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VOL. VI. DIA——ETH

INDOCTI DISCANT, ET AMENT MEMINISSE PERITI.

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ENCYCLOPÆDIA.

DIAMOND, a genus of earths of the siliceous kind, called *Adamas Gemma* by the Latins, *Demant* by the Germans and Swedes, and *Diament* by the French, is the hardest of all stones hitherto discovered; commonly clear or transparent; though this property may perhaps belong only to the crystals, and not to the rock from which they originate. When brought to Europe in its rough state, it is either in the form of roundish pebbles, with shining surfaces, or of octœdral crystals; but though they generally appear in octœdral forms, yet their crystals are frequently irregular, especially when the surface inclines to crystallize during the shooting of the whole crystal, and also when several of them unite in one group; in which case the one hinders the other from assuming a regular form. Mr Magellan, however, informs us, that diamonds sometimes assume other forms. He has seen a rough diamond in its native state, of a regular cubical form, with its angles truncated or cut off: likewise another belonging to Dr Combe of London, whose square sides were naturally joined by two very narrow long facets, forming angles of about 120 degrees; and the corners were quite perfect.

Though the diamond is commonly clear and pellucid, yet some of them are met with of a rose colour, or inclining to green, blue, or black, and some have black specks. Tavernier saw one in the treasury of the Mogul, with black specks in it, weighing about 56 carats; and he informs us, that yellow and black diamonds are produced in the mines at Carnatica. Mr Dutens also relates, that he saw a black diamond at Vienna in the collection of the prince de Lichtenstein. Some diamonds have a greenish crust; and of these M. Tavernier relates, that they burst into pieces while working into a proper shape, or in the very act of polishing on the wheel. In confirmation of this, he mentions a large diamond worth upwards of 5000l. Sterling, which burst into nine pieces while polishing on the wheel at Venice.

The finest diamonds are those of a complexion like that of a drop of pure water. It is likewise a valuable property if they are of a regular form and truly made; as also that they be free from stains, spots, specks, flaws, and cross veins. If diamonds are tinctured yellow, blue, green, or red, in a high degree, they are next in esteem; but if they are tinctured with these colours only in a low degree, the value of them is greatly diminished. There are also diamonds of other complexions; such as brown, and those of a dark hue: the first resembling the brownest sugar-candy, and the latter dusky iron. In the *Philosophical Commerce of Arts*, Dr Lewis tells us of a *black* diamond that he himself had seen. At a distance, it looked uniformly black; but on closer examination appeared in some parts transparent, and in others charged with foulness, on which the black hue depended.

These gems are lamellated, consisting of very thin plates like those of talc, but very closely united; the direction of which must be found out by lapidaries before they can work them properly: Such as have their foliated substance not in a flat position, are called by the workmen *diamonds of nature*.

The names of *oriental* and *occidental*, given by jewellers to this and all other precious stones, have a different meaning from the obvious sense; the finest and hardest being always called *oriental*, whether they be produced in the east or not. Those called *occidental* are of inferior value; but according to Mr Jefferies, who has written a treatise on the subject, the diamonds of Brasil equal the finest oriental ones. The art of cutting these gems was invented in 1476 by Louis de Berquen a native of Bruges in the Austrian Netherlands. This stone becomes luminous in the dark, by exposure during a certain time to the rays of the sun; by heating it in a crucible; by plunging it in boiling water; or by rubbing it with a piece of glass. By friction it acquires an electrical property, by which it attracts the substance used for foils called *black mastic*, and other light matters. The author of the Chemical Dictionary says, that diamonds are refractory in the fire, and even apyrous. Nevertheless, experiments have been made, which prove that diamonds are capable of being dissipated, not only by the collected heat of the sun, but also by the heat of a furnace. Mr Boyle says, that he perceived certain acrid and penetrating exhalations from diamonds exposed to fire. A diamond by exposure to a concave speculum, the diameter of which was 40 inches, was reduced to an eighth part of its weight *. In the *Giornale de Letterati d' Italia, tom.* viii. *art.* 9. we may read a relation of experiments made on precious stones, by order of the grand duke of Tuscany, with a burning lens, the diameter of which was two thirds of a Florentine ell, near the focus of which was placed another smaller lens. By these experiments we find, that diamonds were more altered by solar heat than most of the other precious stones, although not the least appearance of a commencing fusion was observable. A diamond weighing 30 grains, thus exposed during 30 seconds, lost its colour, lustre, and transparency, and became of an opaque white. In five minutes, bubbles appeared on its surface; soon afterwards it burst into pieces, which were dissipated; and the small fragment which remained was capable of being crushed into fine powder by the pressure of the blade of a knife. Neither the addition of glass, flints, sulphur, metals, or salt of tartar, prevented this dissipation

* *Phil. Transf.* N° 386.

pation of diamonds, or occasioned any degree of fusion. By this heat rubies were softened, and lost some of their colour, but preserved their form and weight. By addition of a third lens, a further degree of fusion was given to rubies. Even then rubies could not be made to unite with glass. By having been exposed to this heat, the surface of the rubies which had suffered fusion, lost much of their original hardness, and were nearly as soft as crystal. But their internal parts, which had not been fused, retained their hardness. Emeralds by this heat were rendered white, or of various colours, and soon afterwards were fused. They were found to have lost part of their weight, and to be rendered less hard and brittle.

Experiments were also made by order of the emperor Francis I. on precious stones; from which we find, that diamonds were entirely dissipated by having been exposed in crucibles to a violent fire of a furnace during 24 hours; while rubies by the same heat were not altered in weight, colour, or polish. By exposing diamonds during two hours only at a time, the following alterations produced on them by fire were observed. First, they lost their polish; then they were split into thin plates; and, lastly, totally dissipated. By the same fire, emeralds were fused. *See Magasin de Hambourg, tom.* xviii.

The action of fire on diamonds has, notwithstanding the abovementioned experiments, been lately doubted in France; and the question has been agitated by several eminent chemists with much interest, and numerous experiments have been made which throw some light on the subject. M. D'Arcet found, not only that diamonds included in porcelain crucibles close, or covered with perforated lids, and exposed to the long and intense heat of a porcelain furnace, were perfectly dissipated; but also, that these stones could in a few hours be totally volatilised with a much inferior degree of heat, by exposing them in a coppel, under the muffle of an essay-furnace. In this latter experiment, he observed that the dissipation was gradual, and that it was effected by a kind of exfoliation. The dissipation of diamonds exposed in coppels was confirmed by M. Macquer; who further observed, that the diamonds were, before the dissipation began, rendered, by the fire, brilliant and shining, as it were, with a phosphoric light. In order to determine whether the dissipation of diamonds was actually effected by their reduction into vapour, or by a combustion or other effect of air upon them, Messrs Lavoisier, Macquer, and Cadet, exposed diamonds to intense heat in an earthen retort, during several hours, but without any other effect than that their polish was destroyed, and about $\frac{1}{7}$th of their weight diminished. M. Mitouard put diamonds in a tobacco-pipe filled with pounded charcoal and accurately closed with lute. He further secured the diamonds from access of air or flame, by placing the tobacco-pipe in a crucible, to which another crucible was inverted and carefully luted. The diamonds, thus secluded from external air, having been exposed to the most intense heat which could be excited in a well constructed furnace, were not thereby altered or diminished. M. Mitouard was induced to believe, that the charcoal conduced to the preservation of diamonds not merely by excluding the air, but by some peculiar property, which he supposes may be the same as that by which this substance defends metals from destruction by fire. He was confirmed in his opinion, by observing that diamonds were not preserved from the action of fire by surrounding them with powder of chalk and of calcined hartshorn, and including them in close vessels, so well as when the charcoal had been employed. Some chemists even thought that the perfect exclusion of air alone was sufficient to preserve diamonds, and doubted whether the balls and crucibles of porcelain employed by M. D'Arcet had excluded the air with sufficient accuracy. Indeed, in one of M. D'Arcet's own experiments, a diamond included in a ball of porcelain had resisted the action of fire. In order to ascertain this question, M. Cadet exposed diamonds in covered and luted crucibles to the violent heat of a forge during two hours; by which operation the diamonds lost only $\frac{1}{17}$th part of their weight. He infers, that the destruction of the diamonds by fire in open vessels is not a true volatilization; but merely an exfoliation, caused by the fire expanding the air contained between the thin plates of which these stones consist, and that by this exfoliation or decrepitation these plates are reduced to so fine a powder as to escape observation. M. D'Arcet objected against the experiments of his adversaries, that they were not of sufficient duration to decide against his, which had lasted several days. He renewed and multiplied his experimets, which confirmed him in his opinion of the volatilization of diamonds in vessels perfectly closed; and that this effect of fire on diamonds is not a mere exfoliation or mechanical separation of the plates of which these stones consist, he infers from the parts of the diamonds pervading the most solid porcelain crucibles without being perceptible, and from the luminous appearance first noticed by M. Macquer, and which was afterwards observed by M. Roux to be an actual flame.

Diamonds are found only in the East Indies, and in Brasil in South America. The diamond mines are found only in the kingdoms of Golconda, Visapour, Bengal, and the Island of Borneo. There are four mines, or rather two mines and two rivers, whence diamonds are drawn. The mines are, 1. That of Raolconda, in the province of Carnatica, five days journey from Golconda, and eight from Visapour. It has been discovered about 200 years. 2. That of Gani, or Coulour, seven days journey from Golconda eastwardly. It was discovered 140 years ago by a peasant, who digging in the ground found a natural fragment of 25 carats. 3. That of Soumelpour, a large town in the kingdom of Bengal, near the Diamond-mine. This is the most ancient of them all: it should rather be called that of *Goual*, which is the name of the river, in the sand whereof these stones are found. Lastly, the fourth mine, or rather the second river, is that of Succudan, in the island of Borneo.

Diamond-Mine of Raolconda.—In the neighbourhood of this mine the earth is sandy, and full of rocks and copse. In these rocks are found several little veins of half and sometimes a whole inch broad, out of which the miners, with a kind of hooked irons, draw the sand or earth wherein the diamonds are; breaking the rocks when the vein terminates, that the track may be found again and continued. When a sufficient quantity of earth or sand is drawn forth they wash it two or three times, to separate the stones therefrom

Diamond.

from. The miners work quite naked, except for a thin linen cloth before them; and besides this precaution, have likewise inspectors, to prevent their concealing of stones: which, however, maugre all this care, they frequently find means to do, by watching opportunities when they are not observed, and swallowing them down.

Diamond-Mine of Gani or Coulour.—In this mine are found a great number of stones from 10 to 40 carats, and even more; and it was here that famous diamond of Aureng-Zeb the Great Mogul, which before it was cut weighed 739 carats, was found. The stones of this mine are not very clear; their water is usually tinged with the quality of the soil; being black where that is marshy, red where it partakes of red, sometimes green and yellow, if the ground happen to be of those colours. Another defect of some consequence is a kind of greasiness appearing on the diamond, when cut, which takes off part of its lustre.—There are usually no less than 60,000 persons, men, women, and children, at work in this mine.

When the miners have found a place where they intend to dig, they level another somewhat bigger in the neighbourhood thereof, and inclose it with walls about two feet high, only leaving apertures from space to space, to give passage to the water. After a few superstitious ceremonies, and a kind of feast which the master of the mine makes for the workmen, to encourage them, every one goes to his business, the men digging the earth in the place first discovered, and the women and children carrying it off into the other walled round. They dig 12 or 14 feet deep, and till such time as they find water. Then they cease digging; and the water thus found serves to wash the earth two or three times, after which it is let out at an aperture reserved for that end. This earth being well washed, and well dried, they sift it in a kind of open sieve, or riddle, much as they do corn in Europe: then thrash it, and sift it afresh; and lastly, search it well with the hands to find the diamonds. They work naked as in the mine of Raolconda, and are watched after the like manner by inspectors.

Diamond-Mine of Soumelpour, or river Goual.—Soumelpour is a large town built all of earth, and covered with branches of cacao-trees: the river Goual runs by the foot thereof, in its passing from the high mountains towards the south to the Ganges, where it loses its name. It is from this river that all our fine diamond points, or sparks, called *natural sparks*, are brought. They never begin to seek for diamonds in this river till after the great rains are over, that is, after the month of December; and they usually even wait till the water is grown clear, which is not before January. The season at hand, eight or ten thousand persons, of all ages and sexes, come out of Soumelpour and the neighbouring villages. The most experienced among them search and examine the sand of the river, going up it from Soumelpour to the very mountain whence it springs. A great sign that there are diamonds in it is the finding of those stones which the Europeans call *thunder-stones*. When all the sand of the river, which at that time is very low, has been well examined, they proceed to take up that wherein they judge diamonds likely to be found: which is done after the following manner: They dam the place round with stones, earth, and fascines, and lading out the water, dig about two feet deep: the sand thus got is carried into a place walled round on the bank of the river. The rest is performed after the same manner as at Coulour, and the workmen are watched with equal strictness.

Diamond-Mine in the island of Borneo, or river of Succudan.—We are but little acquainted with this mine; the queen who reigns in that part of the island not allowing strangers to have any commerce in these stones: though there are very fine ones to be bought at Batavia, brought thither by stealth. They were anciently imagined to be softer than those of the other mines; but experience shows they are in no respect inferior to them.

Beside these four diamond-mines, there have been two others discovered; one of them between Coulour and Raolconda, and the other in the province of Carnatica; but they were both closed up almost as soon as discovered: that of Carnatica, because the water of the diamonds was always either black or yellow; and the other, on account of their cracking, and flying in pieces when cut and ground.

The diamond, we have already observed, is the hardest of all precious stones. It can only be cut and ground by itself and its own substance. To bring it to that perfection which augments its price so considerably, they begin by rubbing several against each other, while rough; after having first glued them to the ends of two wooden blocks, thick enough to be held in the hand. It is this powder thus rubbed off the stones, and received in a little box for the purpose that serves to grind and polish the stones.

Diamonds are cut and polished by means of a mill, which turns a wheel of soft iron sprinkled over with diamond-dust mixed with oil of olives. The same dust, well ground, and diluted with water and vinegar, is used in the sawing of diamonds: which is performed with an iron or brass wire, as fine as a hair. Sometimes, in lieu of sawing the diamonds, they cleave them, especially if there be any large shivers therein. But the Europeans are not usually daring or expert enough to run the risk of cleaving, for fear of breaking.

The *first water* in diamonds means the greatest purity and perfection of their complexion, which ought to be that of the purest water. When diamonds fall short of this perfection, they are said to be of the *second* or *third* water, &c. till the stone may be properly called a *coloured one*: for it would be an impropriety to speak of an imperfectly coloured diamond, or one that has other defects, as a stone of a bad water only.

Mr Boyle has observed, from a person much conversant in diamonds, that some of these gems, in their rough state, were much heavier than others of the same bigness, especially if they were cloudy or foul; and Mr Boyle mentions one that weighed $8\frac{1}{7}$ grains, which being carefully weighed in water, proved to an equal bulk of that liquor as $2\frac{1}{7}$ to 1. So that, as far as could be judged by that experiment, a diamond weighs not thrice as much as water: and yet, in his table of specific gravities, that of a diamond is said to be to water as 3400 to 1000; that is, as $2\frac{2}{5}$ to 1; and therefore, according to these two accounts, there should be some diamonds whose specific gravity differs nearly from that of others. But this is a much greater difference

ference than can be expected in two bodies of the same ſpecies; and indeed, on an accurate trial, does not prove to be the caſe with diamonds. The Braſil diamonds differ a little in weight one from another, and greatly vary from the ſtandard ſet by Mr Boyle for the ſpecific gravity of this gem in general; two large diamonds from that part of the world being carefully weighed, one was found as 3518, the other as 3521, the ſpecific gravity of water being reckoned 1000. After this, ten Eaſt India diamonds were choſen out of a large parcel, each as different from the other in ſhape, colour, &c. as could be found. Theſe being weighed in the ſame ſcales and water with the former, the lighteſt proved as 3512, the heavieſt as 3525, ſtill ſuppoſing the water to be 1000.—Mr Ellicot, who made theſe experiments, has drawn out a table of their ſeveral differences, which is done with great care and accuracy; and, taking in all the common varieties in diamonds, may ſerve as a general rule for their mean gravity and differences.

	In air	In water.	ſpecific gravity
Water - - -			1000
	Grains	*Grains.*	
N° 1. A Braſil diamond, fine water and rough coat	92,425	66,16	3518
2. Ditto, fine water, rough coat - -	88,21	63,16	3521
3. ditto, fine bright coat	10,025	7,170	3511
4. Ditto, fine bright coat	9,560	6,830	3501
5. An Eaſt India diamond, pale blue - -	26,485	18,945	3512
6. Ditto, bright yellow -	23,33	16,710	3524
7 Ditto, very fine water, bright coat -	20,66	14,800	3525
8. Ditto, very bad water, honeycomb coat -	20,38	14,590	3519
9. Ditto, very hard bluiſh caſt	22,5	16,1	3515
10. Ditto, very ſoft, good water - -	22,615	16,2	3525
11. Ditto, a very large red foulneſs in it -	25,480	18,230	3514
12. Ditto, ſoft, bad water	29,525	21,140	3521
13. Ditto, ſoft, brown coat	26,535	18,990	3516
13. Ditto, very deep green coat - -	25,250	18,080	3521
The mean ſpecific gravity of the Braſil diamonds appears to be - -			3513
Of the Eaſt India diamonds - - -			3519
The mean of both - - - - -			3517

Therefore if any thing is to be concluded as to the ſpecific gravity of the diamond, it is, that it is to water as 3517 to 1000.

For the valuation of diamonds of all weights, Mr Jefferies lays down the following rule. He firſt ſuppoſes the value of a rough diamond to be ſettled at 2l. per carat, at a medium; then to find the value of diamonds of greater weights, multiply the ſquare of their weight by 2, and the product is the value required. *E. G.* to find the value of a rough diamond of two carats; 2+2=4, the ſquare of the weight; which, multiplied by two, gives 8 l. the true value of a rough diamond of two carats. For finding the value of manufactured diamonds, he ſuppoſes half their weight to be loſt in manufacturing them; and therefore, to find their value, we muſt multiply the ſquare of double their weight by 2, which will give their true value in pounds. Thus, to find the value of a wrought diamond weighing two carats; we firſt find the ſquare of double the weight *viz* 4+4=16; then 16+2=32. So that the true value of a wrought diamond of two carats is 32l. On theſe principles Mr Jefferies has conſtructed tables of the price of diamonds from 1 to 100 carats.

The greateſt diamond ever known in the world is one belonging to the king of Portugal, which was found in Braſil. It is ſtill uncut: and Mr Magellan informs us, that it was of a larger ſize; but a piece was cleaved or broken off by the ignorant countryman, who chanced to find this great gem, and tried its hardneſs by the ſtroke of a large hammer upon the anvil.

This prodigious diamond weighs 1680 carats: and although it is uncut, Mr Romè de l'Iſle ſays, that it is valued at 224 millions ſterling; which gives the eſtimation of 79,36 or about 80 pounds ſterling for each carat: *viz.* for the multiplicand of the ſquare of its whole weight. But even in caſe of any error of the preſs in this valuation, if we employ the general rule abovementioned, this great gem muſt be worth at leaſt 5,644,800 pounds ſterling, which are the product of 1680 by two pounds, *viz.* much above five millions and a half ſterling.

The famous diamond which adornes the ſeptre of the Empreſs of Ruſſia under the eagle at the top of it weighs 779 carats, and is worth at leaſt 4,854,728 pounds ſterling, although it hardly coſt 135,417 guineas. This diamond was one of the eyes of a Malabarian idol, named *Scheringham.* A French grenadier, who had deſerted from the Indian ſervice, contrived ſo well as to become one of the prieſts of that idol, from which he had the opportunity to ſteal its eye: he run away to the Engliſh at Trichinapeuty, and thence to Madras. A ſhip-captain bought it for twenty thouſand rupeees: afterwards a Jew gave ſeventeen or eighteen thouſand pounds ſterling for it: at laſt a Greek merchant, named *Gregory Suffars*, offered it to ſale at Amſterdam in the year 1766: and the late prince Orloff made this acquiſition, as he himſelf told Mr Magellan in London, for his ſovereign the empreſs of Ruſſia. Dutens, page 19. and Bomare, page 389. of his Mineralogy, relate the above anecdote. The figure and ſize of this diamond may be ſeen in the Britiſh Muſeum in London: it is far from being of a regular form.

The diamond of the great Mogul is cut in Roſe; weighs 279 $\frac{9}{16}$ carats, and it is worth 380,000 gunieas. This diamond has a ſmall flaw underneath near the bottom: and Tavernier, page 389. who examined it, valued the carat at 150 French livres. Before this diamond was cut, it weighed 793$\frac{5}{8}$ carats, according to Romè de l'Iſle: but Tavernier, page 339 of his ſecond volume, ſays, that it weighed 900 carats before it was cut. If this is the very ſame diamond, its loſs by being cut was very extraordinary.

Another diamond of the king of Portugal, which weighs 215 carats, is extremely fine, and is worth at leaſt 269,800 guineas.

The diamond of the grand duke of Tuſcany, now of the emperor of Germany, weighs 139$\frac{1}{2}$ carats; and is worth at leaſt 109,520 guineas. Tavernier ſays that

that this diamond has a little hue of a citron colour; and he valued it at 135 *livres tournoiſes* the carat. Robert de Berquen ſays, that this diamond was cut into two: that the grand Turk had another of the ſame ſize; and that there were at Biſnager two large diamonds, one of 250 and another of 140 carats. This Robert de Berquen was the grandſon of Louis de Berquen, who invented the art of cutting diamonds.

The diamond of the king of France, called the *Pitt* or *Regent*, weighs 136$\frac{3}{4}$ carats: this gem is worth at leaſt 208,333 guineas, although it did not coſt above the half of this value.

The other diamond of the ſame monarch, called the *Sancy*, weighs 55 carats; it coſt 25,000 guineas: and Mr Dutens ſays, that it is worth much above that price.

Brilliant DIAMOND, is that cut in faces both at top and bottom; and whoſe table, or principal face at top, is flat. To make a complete ſquare brilliant, if the rough diamond be not found of a ſquare figure, it muſt be made ſo; and if the work is perfectly executed, the length of the axis will be equal to the ſide of the ſquare baſe of the pyramid.—Jewellers then form the table and collet by dividing the block, or length of the axis into 18 parts. They take $\frac{5}{18}$ from the upper part, and $\frac{1}{18}$ from the lower. This gives a plane at $\frac{4}{18}$ diſtance from the girdle for the table; and a ſmaller plane at $\frac{5}{18}$ diſtance for the collet; the breadth of which will be $\frac{1}{5}$ of the breadth of the table. In this ſtate the ſtone is ſaid to be a *complete ſquare table* diamond.—The brilliant is an improvement on the table-diamond, and was introduced within the laſt century, according to Mr Jefferies.—To render a brilliant perfect, each corner of the above deſcribed table-diamond, muſt be ſhortened by $\frac{1}{20}$ of its original. The corner ribs of the upper ſides muſt be flattened, or run towards the centre of the table $\frac{1}{6}$ leſs than the ſides; the lower part, which terminates the girdle, muſt be $\frac{1}{8}$ of one ſide of the girdle; and each corner rib of the under ſides muſt be flattened at the top, to anſwer the above flattening at the girdle, and at bottom muſt be $\frac{1}{4}$ of each ſide of the collet.

The parts of the ſmall work which completes the brilliant, or the ſtar and ſkill facets, are of the triangular figure. Both of theſe partake equally of the depth of the upper ſides of the table to the girdle; and meet in the middle of each ſide of the table and girdle, as alſo at the corners. Thus they produce regular lozenges on the four upper ſides and corners of the ſtone. The triangular facets, on the under ſides, joining to the girdle, muſt be half as deep again as the above facets, to anſwer to the collet part.—The ſtone here deſcribed is ſaid to be a *full-ſubſtanced brilliant*.—If the ſtone is thicker than in the proportion here mentioned, it is ſaid to be an *over-weighted brilliant*.—If the thickneſs is leſs than in this proportion, it is called a *ſpread-brilliant*.—The beauty of brilliants is diminiſhed from their being either over-weighted or ſpread. The true proportion of the axis, or depth of the ſtone to its ſide, is as 2 to 3.—Brilliants are diſtinguiſhed into ſquare, round, oval, and drops, from the figure of their reſpective girdles.

Corniſh DIAMOND, a name given by many people to the cryſtals found in digging the mines of tin in Cornwal. Theſe cryſtals are of the nature of the Kerry-ſtone of Ireland, but ſomewhat inferior to it: they are uſually bright and clear, except towards the root, where they are coarſe and foul, or whitiſh. They are uſually found in the common form of an hexangular column terminated at each end by an hexangular pyramid.

Roſe-DIAMOND is one that is quite flat underneath, with its upper part cut in divers little faces, uſually triangles, the uppermoſt of which terminate in a point.—In roſe-diamonds, the depth of the ſtone from the baſe to the point muſt be half the breadth of the diameter of the baſe of the ſtone. The diameter of the crown muſt be $\frac{2}{5}$ of the diameter of the baſe. The perpendicular, from the baſe to the crown, muſt be $\frac{3}{5}$ of the diameter of the ſtone. The lozenges which appear in all circular roſe-diamonds, will be equally divided by the ribs that form the crown; and the upper angles or facets will terminate in the extreme point of the ſtone, and the lower in the baſe or girdle.

Rough DIAMOND, is the ſtone as nature produces it in the mines.

A rough diamond muſt be choſen uniform, of a good ſhape, tranſparent, not quite white, and free of flaws and ſhivers. Black, rugged, dirty flawey, veiny ſtones, and all ſuch as are not fit for cutting, they uſe to pound in a ſteel mortar made for that purpoſe; and when pulverized, they ſerve to ſaw, cut, and poliſh the reſt. Shivers are occaſioned in diamonds by this, That the miners, to get them more eaſily out of the vein, which winds between two rocks, break the rocks with huge iron levers, which ſhakes, and fills the ſtone with cracks and ſhivers. The ancients had two miſtaken notions with regard to the diamond: the firſt, that it became ſoft, by ſteeping it in hot goat's blood; and the ſecond, that it is malleable, and bears the hammer. Experience ſhows us the contrary; there being nothing capable of mollifying the hardneſs of this ſtone; tho' its hardneſs be not ſuch, that it will endure being ſtruck at pleaſure with the hammer.

Factitious DIAMONDS. Attempts have been made to produce artificial diamonds, but with no great ſucceſs.—Theſe made in France, called *temple diamonds*, on account of the temple at Paris, where the beſt of them are made, fall vaſtly ſhort of the genuine ones; accordingly they are but little valued, though the conſumption thereof is pretty conſiderable for the habits of the actors on the ſtage, &c. See PASTES.

DIAMOND, in the glaſs-trade, an inſtrument uſed for ſquaring the large plates or pieces; and, among glaziers, for cutting their glaſs.

Theſe ſorts of diamonds are differently fitted up. That uſed for large pieces, as looking-glaſſes, &c. is ſet in an iron ferril, about two inches long, and a quarter of an inch in diameter; the cavity of the ferril being filled up with lead, to keep the diamond firm; there is alſo a handle of box or ebony fitted to the ferril, for holding it by.

DIAMOND, in heraldry, a term uſed for expreſſing the black colour in the atchievements of peerage.

Guillim does not approve of blazoning the coats of peers by precious ſtones inſtead of metals and colours; but the Engliſh practice allows it. Morgan ſays the diamond is an emblem of fortitude.

DIANA, the goddeſs of hunting. According to

Cicero,

Cicero, there were three of this name: a daughter of Jupiter and Proserpine, who became mother of Cupid a daughter of Jupiter and Latona; and a daughter of Upis and Glauce. The second is the most celebrated, and to her all the ancients allude. She was born at the same birth as Apollo; and the pains which she saw her mother suffer during her labour gave her such an aversion to marriage, that she obtained of her father to live in perpetual celibacy, and to preside over the travails of women. To shun the society of men, she devoted herself to hunting; and was always accompanied by a number of chosen virgins, who like herself abjured the use of mariage. She is represented with a quiver and attended with dogs, and sometimes drawn in a chariot by two white stags. Sometimes she appears with wings, holding a lion in one hand and a panther in the other, with a chariot drawn by two heifers, or two horses of different colours. She is represented as tall; her face has something manly; her legs are bare, well shaped, and strong; and her feet are covered with a buskin worn by huntresses among the ancients. She received many surnames, particularly from the places where her worship was established, and from the functions over which she presided. She was called *Lucina*, *Ilythia* or *Juno Pronuba*, when invoked by women in childbed; and *Trivia* when worshipped in the cross-ways, where her statues were generally erected. She was supposed to be the same as the moon and Proserpine or Hecate, and from that circumstance she was called *Triformis*; and some of her statues represented her with three heads, that of a horse, a dog, and a boar. Her power and functions under these three characters have been beautifully expressed in these two verses:

Terret, lustrat, agit, Proserpina, Luna, Diana,
Ima, suprema, feras, sceptro, fulgore, sagitta.

She was also called *Agrotera*, *Orithia*, *Taurica*, *Delia*, *Cynthia*, *Aricia*, &c. She was supposed to be the same as the Isis of the Egyptians, whose worship was introduced into Greece with that of Osiris under the name of Apollo. When Typhon waged war against the gods, Diana metamorphosed herself into a cat to avoid his fury. She is generally known, in the figures that represent her, by the cresent on her head, by the dogs which attend her, and by her hunting habit. The most famous of her temples was that of Ephesus, which was one of the seven wonders of the world: (See EPHESUS). She was there represented with a great number of breasts, and other symbols which singified the earth or Cybele. Though she was the patroness of chastity, yet she forgot her dignity to enjoy the company of Endymion, and the very familiar favours which she granted to Pan and Orion are well known: (See ENDYMION, PAN, ORION). The inhabitants of Taurica were particularly attached to the worship of this goddess, and they cruelly offered on her altar all the strangers that were shipwrecked on their coasts. Her temple in Aricia was served by a priest who had always murdered his predecessor; and the Lacedemonians yearly offered her human victims till the age of Lycurgus, who changed this barbarous custom for the sacrifice of flagellation. The Athenians generally offered her goats; and others a white kid, and sometimes a boar pig or an ox. Among plants, the poppy and the ditany were sacred to her. She, as well as her brother Apollo, had some oracles; among which those of Egypt, Cilicia, and Ephesus, are the most known.

DIANÆ ARBOR, or ARBOR LUNÆ, in chemistry, the beautiful crystallizations of silver, dissolved in aquafortis, to which some quicksilver is added: and so called from their resembling the trunk, branches leaves, &c. of a tree. See CHEMISTRY, n° 754.

DIANÆ Fanum, (anc. geog.) a promontory of Bithynia: Now *Scutari*, a citadel opposite to Constantinople, on the east side of the Bosphorus Thracius.

DIANÆ Portus, a port of Corsica, situated between Aleria and Mariana, on the east side.

DIANDRIA (from δις *twice*, and ανηρ *a man*), the name of the second class in Linnæus's sexual system, consisting of hermaphrodite plants; which, as the name imports, have flowers with two stamina or male organs.

The orders in this class are three, derived from the number of styles or female parts. Most plants with two stamina have one style; as jessamine, lilac, privet, veronica, and bastard alaternus: vernal grass has two styles; pepper, three.

DIANIUM (anc. geog.), a town of the Contestani, in the Hither Spain; famous for a temple of Diana, whence the name: Now *Denia*, a small town of Valencia, on the Mediterranean. Also a promontory near Dianium: Now *El Cabo Martin*, four leagues from Denia, running out into the Mediterranean.

DIANTHERA, in botany: A genus of the monogynia order, belonging to the diandria class of plants; and in the natural method ranking under the 40th order *Personatæ*. The corolla is ringent; the capsule bilocular, parting with a spring at the heel; the stamina each furnished with two antheræ placed alternately.—There is only one species, a native of Virginia and other parts of North America. It is a low herbaceous plant, with a perennial root, sending out upright stalks a foot high, garnished with long narrow leaves of an aromatic odour, standing close to the stalks. From the side of the stalks the footstalks of the flowers are produced sustaining small spikes of flowers.—This plant is very difficult to be preserved in Britain; for though it is hardy enough to live in the open air, it is very subject to rot in winter. It may be propagated by seeds sown on a gentle hot-bed; and in the winter the plants must be kept in a dry stove.

DIANTHUS, CLOVE GILLIFLOWER, CARNATION PINK, SWEET-WILLIAM, &c.: A genus of the digynia order, belonging to the decandria class of plants: and in the natural method ranking under the 22d order, *Caryophyllei*. The calyx is cylindrical and monophyllous, with four scales at the base. There are five petals, with narrow heels; the capsule is cylindrical and unilocular.—There are a great number of species: but not more than four that have any considerable beauty as garden-flowers, each of which furnishes some beautiful varieties. 1. The caryophyllus, or clove-gilliflower including all the varieties of carnation. It rises with many short trailing shoots from the root, garnished with long, very narrow, evergreen leaves; and amidst them upright slender flower-stalks, from one to three feet high, emitting many side-shoots; all of which, as well as the main stalk, are terminated by large solitary flowers, having short oval scales to the calyx, and crenated petals. The varieties of this are very numerous, Dianthus. rous, and unlimited in the diversity of flowers. 2. The deltoides, or common pink, rises with numerous short leafy shoots crowning the root, in a tufted head close to the ground, closely garnished with small narrow leaves; and from the ends of the shoots many erect flower-stalks, from about six to 15 inches high, terminated by solitary flowers of different colours, single and double, and sometimes finely variegated. This species is perennial, as all the varieties of it commonly cultivated also are. 3. The Chinensis, Chinese, or Indian pink, is an annual plant with upright firm flower-stalks, branching erect on every side, a foot or 15 inches high, having all the branches terminated by solitary flowers of different colours and variegations, appearing from July to November. 4. The barbatus, or bearded dianthus, commonly called *sweet-william*. This rises with many thick leafy shoots, crowning the root in a cluster close to the ground; garnished with spear-shaped evergreen leaves, from half an inch to two inches broad. The stems are upright and firm, branching erect two or three feet high, having all the branches and main stem crowned by numerous flowers in aggregate clusters of different colours and variegations.

Culture. Though the carnations grow freely in almost any garden earth, and in it produce beautiful flowers, yet they are generally superior in that of a light loamy nature: and of this kind of soil the florists generally prepare a kind of compost in the following manner, especially for those fine varieties which they keep in pots. A quantity of loamy earth must be provided, of a light sandy temperature, from an upland or dry pasture-field or common, taking the top spit turf and all, which must be laid in a heap for a year, and turned over frequently. It must then be mixed with about one-third of rotten dung of old hot-beds, or rotten neats dung, and a little sea-sand, forming the whole into a heap again, to lie three, four, or six months, at which time it will be excellent for use; and if one parcel or heap was mixed with one of these kinds of dungs, and another parcel with the other, it will make a change, and may be found very beneficial in promoting the size of the flowers. This compost, or any other made use of for the purpose should not be sifted, but only well broken with the spade and hands.—When great quantities of carnations are required, either to furnish large grounds, or for market, or when it is intended to raise new varieties, it is easily effected by sowing some seed annually in spring, in common earth, from which the plants will rise abundantly. Several good varieties may also be expected from the plants of each sowing; and possibly not one exactly like those from which the seed was saved. The single flowers are always more numerous than the double ones; but it is from the latter only that we are to select our varieties. The season for sowing the seed is any time from the 20th of March to the 15th of April. —The plants generally come up in a month after sowing: they must be occasionally weeded and watered till July, when they will be fit for transplanting into the nursery beds. These beds must be made about three feet wide, in an open situation; and taking advantage of moist weather, prick the plants therein four inches asunder, and finish with a gentle watering, which repeat occasionally till the plants have taken good root. Here they must remain till September, when they will be so well advanced in growth as to require more room; and should then have their final transplantation into other three feet wide beds of good earth, in rows 9 inches asunder, where they are to be placed in the order of quincunx. Here they are to remain all winter, until they flower, and have obtained an increase of the approved varieties of doubles by layers; and until this period, all the culture they require is, that if the winter should prove very severe, an occasional shelter of mats will be of advantage. In spring, the ground must be loosened with a hoe; they must be kept clear from weeds; and when the flower-stalks advance, they are to be tied up to sticks, especially all those that promise by their large flower-pods to be doubles. Dianthus.

The only certain method of propagating the double varieties is by layers. The proper parts for layers are those leafy shoots arising near the crown of the root, which, when about five, six, or eight inches long, are of a proper degree of growth for layers. The general season for this work is June, July, and the beginning of August, as then the shoots will be arrived at a proper growth for that operation; and the sooner it is done after the shoots are ready the better, that they may have sufficient time to acquire strength before winter: these laid in June and July will be fit to take off in August and September, so will form fine plants in the month of October. The method of performing the work is as follows. First provide a quantity of small hooked sticks for pegs. They must be three or four inches long, and their use is to peg the layers down to the ground. Get ready also in a barrow a quantity of light rich mould, to raise the earth, if necessary, round each plant, and provide also a sharp penknife. The work is begun by stripping off all the leaves from the body of the shoots, and shortening those at top an inch or two evenly. Then choosing a strong joint on the middle of the shoot or thereabouts, and on the back or under side thereof, cut with the penknife the joint half-way through, directing your knife upward so as to slit the joint up the middle, almost to the next joint above, by which you form a kind of tongue on the back of the shoot; observing that the swelling skinny part of the joint remaining at the bottom of the tongue must be trimmed off, that nothing may obstruct the issuing of the fibres; for the layers always form their roots at that part. This done, loosen the earth about the plant; and, if necessary, add from fresh mould, to raise it for the more ready reception of the layers: then with your finger make a hollow or drill in the earth to receive the layer; which bend horizontally into the opening, raising the top upright, so as to keep the gash or slit part of the layer open; and, with one of the hooked sticks, peg down the body of the layer, to secure it in its proper place and position, still preserving the top erect and the slit open, and draw the earth over it an inch or two, bringing it close about the erect part of the shoot; and when all the shoots of each plant are thus laid, give directly some water to settle the earth close, and the work is finished. In dry weather the waterings must be often repeated, and in five or six weeks the layers will have formed good roots. They must then be separated with a knife from the old plant, gently raised out of the earth with the point of a knife or trowel, in order to preserve the fibrous roots of the layers as en-

tire

tire as poſſible; and when thus taken up, cut off the naked ſticky part at bottom cloſe to the root, and trim the tops of the leaves a little. They are then ready for planting either into beds or pots. In November the fine varieties in pots ſhould be moved to a ſunny ſheltered ſituation for the winter; and if placed in a frame, to have occaſional protection from hard froſt, it will be of much advantage. In the latter end of February, or ſome time in March, the layers in the ſmall pots, or ſuch as are in beds, ſhould be tranſplanted with balls into the large pots, where they are to remain for flower. To have as large flowers as poſſible, curious floriſts clear off all ſide-ſhoots from the flower-ſtem, ſuffering only the main or top buds to remain for flowering. When the flowers begin to open, attendance ſhould be given to aſſiſt the fine varieties, to promote their regular expanſion, particularly the largeſt kinds called *burſters*, whoſe flowers are ſometimes three or four inches diameter. Unleſs theſe are aſſiſted by art, they are apt to burſt open on one ſide, in which caſe the flower will become very irregular: therefore, attending every day at that period, obſerve, as ſoon as the calyx begins to break, to cut it a little open at two other places in the indenting at top with narrow-pointed ſciſſars, and hereby the more regular expanſion of the petals will be promoted: obſerving, if one ſide of any flower comes out faſter than another, to turn the pot about, that the other ſide of the flower may be next the ſun, which will alſo greatly promote its regular expanſion. When any fine flower is to be blown as large and ſpreading as poſſible, floriſts place ſpreading paper collars round the bottom of the flowers, on which they may ſpread their petals to the utmoſt expanſion. Theſe collars are made of ſtiff white paper, cut circular about three or four inches over, having a hole in the middle to receive the bottom of the flower, and one ſide cut open to admit it. This is to be placed round the bottom of the petals in the inſide of the calyx, the leaves of which are made to ſpread flat for its ſupport. The petals muſt then be drawn out and ſpread upon the collar to their full width and extent; the longeſt ones undermoſt, and the next longeſt upon theſe; and ſo on; obſerving that the collar muſt no where appear wider than the flower; and thus a carnation may be rendered very large and handſome.

Theſe directions will anſwer equally well for the propagation of the pinks and ſweet-williams, though neither of theſe require ſuch nicety in their culture as the carnations.

DIAPASON, in muſic, a muſical interval, by which moſt authors who have wrote on the theory of muſic uſe to expreſs the OCTAVE of the Greeks.

DIAPASON, among the muſical inſtrument-makers, a kind of rule or ſcale whereby they adjuſt the pipes of their organs, and cut the holes of their hautboys, flutes, &c. in due proportion for performing the tones, ſemitones, and concords, juſt.

DIAPASON-Diaex, in muſic, a kind of compound concord, whereof there are two ſorts; the greater, which is in the proportion of 10-3; and the leſſer, in that of 16-5.

DIAPASON Diapente, in muſic, a compound conſonance in a triple ratio, as 3-9. This interval, ſays Martianus Capella, conſiſts of 9 tones and a ſemitone; 19 ſemitones, and 38 dieſes. It is a ſymphony made when the voice proceeds from the firſt to the twelfth ſound.

DIAPASON Diateſſaron, in muſic, a compound concord founded on the proportion of 8 to 3. To this interval Martianus Capella allows 8 tones and a ſemitone, 17 ſemitones, and 34 dieſes. This is when the voice proceeds from its firſt to its eleventh ſound. The moderns would rather call it the *eleventh*.

DIAPASON Ditone, in muſic, a compound concord, whoſe terms are as 10-4, or as 5-2.

DIAPASON Semiditone, in muſic, a compound concord, whoſe terms are in the proportion of 12-5.

DIAPEDESIS, in medicine, a tranſudation of the fluids through the ſides of the veſſels that contain them, occaſioned by the blood's becoming too much attenuated, or the pores becoming too patent.

DIAPENTE, in the ancient muſic, an interval marking the ſecond of the concords, and with the diateſſaron an octave. This is what in the modern muſic is called a *fifth*.

DIAPHANOUS, an appellation given to all tranſparent bodies, or ſuch as tranſmit the rays of light.

DIAPHORESIS, in medicine, an elimination of the humours in any part of the body through the pores of the ſkin. See PERSPIRATION.

DIAPHORETICS, among phyſicians, all medicines which promote perſpiration.

DIAPHRAGM, DIAPHRAGMA, in anatomy, a part popularly called the *midriff*, and by anatomiſts *ſeptum tranſverſum*. It is a nervous muſcle, ſeparating the breaſt or thorax from the abdomen or lower venter, and ſerving as a partition between the natural and the vital parts, as they are called. See ANATOMY, nº 115.

It was Plato, as Galen informs us, that firſt called it *diaphragm*, from the verb διαφρατειν, to *ſeparate* or *be between two*. Till his time it had been called φρενες, from a notion that an inflammation of this part produced phrenſy; which is not at all warranted by experience, any more than that other tradition, that a tranſverſe ſection of the diaphragm with a ſword cauſes the patient to die laughing.

DIAPORESIS, Διαπορησες, in rhetoric, is uſed to expreſs the heſitation or uncertainty of the ſpeaker.

We have an example in Homer, where Ulyſſes, going to relate his ſufferings to Alcinous, begins thus:

Τι πρωτον, τι δ' επειτα, τι δ' υςατιον καταλεξω?

Quid primum, quid deinde, quid poſtremo alloquar?

This figure is moſt naturally placed in the exordium or introduction to a diſcourſe. See DOUBTING.

DIARBECK, or DIARBEKR, an extenſive province of Eaſtern Aſiatic Turkey; comprehending, in its lateſt extent, *Diarbekr*, properly ſo called, *Yerack* or *Chaldea*, and *Curdiſtan*, which were the ancient countries of Meſopotamia, Chaldea, and Aſſyria, with Bybylon. It is called *Diarbeck*, *Diarbeker*, or *Diarbekr*, as ſignifying the "duke's country," from the word *dhyar* "a duke, and *bekr* "country." It extends along the banks of the Tigris and Euphrates from north-north-weſt to ſouth-eaſt, that is, from Mount Taurus, which divides it from Turcomania on the north, to the inmoſt receſs of the Perſian gulph on the ſouth, about 600 miles; and from eaſt to weſt, that is, from Perſia on the eaſt to Syria and Arabia Deſerta on the weſt, in ſome places 200, and in others about 300, miles, but

Diarbekir. but in the southern or lower parts not above 150. As extending also from the 30th to the 38th degree of latitude, it lies under part of the fifth and sixth climates whose longest day is about 14 hours and a half, and so in proportion, and consequently enjoys a good temperature of air, as well as, in the greater part of it, a rich and fertile soil. There are indeed, as in all hot countries, some large deserts in it, which produce no sustenance for men or cattle, nor have any inhabitants. Being a considerable frontier towards the kingdom of Persia, it is very well guarded and fortified; but as for those many cities once so renowned for their greatness and opulence, they are at present almost dwindled into heaps of ruins. Bagdad, Mossul, Carahmed, and a few more, indeed continue to be populous and wealthy; but the rest can scarce be called by any other name than that of sorry places. The rivers Euphrates and Tigris have almost their whole course through this country.

Diarbeck Proper is bounded on the north by Turcomania, on the west by Syria, on the south by part of Arabia Deserta and Yrack Proper, and on the east by Curdistan. It was named by Moses *Padan Aram;* the latter being the general name of Syria; and the former signifying *fruitful*, a proper epithet for this country, which is really so to a very high degree, especially on the northern side, where it yields corn, wine, oil, fruits, and all necessaries of life in great abundance. Formerly it was the residence of many famed patriarchs, yet was over-run with the grossest idolatry, not only in the time of Abraham's coming out of it, and Jacob's sojourning in it, but likewise during the time it continued under the dominion of the Assyrians, Babylonians, Medes, Persians, and Romans. It received indeed the light of the gospel soon after our Saviour's ascension, from St Thaddæus, who is said to have been sent thither by St Thomas, at the request of Agbarus king of Edessa. This account, together with that monarch's letter to Jesus Christ, we have from Eusebius, who took it from the archives of that city; and the whole had passed current and uncontradicted for many ages, till our more enlightened moderns found reasons to condemn it; but whether right or wrong, it plainly appears that Christianity flourished here in a most eminent manner, till its purity was sullied about the beginning of the sixth century by the heresy of the Jacobites, whose patriarch still resides here, with a jurisdiction over all that sect in the Turkish dominions.

Diarbeck Proper, is a beglerbegate, under which are reckoned twelve sangiacs; and the principal towns in it are, Diarbekir or Caramed, Rika, Moussul, Orsa or Edessa, Elbir, Nisibis, Gezir Merdin, Zibin, Ur of the Chaldees, Amad, and Carasara; but all now of little note excepting Diarbekir and Moussul.

Diarbekir, the capital of the above district, is situated in a delightful plain on the banks and near the head of the Tigris, about 155 miles or 15 caravan days journey, north-east from Aleppo, in latitude 37° 35′, east longitude 40° 50′. The bridge of 10 arches over the said river is said to have been built by the order of Alexander the Great. It is one of the richest and most mercantile cities in all Asiatic Turkey; and is well fortified, being encompassed with a double wall, the outermost of which is flanked, with 72 towers; said to have been raised in memory of our Saviour's 72 disciples. It has several stately piazzas or market-places, well stored with all kinds of rich merchandize, and 12 magnificent mosques, said to have been formerly Christian churches. Its chief manufacture is the dressing, tanning, and dying of goat-skins, commonly called *Turkey leather*, of which the vent is almost incredible in many parts of Europe and Asia: besides this, there is another of dyed fine linen and cotton cloths, which are nearly in the same request. The waters of the Tigris are reckoned extraordinary for those two branches of trade, and give red leather a finer grain and colour than any other. There is a good number of large and convenient inns on both sides of the river, for the caravans that go to and from Persia; and on the road near the town is a chapel with a cupola, where Job is said to lie buried. This place is much frequented by pilgrims of all nations and religions, and a Turkish hermit has a cell close to it. The fair sex, who, in most other parts of the Turkish empire, are kept quite immured and considered as mere slaves, enjoy here an extraordinary liberty, and are commonly seen on the public walks of the city in company with the Christian women, and live in great friendship and familiarity with them. The same is said of the men, who are polite, affable, and courteous, and very different from what they affect to be, especially the Turks, in other cities of this empire. The city is under the government of a basha, who has great power and very large dominions. He has commonly a body of 20,000 horse under him, for repelling the frequent incursions of the Curdes and Tartars, who always go on horseback to rob the caravans. The adjacent territory is very rich and beautiful; the bread, wine, and flesh excellent; the fruits exquisite, and the pigeons better and larger than any in Europe.

Mr Ives, who passed through this city in 1758, informs us, that "about two years ago it was very populous, its inhabitants amounting to 400,000 souls; but in the last year 300,000 died either by cold or famine. The Christians residing in the city before this calamity were reckoned to amount to 26,000, of whom 20,000 died. This account we had from one of the French missionaries, a capuchin, who also said, that before the famine the city contained 60,000 fighting men, but that now they are not able to muster 10,000. He assures us, that the houses and streets, nay the very mosques, were filled with dead; that every part of the city exhibited a dreadful image of death; and that the surviving inhabitants not only greedily devoured all kinds of beasts, brutes, and reptiles, but also were obliged to feed on human bodies. Yet, in the midst of this scene of horror, the grandees of the city had every thing in plenty; for they had taken care to monopolize vast quantities of corn, which they sold out to the other inhabitants at most extravagant prices, and thereby acquired for themselves immense fortunes. Corn rose from two piastres a measure to 50, 60, and even 70, in the space of six months. The father added, that the very severe winter of 1756, and the locusts in 1757, were the causes of this dreadful visitation: for by reason of the former, there were but few acres of land sown with corn; and by the latter, the small crop they had was in a great measure destroyed. He spoke of the severity of that winter in terms almost incredible: that it was common to see the

people

people fall down dead in the ſtreets; that he himſelf once on quitting a warm room, and going into the open air, fell down motionleſs; and that his brother, in attempting to aſſiſt him, met with the ſame fate." This account of the effects of cold in the city of Diarbekir, which lies only in about 38° north, ſeems at firſt very ſurpriſing; but conſidering that the place ſtands on a riſing ground in the midſt of an extenſive plain, and that the high Courdiſtan mountains lie to the ſouth and eaſt of it, and the Armenian or Turcomanian to the north, whoſe heads are always covered with ſnow, and even now in July ſupply the city with ice; it will not appear at all improbable, that in a very ſevere winter, ſuch as was that in 1756, the inhabitants of this city ſhould ſo ſeverely feel the effects of it. Beſides, fuel muſt have been extremely ſcarce, eſpecially among the poorer ſort, as nothing of this kind is produced but upon the mountains, and theſe lie at ſuch a diſtance that the price of it muſt thereby be greatly enhanced.

DIARRHŒA, or Looseness, in medicine, is a frequent and copious evacuation of liquid excrement by ſtool. (See the *Index* ſubjoined to) Medicine.

DIARTHROSIS, in anatomy, a kind of articulation or juncture of the bones; which being pretty lax, affords room for a manifeſt motion. The word comes from δια and αρθρον, *juncture, aſſemblage*. It is oppoſed to *ſynarthroſis*, wherein the articulation is ſo cloſe that there is no ſenſible motion at all. See Anatomy, n° 2.

DIARY, a term ſometimes uſed for a journal or day-book, containing an account of every day's proceedings. Thus we ſay, *diaries of the weather*, &c.

Diary *Fever*, is a fever of one day. See Ephemera.

DIASCHISM, among muſicians, denotes the difference between the comma and enharmonic dieſis, commonly called the *leſſer comma*.

DIASCORDIUM, in pharmacy, a celebrated compoſition, ſo called from *ſcordium*, one of its ingredients. See Pharmacy.

DIASTOLE, among phyſicians, ſignifies the dilatation of the heart, auricles, and arteries; and ſtands oppoſed to the systole, or contraction of the ſame parts. See Anatomy, n° 124.

Diastole, in grammar, a figure in proſody whereby a ſyllable naturally ſhort is made long. Such is the firſt ſyllable of *Priamides* in the following verſe of Virgil;

Atque hic Priamides! nihil o tibi, amice, relictum.

DIASYRMUS, in rhetoric, a kind of hyperbole, being an exaggeration of ſome low, ridiculous thing.

DIATESSARON, among ancient muſicians, a concord or harmonical interval, compoſed of a greater tone, a leſs tone, and one greater ſemitone: its proportion in numbers is as 4 : 3.

DIATONICK, in muſic, (compounded of two Greek words, *viz.* the prepoſition δια, ſignifying a tranſition from one thing to another, and the ſubſtantive τονος, importing a given degree of tenſion or muſical note), is indifferently applied to a ſcale or gammut, to intervals of a certain kind, or to a ſpecies of muſic, whether in melody or harmony, compoſed of theſe intervals. Thus we ſay the *diatonick* ſeries, a *diatonick* interval, *diatonick* melody or harmony. As the diatonick ſcale forms the ſyſtem of diatonick muſic, and conſiſts of diatonick intervals, it will be neceſſary, for underſtanding the former, that we ſhould explain the latter. See Interval.

DIATRAGACANTH, in pharmacy, a name applied to certain powders, of which gum tragacanth is the chief ingredient.

DIAUGOPHRAGMIA, in natural hiſtory, a genus of foſſils of the order of ſeptariæ, whoſe partitions or ſepta, conſiſt of ſpar with an admixture of cryſtal. Of this genus there are three ſpecies. 1. A red kind, with browniſh yellow partitions. 2. A browniſh yellow kind, with whitiſh partitions. 3. A bluiſh-white kind, with ſtraw-coloured partitions.

DIBBLE, or Dibber, a ſimple but uſeful implement in gardening, uſed for planting out all ſorts of young plants, &c.

DIBBLING wheat. See Agriculture, n° 126—129.

DIBIO, or Divio (anc. geog.), the *Divionenſe Caſtrum*, and the *Divionum* of the lower age; a town of the Lingones, in Gallia Belgica: *Dibionenſes*, the people. Now *Dijon*, the capital of Burgundy. E. Long. 5. 5. N. Lat. 47. 15.

DICE, among gameſters, certain cubical pieces of bone or ivory, marked with dots on each of their faces, from one to ſix, according to the number of faces.

Sharpers have ſeveral ways of falſifying dice. 1. By ſticking a hog's briſtle in them, ſo as to make them run high or low as they pleaſe. 2. By drilling and loading them with quickſilver: which cheat is found out by holding them gently by two diagonal corners; for if falſe, the heavy ſides will turn always down. 3. By filing and rounding them. But all theſe ways fall far ſhort of the art of the dice-makers; ſome of whom are ſo dexterous this way, that your ſharping gameſters will give any money for them.

Dice in Britain formerly paid 5s. every pair imported, with an additional duty of 4s. $9\frac{45}{100}$d. for every 20s. value upon oath; but are now prohibited to be imported.

DICÆARCHUS, a ſcholar of Ariſtotle, compoſed a great number of books which were much eſteemed. Cicero and his friend Pomponius Atticus valued him highly. He wrote a book to prove, that men ſuffer more miſchief from one another than from all evils beſide. And the work he compoſed concerning the republic of Lacedemon was extremely honoured, and read every year before the youth in the aſſembly of the ephori. Geography was one of his principal ſtudies, on which ſcience there is a fragment of a treatiſe of his ſtill extant, and preſerved among the *Veteris geographiæ ſcriptores minores*.

DICHOTOMOUS, in botany. See Botany, p. 442, n° 41.

DICHOTOMY, a term uſed by aſtronomers for that phaſis or appearance of the moon, wherein ſhe is biſected, or ſhows juſt half her diſk. In this ſituation the moon is ſaid to be in a quadrate aſpect, or to be in her quadrature.

DICKER, in old writers, denotes the quantity of ten hides of ſkins, whereof 20 made a laſt: alſo 10 pair of gloves, ten bars of iron, and the like, are ſometimes expreſſed by the term *dicker*.

DICKINSON, (Edmund), a celebrated Engliſh phyſician and chemiſt, born in 1624. He ſtudied and took

took his degrees at Merton-college, Oxford: and in 1655 published there his *Delphi Phœnicizantes*, &c. a most learned piece, in which he attempted to prove, that the Greeks borrowed the story of the Pythian Apollo, and all that rendered the oracle at Delphos famous, from the Holy Scriptures, and the book of Joshua in particular: a work that procured him great reputation both at home and abroad. He practised physic first at Oxford; but removing to London in 1684, his good fortune in recovering the earl of Arlington from a dangerous sickness, procured his promotion to be physician in ordinary to Charles II. and to his household. As that prince understood and loved chemistry, Dr Dickinson grew into great favour at court; and was continued in his appointments under James. II. After the abdication of his unfortunate master, being then in years, and afflicted with the stone, he retired from practice, and died in 1707. He published many other things, particularly *Physica vetus & vera*, &c. containing a system of philosophy chiefly framed on principles collected from the Mosaic history.

DICTAMNUS, WHITE DITTANY, or *Fraxinella:* A genus of the monogynia order, belonging to the decandria class of plants; and in the natural method ranking under the 26th order, *Multisiliquæ*. The calyx is pentaphyllous; the petals are five, and patulous; the filaments sprinkled with glandulous points; the capsules five, coalited. There is only one species. It hath thick, penetrating, perennial roots, collected into a head at top, sending up erect stalks annually, two or three feet high, garnished with pinnated alternate leaves, of three or four pair of oblong stiff lobes, terminated by an odd one; and the stalks crowned by long, pyramidal, loose spikes of flowers, of white, red, and purple colours. They are very ornamental plants, and succeed in any of the common borders. The dittany which grows in Crete, Dalmatia, and the Morea, forms an article in the materia medica. The leaves, which are the only parts used, are imported from Italy. The best sort are well covered over with a thick white down, and now and then intermixed with purplish flowers. In smell and taste they somewhat resemble lemon-thyme, but have more of an aromatic flavour, as well as a greater degree of pungency; when fresh, they yield a considerable quantity of an excellent essential oil.

DICTATOR, a magistrate at Rome invested with regal authority. This officer was first chosen during the Roman wars against the Latins. The consuls being unable to raise forces for the defence of the state, because the plebeians refused to inlist if they were not discharged of all the debts they had contracted with the patricians, the senate found it necessary to elect a new magistrate with absolute and uncontroulable power to take care of the state. The dictator remained in office for six months, after which he was again elected if the affairs of the state seemed to be desperate; but if tranquillity was re-established, he generally laid down his power before the time was expired. He knew no superior in the republic, and even the laws were subjected to him. He was called dictator, because *dictus*, named by the consul, or *quoniam dictis ejus parebat populus*, because the people implicitly obeyed his command. He was named by the consul in the night *viva voce*, and his election was confirmed by the auguries. As his power was absolute, he could proclaim war, levy forces, conduct them against an enemy, and disband them at his pleasure. He punished as he pleased, and from his decision there lay no appeal, at least till later times. He was preceded by 24 lictors with the *fasces*; during his administration, all other officers, except the tribunes of the people, were suspended, and he was the master of the republic. But amidst all this independence, he was not permitted to go beyond the borders of Italy, and he was always obliged to march on foot in his expeditions, and he never could ride in difficult and laborious marches without previously obtaining a formal leave from the people. He was chosen only when the state was in imminent dangers from foreign enemies or inward seditions. In the time of a pestilence a dictator was sometimes elected, as also to hold the *comitia*, or to celebrate the public festivals, or drive a nail in the capital, by which superstitious ceremony the Romans believed that a plague could be averted, or the progress of an enemy stopped. This office, so respectable and illustrious in the first ages of the republic, became odious by the perpetual usurpations of Sylla and J. Cæsar; and after the death of the latter, the Roman senate passed a decree which for ever after forbad a dictator to exist in Rome. The dictator, as soon as elected, chose a subordinate officer called his master of horse, *magister equitum*. This officer was respectable; but he was totally subservient to the will of the dictator, and could do nothing without his express order. This subordination, however, was some time after removed; and during the second Punic war the master of the horse was invested with a power equal to that of the dictator. A second dictator was also chosen for the election of magistrates at Rome after the battle of Cannæ. The dictatorship was originally confined to the patricians; but the plebeians were afterwards admitted to share it. Titus Largius Flavus was the first dictator, in the year of Rome 253.

DICTION, the phrase, elocution, or style, of a writer or speaker. See ORATORY, n° 99—121.

DICTIONARY, in its original acceptation, is the arranging all the words of a language according to the order of the alphabet, and annexing a definition or explanation to each word. When arts and sciences began to be improved and extended, the multiplicity of technical terms rendered it necessary to compile dictionaries, either of science in general, or of particular sciences, according to the views of the compiler.

DICTIONARY of the English Language. The design of every dictionary of language is to explain, in the most accurate manner, the meaning of every word; and to show the various ways in which it can be combined with others, in as far as this tends to alter its meaning. The dictionary which does this in the most accurate manner, is the most complete. Therefore the principal study of a lexicographer ought to be, to discover a method which will be best adapted for that purpose. Dr Johnson, with great labour, has collected the various meanings of every word, and quoted the authorities: but, would it not have been an improvement if he had given an accurate definition of the precise meaning of every word; pointed out the way in which it ought to be employed with the greatest propriety; showed the various deviations from that original meaning, which custom had so far established as to render allowable; and fixed the precise limits beyond which it could not be employed without becoming a vicious expression? With this view, it would have been necessary to exhibit the nice distinctions that take place between words which are nearly synonymous. Without this, many words can only be defined in such a manner, as that they must be considered as exactly synonymous. We omit giving any quotations from Johnson, to point out these defects; and shall content ourselves with giving a few examples, to show how, according to our idea, a dictionary of the English language ought to be compiled.

IMMEDIATELY. *adv. of time.*

1. Instantly, without delay. Always employed to denote future time, and never past. Thus, we may say, *I will come immediately*; but not, *I am immediately come from such a place.* See PRESENTLY.
2. Without the intervention of any cause or event; as opposed to *mediately*.

PRESENTLY. *adv. of time.*

1. Instantly, without delay. Exactly synonymous with *immediately*; being never with propriety employed to denote any thing but future time.
2. Formerly it was employed to express present time. Thus, *The house presently possessed by such a one*, was often used: but this is now become a vicious expression; and we ought to say, *The house possessed at present.* It differs from *immediately* in this, that even in the most corrupt phrases it never can denote past time.

FORM. *subst.* The external appearance of any object, when considered only with respect to shape or figure. This term therefore, in the literal sense, can only be applied to the objects of the sight and touch; and is nearly synonymous with *figure*: but they differ in some respects. *Form* may be employed to denote more rude and unfinished shapes; *figure*, those which are more perfect and regular. *Form* can never be employed without denoting matter; whereas *figure* may be employed in the abstract: thus, we say a square or a triangular *figure*; but not a square or triangular *form*. And in the same manner we say, the *figure* of a house; but we must denote the substance which forms that figure, if we use the word *form*; as, *a cloud of the form of a house*, &c. See FIGURE.

2. In contrast to irregularity or confusion. As beauty cannot exist without order, it is by a figure of speech employed to denote beauty, order, &c.
3. As *form* respects only the external appearance of bodies, without regard to their internal qualities, it is, by a figure of speech, employed in contrast to these qualities, to denote empty show, without essential qualities. In this sense it is often taken when applied to religious ceremonies, &c.
4. As *form* is employed to denote the external appearance of bodies; so, in a figurative sense, it is applied to reasoning, denoting the particular mode or manner in which this is conducted; as, *the form of a syllogism.* &c.
5. In the same manner it is employed to denote the particular mode of procedure established in courts of law; as *the forms of law, religion*, &c.
6. *Form* is sometimes, although improperly, used to denote the different circumstances of the same body; as *water in a fluid or a solid form.* But as this phrase regards the internal qualities rather than the external figure, it is improper; and ought to be, *water in a fluid or a solid state.*
7. But when bodies of different kinds are compared with one another, this term may be employed to denote other circumstances than shape or figure: for we may say, *a juice exsuding from a tree in the form of wax or resin*; although, in this case, the consistence, colour, &c. and not the external arrangement of parts, constitutes the resemblance.
8. From the regular appearance of a number of persons arranged in one long seat, such persons so arranged are sometimes called a *form*; as *a form of students*, &c. And,
9. By an easy transition, the seat itself has also acquired that name.

GREAT. *adj.* A relative word, denoting largeness of quantity, number, &c. serving to augment the value of those terms with which it is combined, and opposed to *small* or *little*. The principal circumstances in which this word can be employed are the following:

1. When merely *in*animate objects are considered with regard to quantity, *great* is with propriety employed, to denote that the quantity is considerable; as, *a great mountain, a great house*, &c. and it is here contrasted with *small*. When *great* is thus employed, we have no other word that is exactly synonymous.
2. When *in*animate objects are considered with regard to their extent, this term is sometimes employed, although with less propriety; as, *a great plain, a great field*, &c. And in this sense it is nearly synonymous with *large*; and they are often used indiscriminately, but with some difference of meaning: for, as *large* is a term chiefly employed to denote extent of superficies, and as *great* more particularly regards the quantity of matter; therefore, when *large* is applied to any object which is not merely superficial, it denotes that it is the extent of surface that is there meant to be considered, without regard to the other dimensions: whereas when the term *great* is employed, it has a reference to the whole contents. If, therefore, we say, *a large house*, or *a large river*, we express that the house, the river, have a surface of great extent, without having any necessary connection with the size in other respects. But if we say, *a great house*, or *a great river*, it at once denotes that they have not only a large surface, but are also of great size in every respect.
3. *Great*, when applied to the human species, never denotes the size or largness of body, but is applied solely to the qualities of the mind. Thus, when

when we ſay that *Socrates was a great man*, we do not mean that he was a man of great ſize, but that he was a man who excelled in the endowments of the mind. The terms which denote largeneſs of ſize in the human body are, *big*, *bulky*, *huge*, &c.

4. *Great* is ſometimes applied to the human ſpecies, as denoting high rank. In this caſe it is oftener uſed in the plural number than otherwiſe. Thus we ſay ſimply, *the great*, meaning the whole body of men in high ſtation, as oppoſed to *mean*. It ſhould ſeldom be employed in this ſenſe, as it tends to confound dignity of rank with elevation of mind.

5. As this is a general term of augmentation, it may be joined with all nouns which denote *quantity*, *quality*, *number*, *excellence*, or *defects*; or ſuch as imply *praiſe*, *blame*, *anger*, *contempt*, or any other affection of the mind.

6. It is employed to denote every ſtep of aſcending or deſcending conſanguinity; as, *great-grandfather*, *great-grandſon*, &c.

HIGH. *adj.* Exalted in a perpendicular direction at a diſtance from the ſurface of the earth. Oppoſed to *low*.

1. *High* is a term altogether indefinite, and is employed to expreſs the degree of elevation of any inanimate body. Thus we ſay, *a high mountain*, *a high houſe*, *ſteeple*, *tower*, *pillar*, &c. Nor is there any other word that can here be conſidered as ſynonymous; *lofty* being employed only to denote a very eminent degree of elevation.

2. To expreſs the perpendicular elevation of vegetables, either *high* or *tall* may be employed, as being in this caſe nearly ſynonymous. We may therefore ſay, a *high* or *tall tree*, a *high* or *tall maſt*, &c. but with this difference between theſe two expreſſions, that *tall* can be more properly applied to thoſe that are much elevated and of ſmall dimenſions; and *high*, to ſuch as are more bulky, and of greater ſize.

3. The perpendicular height of man can never be expreſſed by the word *high*; *tall* being here the proper expreſſion. And altho' *high* is ſometimes uſed to expreſs the height of other animals, yet it ſeems to be an improper expreſſion. See Tall.

4. *High*, when applied to the human ſpecies, always refers to the mind; and denotes *haughtineſs*, *ſtatelineſs*, *pride*, &c. and, when combined with the expreſſions of any energy of the mind, it denotes that in a higher degree. In this ſenſe, it is oppoſed to *meanneſs*, *abjectneſs*, and *humility*.

5. As this is an indefinite term, tending to denote any thing that is elevated above us, it may be combined with almoſt every noun which admits of this elevation. And as objects high above us are always out of our reach, it is in a metaphorical ſenſe uſed to denote any thing that ſeems to be above the ordinary condition of mankind; or thoſe qualities or endowments of mind that are not eaſily acquired: as, *dignity* or *elevation of ſentiment*; *dignity of rank*; *acuteneſs in reaſoning on difficult ſubjects*; *pride*, *haughtineſs*, or any other quality which ſeems beyond the ordinary level of mankind; *dearneſs of price*, &c.

6. In the ſame manner we apply this term to time; which having a metaphorical reſemblance to a river flowing on with an unceaſing current through all ſucceſſive ages, any thing of remote antiquity is denoted by the term *high*.

7. Likewiſe thoſe degrees of latitudes far removed from the line, where the pole becomes more elevated.

8. And to ſome particular crimes, as being attended with peculiar degrees of guilt; as, *high treaſon*.

TALL. *adj.* Something elevated to a conſiderable degree in a perpendicular direction. Oppoſed to *low*.

1. This term is chiefly employed to expreſs the height of man and other animals; and is applied to denote the height of the body only, without having any reference to the mind. When applied to man, no other word can be ſubſtituted in its ſtead: when applied to other animals, *high* is ſometimes conſidered as nearly ſynonymous. See High.

2. It is likewiſe employed to denote the perpendicular height of vegetables; and in this caſe, it is nearly ſynonymous with *high*. See High.

3. It can in no caſe be employed to expreſs the height of merely inanimate objects; as we can never ſay a *tall ſteeple*, *tower*, or *pillar*, but a *high ſteeple*, &c. For the diſtinctions in theſe caſes, ſee High.

LONG. *adj.* A relative term, denoting the diſtance between the extremes of any body, which is extended more in one of its geometrical dimenſions than another. Oppoſed to *ſhort*.

1. This term may be applied to all inanimate objects, of whatever kind, whoſe dimenſions in one way exceeds the other, and when not in an erect poſture, whatever be the other circumſtances attending them; whether it relates to ſuperficies alone, or to ſolid bodies; whether theſe be bounded or open, ſtraight or crooked, flexible or rigid, or in any other circumſtances whatever; thus we ſay, *a long* or *ſhort line*, *a long* or *ſhort ridge*, *ſtreet*, *ditch*, *rope*, *chain*, *ſtaff*, &c. But it is to be obſerved, that although *long* is in the ſtrict ſenſe only oppoſed to *ſhort*; yet as it expreſſes the extenſion of matter in one of its geometrical proportions, it is often contraſted by thoſe words which expreſs the other proportions when we mean only to deſcribe the ſeveral proportions: as, *a table long and broad*. And as theſe ſeveral dimenſions are expreſſed by different words, according to the various forms, modifications, and circumſtances, in which bodies are found, therefore it is in this ſenſe contraſted by a great diverſity of terms; as, *a long and broad* or *wide*, *narrow* or *ſtrait*, *ſtreet* or *lane*; *a long and thick*, or *ſmall*, *rope*, *chain*, *ſtaff*. For the diſtinctions in theſe caſes, ſee Broad, Wide, &c.

2. Objects neceſſarily fixed in an erect poſition can never have this term applied to them; and therefore we cannot ſay *a long*, but *a high*, *tower* or *ſteeple*. And for the ſame reaſon, while trees are growing and fixed in an erect poſition, we cannot apply this term to them; but when they are felled

ed and laid upon the ground, it is quite proper and neceſſary. Thus, we do not ſay *a long*, but *a tall* or *high tree*, while it is growing; but we ſay *a long*, not *a tall log of wood*: and in the ſame manner we ſay *a tall maſt*, when it is fixed in the ſhip; but *a long maſt*, while it lies upon the beach. See TALL and HIGH.

3. Thoſe vegetables which are of a tender pliant nature, or ſo weak as not to be able to retain a fixt poſition, being conſidered as of a middle nature between erect and proſtrate bodies, admit of either of the terms *long*, *tall*, or *high*; as *a long* or *tall ruſh* or *willow wand*, or *a long*, *tall*, or *high ſtalk of corn*. See HIGH and TALL.
4. The parts of vegetables, when conſidered as diſtinct from the whole, even when growing and erect, aſſume the term *long*: for we do not ſay *a tall*, but *a long*, *ſhoot of a tree*; and *a tree with a long ſtem*, in preference to *a tree with a high ſtem*.
5. For the ſame reaſon, a ſtaff, and pole, even when fixed in a perpendicular direction, aſſume the word *long*, in preference to *tall* or *high*.
6. With regard to animals, the general rule is applied, without any exceptions: *tall*, and not *long*, being employed to denote the height of the human body, when in an erect poſture; and *long*, and not *tall*, to denote its length when in an incumbent ſituation. *Long*, applied to all other animals which do not walk erect, always denotes their greateſt length in a horizontal poſition from head to tail.
7. In a figurative ſenſe, it denotes, with regard to time, any thing at a great diſtance from us.
8. As alſo, any thing that takes up much time before it is finiſhed; as, *a long diſcourſe*, *a protracted note in muſic*, &c.

BROAD, *adj.* The diſtance between the two neareſt ſides of any body, whoſe geometrical dimenſions are larger in one direction than in another; and has a reference to ſuperficies only, and never to the ſolid contents. Oppoſed to *narrow*.

1. *Broad*, in the ſtricteſt acceptation, is applied to denote thoſe bodies only whoſe ſides are altogether open and unconfined; as *a broad table*, *a broad wheel*, &c.: and in theſe caſes it is invariably contraſted by the word *narrow*; nor is there any other word which in theſe caſes can be conſidered as ſynonymous with it, or uſed in its ſtead.
2. When any object is in ſome ſort bounded on the ſides, although not quite cloſed up, as a road, ſtreet, ditch, &c. either *broad* or *wide* may be employed, but with ſome difference of ſignification; *broad* being moſt properly uſed for thoſe that are more open, and *wide* for thoſe which are more confined: nor can this term be ever applied to ſuch objects as are cloſe bounded all around, as a houſe, a church, &c. *wide* being here employed. For the more accurate diſtinctions in theſe caſes, ſee the article WIDE.

WIDE. *adj.* A term employed to denote relative extent in certain circumſtances. Oppoſed to *narrow* and *ſtrait*.

1. This term is in its proper ſenſe applied only to denote the ſpace contained within any body cloſed all round on every ſide; as a houſe, gate, &c.: and differs from *broad*, in this that it never relates to the ſuperficies of ſolid objects, but is employed to expreſs the capaciouſneſs of any body which containeth vacant ſpace; nor can capaciouſneſs in this ſenſe be expreſſed by any other word but *wide*.

2. As many bodies may be conſidered either with reſpect to their capaciouſneſs or ſuperficial extent; in all theſe caſes, either the term *broad* or *wide* may be uſed; as, *a broad* or *wide ſtreet* or *ditch*, &c. but with a greater or leſs degree of propriety, according to the circumſtances of the object, or the idea we wiſh to convey. In a ſtreet where the houſes are low and the boundaries open, or in a ditch of ſmall depth and large ſuperficies, as this largeneſs of ſuperficies bears the principal proportion, *broad* would be more proper: but if the houſes are of great height, or the ditch of great depth, and capaciouſneſs is the principal property that affects the mind, we would naturally ſay *a wide ſtreet* or *ditch*; and the ſame may be ſaid of all ſimilar caſes. But there are ſome caſes in which both theſe terms are applied, with a greater difference of meaning; thus we ſay *a broad* or *a wide gate*: But as the gate is employed to denote either the aperture in the wall, or the matter which cloſes that aperture, theſe terms are each of them uſed to denote that particular quality to which they are generally applied; and as the opening itſelf can never be conſidered as a ſuperficies, the term *wide*, in this caſe, denotes the diſtance between the ſides of the aperture; while, on the contrary, *broad* denotes the extent of matter fitted to cloſe that aperture; nor can theſe two terms in any caſe be ſubſtituted for one another.
3. As a figurative expreſſion, it is uſed as a cant phraſe for a miſtake: as, *you are wide of the mark*; that is, not near the truth.

NARROW. *adj.* A relative term, denoting a proportional ſmallneſs of diſtance between the ſides of the ſuperficies of plain bodies. Oppoſed to *broad*.

1. As this is only applied to ſuperficies, it is exactly contraſted by *broad*, and is applied in all caſes where the term *broad* can be uſed, (ſee BROAD); and in no other caſe but as a contraſt to it, except the following.
2. It ſometimes is employed to deſcribe the ſmallneſs of ſpace circumſcribed between certain boundaries, as oppoſed to *wide*, and nearly ſynonymous with *ſtrait*; as we ſay *a wide* or *a narrow houſe*, *church*, &c. For the neceſſary diſtinctions here, ſee the article STRAIT.
3. In a figurative ſenſe it denotes *parſimony*, *poverty*, *confined ſentiments*, &c.

STRAIT, *adj.* A relative term, denoting the extent of ſpace in certain circumſtances. Oppoſed to *wide*: See WIDE.

1. This term is employed, in its proper ſenſe, to denote only ſpace, as contained between ſurrounding bodies in ſuch circumſtances as to denote ſome degree of confinement; and is exactly oppoſed to *wide*: as *a wide* or *a ſtrait gate*, &c. See WIDE.
2. So neceſſary is it that the idea of confinement ſhould

ſhould be connected with this word, that in all thoſe caſes where the ſpace contained is large, as in a church or houſe, we cannot expreſs a ſmaller proportional width by this term. And as we have no other word to expreſs ſpace in theſe circumſtances, we have been obliged to force the word *narrow* from its natural ſignification, and make it expreſs this. See NARROW.

3. In ſome particular caſes, *narrow* or *ſtrait* may be employed to the ſame object; as, *a narrow* or *a ſtrait line:* but here *ſtrait* is never employed but where an idea of confinement is ſuggeſted, and where it is exactly contraſted to *wide;* nor can *narrow* be employed but in ſuch circumſtances where *broad* would be a perfect contraſt to it. Therefore theſe two terms may be always employed in the ſame circumſtances as thoſe which contraſt them may be. For an account of which, ſee WIDE.

3. The term *ſtrait* is likewiſe in a peculiar manner uſed to denote the ſmallneſs of the internal diameter of thoſe ſmall bodies which are fitted to receive or contain others, as any kind of bag, tube, body-clothes, mortoiſes, and others of the ſame kind; and in all theſe caſes this term may be employed to denote the ſmallneſs of their leſſer diameter, and never the term *narrow*. But in certain circumſtances the word *tight* may be ſubſtituted for it. See TIGHT.

4. *Strait,* in a figurative ſenſe, denotes any ſort of confinement of ſentiment or diſpoſition.

TIGHT. *adj.* A term employed in certain circumſtances to denote the internal capacity of particular bodies. Nearly ſynonymous with *ſtrait.*

This term is confined entirely to denote the ſmallneſs of the internal dimenſions of ſuch objects as are formed to cover or to receive or contain other ſolid bodies, and can be employed in no other caſe. And although it agrees with *ſtrait,* in always denoting confinement, and by being applicable to the ſame ſpecies of objects, yet it differs in the following reſpects: 1. If there be any difference of the diameter of the objects to which the term *ſtrait* can be applied, it always has reference to the ſmaller; yet *tight* may be applied to any ſort of confinement, whether it regards the length or breadth. 2. *Strait* can be applied to all bodies of capacity when of ſmall diameter, without any ſort of reference to the nature of the ſubſtance which it may be capable of containing. For we can ſay *a ſtrait bag, a ſtrait ſleeve, a ſtrait mortoiſe, a ſtrait gate,* &c. whereas *tight* can only be applied to any body when it is conſidered as having reference to another body which is intended to be contained in it, and is pinched for want of room. Thus we ſay, *the ſleeve of a coat is too tight for the arm, the mortoiſe is too tight for the tenon,* &c. but we cannot ſay, *the bag, or the gate, is too tight,* becauſe theſe are fitted to receive any ſort of objects. And hence it happens, that, in many caſes, the dimenſions of the ſame body may be expreſſed by *tight* or *ſtrait* when conſidered in different circumſtances. Thus we may ſay, *this ſleeve is too ſtrait,* when we look at a coat when lying on the table, and conſider its proportions; but it is not till we have tried it upon the arm that it is intented to cover, that we call it *tight.* And we may ſay, *a gate is too ſtrait,* or *too tight:* but in the firſt caſe we conſider it as being too confined for admitting objects to paſs, through it; and in the laſt, as being too confined with reſpect to the leaves that are to ſhut the aperture, not allowing them ſpace to move with freedom.

Theſe examples may ſerve to give ſome idea of the plan of an Engliſh Dictionary compoſed upon philoſophical principles: But, beſides the circumſtances above enumerated, there are many others which would require particular attention in the execution of a work of this kind. In the Engliſh language, a great variety of terms occur, which denote matters under certain general forms or circumſtances, without regarding the minute diverſities that may take place; as the word *cloth,* which denotes matter as manufactured into a particular form, including under it all the variety of ſtuffs manufactured in that particular way, of whatever materals, colours, texture or fineneſs, they may be. The ſame may be ſaid of *wood, iron, yarn,* and a great variety of terms of the ſame nature, ſome of which cannot aſſume any plural; while others admit of it in all caſes, and others admit or refuſe it according to the different circumſtances in which they are conſidered. In a dictionary, therefore, all this variety of caſes ought to be clearly and diſtinctly pointed out under each particular article: this is the more neceſſary, as ſome of theſe words have others formed from them, which might be readily miſtaken for their plurals, altho' they have a very different ſignification; as *cloaths,* which does not denote any number of pieces, or different kinds of *cloth,* but *wearing apparel.* The following example will illuſtrate this head.

WOOD. *ſub.* A ſolid ſubſtance, of which the trunks and branches of trees conſiſt.

1. This term is employed to denote the ſolid parts of vegetables of all kinds, in whatever form or circumſtances they are found. Nor does this term admit of plural with propriety, unleſs in the circumſtances after-mentioned: for we ſay, *many different kinds of wood,* in preference to *many kinds of woods;* or, we ſay, *oak, aſh,* or *elm wood,* not *woods.*

2. But where we want to contraſt *wood* of one quality or country with that of another, it admits of a plural: for we ſay, *white woods are in general ſofter than red;* or *Weſt-Indian woods are in general of greater ſpecific gravity than the European woods:* But unleſs where the colour, or ſome quality which diſtinguiſhes it from growing wood, is mentioned, this plural ought as much as poſſible to be avoided, as it always ſuggeſts an idea of growing wood.

3. *Wood* likewiſe denotes a number of trees growing near one another; being nearly ſynonymous with *foreſt:* See FOREST. In this ſenſe it always admits of a plural; as, *Ye woods and wilds whoſe ſolitary gloom,* &c.

A dictionary cannot be reckoned complete without explaining obſolete words; and if the terms of the ſeveral

veral provincial dialects were likewife given, it would be of great utility: nor would take much time; becaufe a number of thefe words need no other explanation than to mark along with them the words which had come in their place, when there happened to be one perfectly fynonymous: and in thofe cafes where the fame idea could not be expreffed in modern language without a periphrafis, it would be of ufe to explain them diftinctly; fo that, when a writer found himfelf at a lofs for a term, and obliged to fearch for one beyond the bounds of our own language, he might take one of thefe, when he found that it was expreffive and energetic, in preference to another drawn from a foreign language. This would at leaft have one good effect: it would make our language more fixed and ftable; not to fay more accurate and precife, than by borrowing from foreign languages. The following examples may ferve to give fome idea of the manner of treating this part of the work.

MOE, or MO. *adj.* An obfolete term ftill employed in the Scotch dialect, and by them pronounced *mae*; denoting a greater number, and nearly fynonymous with *more*: but it differs in this refpct, that in the Scotch dialect, *mae* and *mair* (Englifh *more*) are each employed in their diftinct fphere, without encroaching upon one another; *mae* being employed to denote number, but never quantity or quality; and *mair*, to denote quantity and quality, but never number: thus they fay *mae*, not *mair*, *apples*, *men*, &c. and they fay *mair*, not *mae*, *cloth*, *earth*, *courage*, &c. See MAIR. Both of thefe terms are fupplied by the word *more*; which in the Englifh language is applied indifcriminately to denote quantity, quality, and number. See MORE.

THIR. *pron.* Obfolete; ftill employed in the Scotch dialect: the plural of *this*; and contrafted to *thefe*, in the fame manner as *that* is to *this*.

As there is no word in the Englifh language equivalent to this, we thus fhow the manner in which it is employed. In the Englifh language we fay, *that ftone* or *houfe*, pointing at one at a diftance, *is larger or more commodious than this ftone* or *this houfe*, which is fuppofed to be at hand. In the fame manner, in the Scotch dialect, they fay, *thefe* (or, as it pronounced, *thae*) *ftones are whiter than thir ftones*; denoting, that the former are at a diftance and the latter at hand. And, in the fame manner, it is invariably applied to denote any prefent object in the plural number, as oppofed to *thefe*: as *thefe* or *thir apples*, as at hand, or at a diftance; *thefe*, or *thir trees*, &c.; but never in the fingular number, as it is always *this* or *that tree*, *houfe*, &c.

As the Englifh language is fo exceedingly irregular in the pronunciation, the fame letter in the fame fituation often affuming founds totally different in different words, it is impoffible to eftablifh any general rules on this fubject, which do not admit of many exceptions: therefore, a dictionary is the beft means of afcertaining and pointing out the proper pronunciation of words. For, if the writer firft pointed out all the different founds that the fame letter could ever be made to exprefs, and affigned to every particular found which each letter could be made to affume, a particluar mark, which was appropriated to denote that particular found of the letter whenever it occured; by placing thefe particular marks above the letters in the dictionary, the found of each letter would be pointed out in all cafes with the utmoft certainty. It would be impoffible for us to illuftrate this by examples, without firft afcertaining all the founds of each letter; which would lead us into a difcuffion too long for this place.

We fhall only further obferve, that, befides having the accented fyllable of every word *properly* diftinguifhed in a dictionary to affift in the pronunciation, the Englifh language requires another effential improvement, *viz.* the ufe of accents to diftinguifh the meaning of *words* and *phrafes*: which, although it is not fo properly confined to a lexicographer, yet it is not quite without his fphere. Thus the word *as* admits of two very different founds, as well as different fignifications; as in this example, "Cicero was nearly *as* eloquent *as* Demofthenes: in which the firft *as* is pronounced *afs*, and the laft is pronounced *az*. Now, it often happens, that, in reading, the particular way in which it ought to be underftood is not pointed out by the context, till after the word itfelf is pronounced, which has an equal chance at leaft of being pronounced wrong; whereas, if it were always accented when employed in the one fenfe, and not in the other, it would free the reader from this perplexity. There are other cafes in which the ufe of proper accents in writing would be of great confequence; as at the beginning of a fentence, when it was put as a queftion, or ufed ironically, &c. the want of which every one muft have obferved. But as this does not fo properly belong to the lexicographer as the grammarian, we fhall here take no further notice of it.

The above examples, we hope, will be fufficient to give the reader fome idea of the plan that we would propofe; and enable him to determine, whether or not a dictionary, executed upon this plan, would convey to his mind a more perfect knowledge of the Englifh language, than thofe dictionaries that have been hitherto publifhed. Thefe examples were given rather with a view to fhow the manner in which a work of this kind might be conducted, than as perfect and unexceptionable explanations of the feveral articles there enumerated; and therefore we did not think it neceffary to produce any authorities, although we are fenfible that they would be requifite in fuch a work.

DICTYMNIA, or DICTYNNIA, in mythology, were feafts celebrated at Lacedæmon and in Crete, in honour of Diana Dictymnia, or Dictynnia, or of a nymph taken for her, who, having plunged herfelf into the fea, to efcape the paffion of Minos, was caught in a fifherman's net or δικτυον, whence the name.

DICTYS (Cretenfis), a very ancient hiftorian, who ferving under Idomeneus king of Crete in the Trojan war, wrote the hiftory of that expedition in nine books; and Tzetzes tells us, that Homer formed his Iliad upon the plan of that hiftory. It is however maintained, that the Latin hiftory of Dictys which we have at prefent is fpurious.

DIDACTIC, in the fchools, fignifies the manner of fpeaking or writing, adapted to teach or explain the

Didapper, Didelphis.

the nature of things.—The word is formed from the Greek διδασκω, *doceo*, "I teach."

There are many words that are only used in the didactic and dogmatic way: and there are many works, ancient and modern, both in prose and verse, written after this method: such are the Georgics of Virgil, Lucretius's poem De Rerum Natura, and Pope's Essays on Criticism and on Man, &c. &c.

DIDAPPER, in ornithology. See COLYMBUS.

Plate CLV (in Vol. V)

DIDELPHIS, or OPOSSUM, in zoology; a genus of quadrupeds belonging to the order of feræ, the characters of which are these: They have ten fore-teeth in the upper jaw, and eight in the under one. The dog-teeth are long; the tongue is somewhat ciliated; and they have a pocket formed by a duplicature of the skin of the belly, in which the dugs are included.

1. The marsupialis, or Virginian opossum, has a long sharp-pointed nose; large, round, naked, and very thin ears; small, black, lively, eyes; long stiff hairs on each side the nose, and behind the eyes: the hind part of the neck and back covered with hair two inches long; the bottoms of a yellowish white, middle part black, ends whitish: the sides covered with hair of a dirty and dusky colour; the belly with soft woolly, dirty white hair: the tail, for near three inches, clothed with long hairs like those on the back; the rest of the tail covered with small scales. The tail of this animal has a disagreeable appearance, looking like the body of a snake, and has the same prehensile quality with that of some monkeys; the body is round and pretty thick, the legs short: on the lower part of the belly of the female is a large pouch, in which the teats are lodged, and where the young shelter as soon as they are born. The length of the body is 16 or 17 inches; that of the tail 14.—This creature inhabits many parts of America and the East Indies. It is very destructive to poultry, and sucks the blood without eating the flesh; it feeds also on roots and wild fruits, and is very active in climbing trees. It hunts eagerly after birds and their nests; and will hang suspended from the branches of a tree by its tail; then, by swinging its body, it will fling itself among the trees that grow in the neighbourhood. It walks very slow; and when pursued and overtaken will feign itself dead. It is not easily killed, being as tenacious of life as a cat. When the female is about to bring forth, she makes a thick nest of dry grass in some close bush at the foot of a tree; and brings four, five, or six, young at a time. As soon as the young are brought forth, they take shelter in the pouch or false belly; and fasten so closely to the teats, that they cannot be separated without difficulty. They are blind, naked, and very small, when new-born, and resemble fetuses: it is therefore necessary that they should continue in that false belly till they attain proper strength and sight; and are prepared to undergo what may be called a *second birth*. After this they run into the pouch as into an asylum in time of danger; and the parent carries them about with her. During the time of this second gestation, the female shows an excessive attachment to her young, and will suffer any torture rather than allow this receptacle to be opened; for she has the power of opening or closing it by the assistance of some very strong muscles. The flesh of the old animal is very good, like that of a sucking pig: the hair is dyed by the Indian women, and wove into garters and girdles: the skin is very fetid.

Didelphis.

2. The Molucca opossum has long, oval, and naked ears: the mouth is very wide: the lower side of the upper jaw, throat, and belly, is of a whitish ash colour; rest of the hair a cinereous brown tipt with tawny, darkest on the back: the tail is as long as the body; near the base covered with hair, the rest naked: the claws are hooked. On the belly of the female is a pouch, in which the young (like those of the former) shelter. Marcgrave found six young within the pouch. It has ten cutting teeth above and eight below. The length of the animal from nose to tail is ten inches; and the tail exceeds the length of head and body. Its whole figure is of a much more slender and elegant make than the former. The tail pulverised, and taken in a glass of water, is reckoned in New Spain a sovereign remedy against the gravel, colic, and several other disorders. This species is found in great numbers in Aroe and Solor: It is called in the Indies *pelandor aroe*, or the *aroe rabbet*. They are reckoned very delicate eating; and are very common at the tables of the great, who rear the young in the same places in which they keep their rabbets. It inhabits also Surinam, and the hot parts of America.

3. The murina or murine opossum, hath the face and upper parts of the body of a tawny colour; the belly of a yellowish white: the tail is slender, and covered with minute scales to the very rump: the length of the animal from nose to tail, about six inches and a half; the tail of the same length: the female wants the false belly of the former; but on the lower part the skin forms on each side a fold, between which the teats are lodged. It inhabits the hot parts of South-America; agrees with the others in its food, manners, and the prehensile power of its tail. It brings from 10 to 14 young ones at a time: they affix themselves to the teats as soon as they are born, and remain attached like inanimate things, till they attain growth and vigour to shift a little for themselves.

4. The Mexican opossum, is of an ash-colour on the head and upper parts of the body: the belly and legs are whitish: the tail is long and pretty thick, varied with brown and yellow; it is hairy near an inch from its origin, the rest naked: the length of the animal from nose to tail, about seven inches and a half; of the tail, more than 11.—It inhabits the mountains of Mexico, and lives in trees, where it brings forth its young: when in any fright, they embrace the parent closely. The tail is prehensile, and serves instead of a hand.

5. The phalanger, or Surinam opossum of Buffon, has the upper part of the body reddish, mixed with a light ash-colour and yellow: the under parts are of a dirty yellowish white; the bottom of the tail is covered with hair, for near two inches and a half; the rest naked: the length of the animal from nose to tail is near nine inches; the tail ten. It inhabits Surinam, according to Buffon; who supposed it may be the species called by the colonists the *cane rat*, which is so destructive to the sugar-canes. According to Dr Pallas, it inhabits the East India Islands, but is not found in Surinam.

6. The dorsigera, or merian opossum, hath the head and upper part of the body of a yellowish brown colour; the belly white, and tinged with yellow; the tail

Didelphis. tail very long and ſlender, and, except at the baſe, quite naked.—It is a native of Surinam, and burrows under ground: it brings five or ſix young at a time, which follow their parent: on any apprehenſion of danger, they jump on her back; and twiſting their tails round her's, ſhe immediately runs with them into her hole.

7. The kanguroo. This animal has a ſmall head, neck, and ſhoulders; the body increaſing in thickneſs to the rump. The head is oblong, formed like that of a fan, and tapering from the eyes to the noſe; end of the noſe naked and black; the upper lip divided. The noſtrils are wide and open; the lower jaw is ſhorter than the upper; and the aperture of the mouth ſmall; there are whiſkers on both jaws, thoſe on the upper longeſt; and ſtrong hairs above and below the eyes. The eyes are not large; the irides are duſky; the pupil is of a bluiſh black. The ears are erect, oblongly ovated, rounded at the ends, and thin, covered with ſhort hairs; four inches long. There are no canine teeth; but ſix broad cutting teeth in the upper jaw; two long lanceolated teeth in the lower jaw, pointing forward; and four grinding teeth in each jaw, remote from the others. The belly is convex and great. The fore legs are very ſhort, ſcarcely reaching to the noſe; and uſeleſs for walking. The hind legs are almoſt as long as the body; and the thighs are very thick: on the fore feet are five toes, with long conic and ſtrong claws; on the hind feet, only three: the middle toe is very long and thick, like that of an oſtrich; the two others are placed very diſtinct from it, and are ſmall: the claws are ſhort, thick, and blunt: the bottom of the feet, and hind part, black, naked, and tuberculated, as the animal reſts often on them. The tail is very long, extending as far as the ears; thick at the baſe, tapering to a point. The ſcrotum is large and pendulous. The hair on the whole animal is ſoft, and of an aſh-colour; ligheſt on the lower parts. The dimenſions of a full grown animal are not yet known. The following are thoſe of a male lately ſent to Lord Sidney by Governor Phillip.

	f.	in.
Length from the point of the noſe to the end of the tail, - -	8	5
Length of the tail, - -	3	1
———— head, - -	0	11
———— fore legs, - -	2	0
———— hind legs, - -	3	7
Circumference of the fore part by the legs,	1	9
———————lower parts ——	1	5
Round the thicker part of the tail, which gradually tapers to the end. - -	1	1

The above is the largeſt kanguroo that has yet been ſeen, and we are told there is every reaſon to believe that even this had not near attained its full growth.

It inhabits the weſtern ſide of New-Holland, and has as yet been diſcovered in no other part of the world. It lurks among the graſs; and feeds on vegetables: it goes entirely on its hind legs; making uſe of the fore feet only for digging, or bringing its food to its mouth. The dung is like that of a deer. It is very timid: at the ſight of men it flies from them by amazing leaps, ſpringing over buſhes ſeven or eight feet high: and going progreſſively from rock to rock. It carries its tail quite at right angles with its body when it is in motion; and when it alights, often looks back. Didelphis.

In the account lately publiſhed of Governor Phillip's Voyage, we are told that theſe animals have been ſeen feeding in herds of about 30 or 40: and that one is always obſerved to be apparently on the watch at a diſtance from the reſt.—The largeſt kanguroo which has yet been ſhot, we are there told, weighed about 140 pounds. But it has been diſcovered that there are two kinds, one of which ſeldom exceeds 60 pounds in weight: theſe live chiefly on the high grounds: their hair is of a reddiſh caſt, and the head is ſhorter than the larger ſort. Young kanguroos which have been taken, have in a few days grown very tame, but none have lived more than two or three weeks. Yet it is ſtill poſſible that when their proper food ſhall be better known, they may be domeſticated. Near ſome water was found the dung of an animal that fed on graſs, which, it was ſuppoſed, could not have been leſs than a horſe. A kanguroo, ſo much above the uſual ſize, would have been an extraordinary phænomenon, though no larger animal has yet been ſeen, and the limits of growth in that ſpecies are not aſcertained. The tail of the kanguroo, which is very large, is found to be uſed as a weapon of offence, and has given ſuch ſevere blows to dogs as to oblige them to deſiſt from purſuit. Its fleſh is coarſe and lean, nor would it probably be uſed for food, where there was not a ſcarcity of freſh proviſions.

Mr Pennant obſerves, that this is a very anomalous animal; but ranks it under this genus as having more relation to it than to any other. In the account of Phillip's Voyage, however, we are informed, that the pouch of the female, hitherto eſteemed peculiar to the opoſſum genus, has been found both in the rat and the ſquirrel kind in New Holland.

8. The quoll, or ſpotted opoſſum, is deſcribed as in length from the noſe to the beginning of the tail about 15 inches, and the tail about nine or ten. The general colour black, inclining to brown beneath; the neck and body, ſpotted with irregular roundiſh patches of white; the ears pretty large and erect; the viſage pointed, the muzzle furniſhed with long ſlender hairs; the legs, from the knees downward, almoſt naked, and aſh-coloured; on the fore feet are five claws, and on the hind, four and a thumb without a claw; the tail, for about an inch and an half from the root, is covered with hairs of the ſame length as thoſe on the body, from thence to the end with long ones not unlike that of a ſquirrel. The female has ſix teats placed in a circle within the pouch.

9. The kanguroo rat is deſcribed as ſimilar, both in the general ſhape of the body and the conformation of the legs, to the kanguroo; but the viſage having a ſtrong reſemblance to that of the rat, and the colour of the whole not ill reſembling that animal, it has obtained the name of the *kanguroo rat*. It is an inhabitant of New Holland; and two of the ſpecies are now to be ſeen alive at the curious exhibition of animals over Exeter Exchange; where one of them, being a female, has brought forth young. This ſpecies has two cutting teeth in front of the upper jaw, with three others on each ſide of them; and at a diſtance one

Didelphis. one false grinder, sharp at the edge, and channelled or fluted on the sides; and close to these, two true grinders: in the lower jaw there are two long cutting teeth formed like those of the squirrel, with three grinders corresponding with those in the upper jaw.

10. The flying opossum, a beautiful species, and clothed with fur of the most exquisite texture, is an inhabitant of New Wales. In length, from the tip of the nose to the root of the tail, it is 20 inches; the tail itself is 22 inches, at the base quite light, increasing gradually to black at the end: the ears are large and erect: the coat or fur is of a richer and most delicate texture; appearing, on the upper parts of the body, at first sight, of a glossy black, but on a nicer inspection found to be mixed with grey; the under parts are white, and on each hip is a tan-coloured spot nearly as big as a shilling; at this part the fur is thinnest, but at the root of the tail it is so rich and close that the hide cannot be felt through it. The fur is also continued to the claws. On each side of the body is a broad flap or membrane (as in the flying squirrels), which is united to both the fore and hind legs. The jaws are furnished with teeth, placed as in some others of this genus: in the upper jaw forwards are four small cutting teeth, then two canine ones, and backwards five grinders: the under jaw has two long large cutting teeth, five grinders, with no intermediate canine ones, the space being quite vacant. The fore legs have five toes on each foot, with a claw on each; the hinder ones four toes, with claws (the three outside ones without any separation), and a thumb without a claw, enabling the animal to use the foot as a hand, as many of the opossum tribe are observed to do.

11. The Cayenne opossum has a long slender face: ears erect, pointed, and short: the coat woolly, mixed with very coarse hairs, three inches long, of a dirty white from the roots to the middle; from thence to the ends of a deep brown; sides and belly of a pale yellow; legs of a dusky brown; thumb on each foot distinct; on the toes of the fore feet, and thumb of the hind, are nails; on the toes of the hind feet crooked claws; tail very long, taper, naked, and scaly. Length 17 French inches; of the tail fifteen and a half. The subject measured was young. Inhabits Cayenne: very active in climbing trees, on which it lives the whole day. In marshy places, feeds on crabs, which when it cannot draw out of their holes with its feet, it hooks them by means of its long tail. If the crab pinches its tail, the animal sets up a loud cry, which may be heard afar: its common voice is a grunt like a young pig. It is well furnished with teeth, and will defend itself stoutly against dogs; brings forth four or five young, which it secures in some hollow tree. The natives eat these animals, and say their flesh resembles a hare. They are easily tamed, and will then refuse no kind of food.

12. The New Holland opossum has the upper part of the head, and the back and sides, covered with long, soft, glossy hairs, of a dark cinereous colour at the bottoms, and of a rusty brown towards the ends: the belly is of a dirty white. The tail is taper, covered with short brown hairs, except for four inches and a half of the end, which is white, and naked underneath; the toes like those of the former. Described by Mr Pennant from a skin, the length of which, from the head to the tail, was 13 inches, and the tail the same. The animal was found near Endeavour river, on the eastern coast of New Holland, with two young ones. It lodges in the grass, but is not common. There are two or three other species.

Dido. DIDO, called also Elisa, a daughter of Belus king of Tyre, who married Sichæus or Sicharbas her uncle, who was priest of Hercules. Pygmalion, who succeeded to the throne of Tyre after Belus, murdered Sichæus to get possession of the immense riches which he had; and Dido, disconsolate for the loss of her husband, whom she tenderly loved, and by whom she was equally esteemed, set sail in quest of a settlement with a number of Tyrians, to whom the cruelty of the tyrant became odious. According to some accounts, she threw into the sea the riches of her husband which Pygmalion so greedily desired, and by that artifice compelled the ships to fly with her that had come by order of the tyrant to obtain the riches of Sichæus. During her voyage, Dido visited the coast of Cyprus; where she carried away 50 women who prostituted themselves on the sea-shore, and gave them as wives to her Tyrian followers. A storm drove her fleet on the African coast, and she bought of the inhabitants as much land as could be covered by a bulls hide cut into thongs. Upon this piece of land she built a citadel called *Byrsa*; and the increase of population, and the rising commerce among her subjects, soon obliged her to enlarge her city and the boundaries of her dominions. Her beauty, as well as the fame of her enterprise, gained her many admirers; and her subjects wished to compel her to marry Iarbas king of Mauritania, who threatened them with a dreadful war. Dido begged three months to give her decisive answer; and during that time she erected a funeral pile, as if wishing by a solemn sacrifice to appease the manes of Sichæus, to which she had promised eternal fidelity. When all was prepared, she stabbed herself on the pile in presence of her people; and by this uncommon action obtained the name of *Dido*, "valiant woman," instead of Elisa. According to Virgil and Ovid, the death of Dido was caused by the sudden departure of Æneas; of whom she was deeply enamoured, and whom she could not obtain as a husband. This poetical fiction represents Æneas as living in the age of Dido, and introduces an anachronism of near 300 years. Dido left Phœnicia 247 years after the Trojan war or the age of Æneas, that is, about 953 years before Christ. This chronological error proceeds not from the ignorance of the poets, but it is supported by the authority of Horace:

Aut famam sequere, aut sibi convenientia finge.

While Virgil describes, in a beautiful episode, the desperate love of Dido, and the submission of Æneas to the will of the gods, he at the same time gives an explanation of the hatred which existed between the republics of Rome and Carthage; and informs his reader, that their mutual enmity originated in their very first foundation, and was apparently kindled by a more remote cause than the jealousy and rivalship of two flourishing empires. Dido after her death was honoured as a deity by her subjects.

 DIDUS,

DIDUS, or DODO, in ornithology, a genus belonging to the order of gallinæ. The bill is contracted in the middle by two transverse rugæ; each mandible is inflected at the point; and the face is bare behind the eyes. Only one species, the ineptus, is mentioned by Linnæus; but three are described by Buffon: though it is doubted whether on further observation they may not all prove one and the same species, differing only in sex or age.

1. The dronte, or hooded dodo, (ineptus, *Lin.*), is somewhat bigger than a swan, and near three feet in length. The bill is strong, large, and hooked at the end; the gape stretches beyond the eyes: the colour of it is a very pale blue; except the end of the upper mandible, which is yellowish, and a red spot on the bend of it; the end of the lower is blackish: the irides are white. The general colour of the plumage is cinereous, and soft to the touch; the belly and thighs are whitish. The head is large, and seems as it were covered with a black hood or cowl. The wings are very short, and of a yellowish ash-colour: the tail feathers are curled, stand up on the rump, and incline to yellow. The legs have four toes, three before and one behind; are very stout, short, and yellowish: the claws are black. It inhabits the islands of Mauritius and Bourbon in the Indian Ocean.

2. The solitaire, or solitary dodo, is a large bird, and the male is said to weigh sometimes 45 pounds. The neck is of a proportionable length, and the eye black and lively: the head is not crested, and the general colour of the plumage is grey and brown mixed: it has scarce any tail, and the bastard wing swells out into a round knob: the wings are too short for flight: and the hind parts are rounded like a horse's rump, being clothed with feathers, which may be termed *coverts*. —The females are covered with sometimes brown and sometimes light yellow feathers, and appear very beautiful. The feathers on each side of the breast enlarge into two white tufts, somewhat resembling the bosom of a woman. Those of the thighs are rounded at the end like shells; and, according to Leguat, the bird has altogether a noble and elegant gait. This is an inhabitant of the Isle of Rodrigue, where it is not uncommon; but not met with in flocks, scarcely more than two being found together. It makes the nest in by-places, of leaves of the palm, a foot and a half in thickness; and lays one egg, bigger than that of a goose. The male sits in his turn; and does not suffer any bird to approach within 200 yards of the spot while the hen is sitting, which is seven weeks. The young is some months before it can shift for itself; the old ones, in the mean time, are affectionate to it, and faithful to each other afterwards, though they occasionally may mix with others of their kind. The young birds, though timid, are stupid enough to suffer the approach of any one; but when grown up are more shy, and will not be tamed. They are chased in the winter season, *viz.* from March to September; being then fat, and the young birds are much esteemed for the table.

3. The Nazarene dodo is bigger than a swan. The bill is a little bent downwards and large: instead of feathers, the whole is covered over with a black down; but the wings are feathered, and it has some frizzled ones upon the rump, which serve instead of a tail: the legs are long and scaly, and there are three toes on each foot. This was met with in the Isle of France, and described as above by Fr. Cauche; who adds, that the female only lays one egg, which is white, and as big as a penny loaf, and that there is always found with it a white stone of the size of an hen's egg; that it makes the nest of leaves and dry herbs, in the forests, on the ground; and that there is likewise found a grey stone in the gizzard of the young bird.

DIDYMUS of Alexandria, an ecclesiastical writer of the fourth century; who, though he is said to have lost his eyes at five years of age, when he had scarcely learned to read, yet applied so earnestly to study, that he attained all the philosophic arts in a high degree, and was thought worthy to fill the chair in the famous divinity-school at Alexandria. He was the author of a great number of works; but all we have now remaining are, a Latin translation of his book upon the Holy Spirit, in the works of St Jerome, who was the translator; short strictures on the Canonical Epistles; and a book against the Manichees.

DIDYNAMIA (from δις *twice*, and δυναμις *power*), the name of the 14th class in Linnæus's sexual method; consisting of plants with hermaphrodite flowers, which have four stamina or male organs, two of which are long and two short. See BOTANY, the scheme, and Plate CII. fig. 14.

DIEMEN's LAND, the southern coast or point of New Holland, S. Lat. 43° 21′ 20″, E. Long. 147° 29′. This coast was discovered in November 1642 by Tasman, who gave it the name of *Van Deimen's Land*. Captain Furneaux touched at it in March 1773, and the country has been since further explored by late navigators. Here is a very safe road, named by Captain Cook *Adventure* Bay. The parts adjoining to the bay are mostly hilly, and form an entire forest of tall trees, rendered almost impassable by brakes of fern, shrubs, &c. The soil on the flat land, and on the lower part of the hills, is sandy, or consists of a yellowish earth, and in some parts of a reddish clay; but further up the hills it is of a grey tough cast. This country, upon the whole, bears many marks of being very dry, and the heat appears to be great. No mineral bodies, nor stones of any other kind than the white sand-stone, were observed: nor any vegetables that afforded subsistence for man. The forest-trees are all of one kind, generally quite straight, and bearing clusters of small white flowers. The principal plants observed were wood-sorrel, milk-wort, cudweed, bell-flower, gladiolus, samphire, and several kinds of fern. The only quadruped seen distinctly was a species of opossum, about twice the size of a large rat. The kanguroo, found farther northward in New Holland, may also be supposed to inhabit here, as some of the inhabitants had pieces of the skin of that animal. The principal sorts of birds in the woods are brown hawks or eagles, crows, large pigeons, yellowish paroquets, and a species which was called *motacilla cyanea*, from the beautiful azure colour of its head and neck. On the shore were several gules, black oyster-catchers or sea-pies, and plovers of a stone-colour. In the woods were seen some blackish snakes of a pretty large size; and a species of lizard fifteen inches long and six round, beautifully

fully clouded with yellow and black. Among a variety of fish caught, were some large rays, nurses, leather-jackets, bream, soles, flounders, gurnards, and elephant-fish. Upon the rocks are muscles and other shell-fish, and upon the beach were found some pretty Medusa's heads. The most troublesome insects met with were the musquitoes; and a large black ant, the bit of which inflicts extreme pain.

The inhabitants seemed mild and cheerful, with little of that wild appearance with savages in general have. They are almost totally devoid of personal activity or genius, and are nearly upon a par with the wretched natives of Terra del Fuego. They display, however, some contrivance in their method of cutting their arms and bodies in lines of different directions, raised above the surface of the skin. Their indifference for presents offered them, their general inattention and want of curiosity, were very remarkable, and testified no acuteness of understanding. Their complexion is a dull black, which they sometimes heighten by smutting their bodies, as was supposed from their leaving a mark behind on any clean substance. Their hair is perfectly woolly, and is clotted with grease and red ochre like that of the Hottentots. Their noses are broad and full, and the lower part of the face projects considerably. Their eyes are of a moderate size; and though they are not very quick or piercing, they give the countenance a frank, cheerful, and pleasing cast. Their teeth are not very white nor well set, and their mouths are wide: they wear their beards long and clotted with paint. They are upon the whole well proportioned, though their belly is rather protuberant. Their favourite attitude is to stand with one side forward, and one hand grasping across the back the opposite arm, which on this occasion hangs down by the side that projects.

Near the shore in the bay were observed some wretched constructions of sticks covered with bark; but these seemed to have been only temporary, and they had converted many of their largest trees into more comfortable and commodious habitations. The trunks of these were hollowed out to the height of six or seven feet by means of fire. That they sometimes dwell in them was manifest from their hearths in the middle made of clay, round which four or five persons might sit. These places of shelter are rendered durable by their leaving one side of the tree sound, so that it continues growing with great luxuriance.

DIEMERBROEK, (Isbrand), a learned professor of physic and anatomy at Utrecht, was born at Montfort, in Holland, in 1609, where he acquired great reputation by his lectures and his practice; and died at Utrecht in 1674. He wrote a treatise on the plague which is esteemed; and several learned works in anatomy and medicine, which were printed at Utrecht in 1685 in folio.

DIEPPE, a handsome sea-port town of France, in Upper Normandy, in the territory of Caux; with a good harbour, an old castle, and two handsome moles. The parish-church of St James is an elegant structure; and there is a tower from which, in fine weather, the coast of England may be seen. The principal trade consists in herrings, whitings, mackerel, ivory, toys, and laces. It was bombarded by the English in 1694, and it is not now so considerable as it was formerly. It is seated at the mouth of the river Argues, in E. Long. 1. 9. N. Lat. 49. 55.

DIES MARCHIÆ, was the day of congress or meeting of the English and Scots, annually appointed to be held on the marches or borders, in order to adjust all differences between them.

DIESIS, in music, is the division of a tone less than a semitone; or an interval consisting of a less or imperfect semitone.

Diesis is the smallest and softest change or inflexion of the voice imaginable, it is called a *faint*, expressed thus X, by a St Andrew's cross or saltier.

DIESPITER, in antiquity, a name given to Jupiter; and signifying *diei pater*, "father of the day." St Augustine derives the name from *dies* "day," and *partus* "production, bringing forth;" it being Jupiter that brings forth the day. Of which sentiment were Servius and Macrobius: the former adding, that in the language of the Osci they called him *Lucentius*, as *Diespiter* in Latin.

DIET, in medicine, according to some, comprehends the whole regimen or rule of life with regard to the six non-naturals; air, meats and drinks, sleep and watching, motion and rest, passions of the mind, retentions and excretions. Others restrain the term of *diet* to what regards eating and drinking, or solid aliments and drinks. See FOOD.

The natural constitution of the body of man is such, that it can easily bear some changes and irregularities without much injury. Had it been otherwise, we should be almost constantly put out of order by every slight cause. This advantage arises from those wonderful communications of the inward parts, whereby, when one part is affected, another comes immediately to its relief.

Thus, when the body is too full, nature causes evacuations through some of the outlets: and for this reason it is, that diseases from inanition are generally more dangerous than from repletion; because we can more expeditiously diminish than increase the juices of the body. Upon the same account, also, though temperance be beneficial to all men, the ancient physicians advised persons in good health, and their own masters, to indulge a little now and then, by eating and drinking more plentifully than usual. But of the two, intemperance in drinking is safer than in eating: and if a person has committed excess in the latter, cold water drank upon a full stomach will help digestion; to which it will be of service to add lemon juice, or elixir of vitriol. If he has eaten high seasoned things, rich sauces, &c. then let him sit up for some little time, and afterwards sleep. But if a man happen to be obliged to fast, he ought to avoid all laborious work. From satiety it is not proper to pass directly to sharp hunger, nor from hunger to satiety: neither will it be safe to indulge absolute rest immediately after excessive labour, nor suddenly to fall to hard work after long idleness. In a word, therefore, all changes in the way of living should be made by degrees.

The softer and milder kinds of aliment are proper for children, and for youth the stronger. Old people ought to lessen the quantity of their food, and increase that of their drink: but yet some allowance is to be made for custom, especially in the colder climates like ours; for as in these the appetite is keener, so is the digestion,

digestion better performed. *Mead's Monita & Præcepta.*

Diet-Drinks, a form in physic, including all the medicated wines, ales, and wheys, used in chronic cases. They require a course or continuation to answer any intention of moment.

Diet of Appearance, in Scots law, the day to which a defender is cited to appear in court; and every other day to which the court shall afterwards adjourn the consideration of the question.

Diet, or *Dyet*, in matters of policy, is used for the general assembly of the states or circles of the empire of Germany and of Poland, to deliberate and concert measures proper to be taken for the good of the public.

The general diet of the empire is usually held at Ratisbon. It consists of the emperor, the nine electors, and ecclesiastical princes; *viz.* the archbishops, bishops, abbots, and abbesses; the secular princes, who are dukes, marquises, counts, viscounts, or barons; and the representatives of the imperial cities. It meets on the emperor's summons, and any of the princes may send their deputies thither in their stead. The diet makes laws, raises taxes, determines differences between the several princes and states, and can relieve the subjects from the oppressions of their sovereigns.

The diet of Poland, or the assembly of the states, consisted of the senate and deputies, or representative of every palatinate or county and city; and usually met every two years, and oftener upon extraordinary occasions, if summoned by the king, or, in his absence, by the archbishop of Gnesna. The general diet of Poland sat but six weeks, and often broke up in a tumult much sooner: for one dissenting voice prevented their passing any laws, or coming to any resolutions on what was proposed to them from the throne. Switzerland has also a general diet, which is usually held every year at Baden, and represents the whole Helvetic body: it seldom lasts longer than a month. Besides this general diet, there are diets of the protestant cantons, diets of catholic ones; the first assemble at Araw, and are convoked by the canton of Zurich; the second at Lucern, convoked by the canton of that name.

DIETETIC, denotes something belonging to diet, but particularly that part of physic which treats of this subject. See Diet, Food, and Drink.

DIETRICH, or Dietricy (Christian William Ernest), a modern artist, who was born at Weimar in 1712. He resided chiefly at Dresden, where he was professor of the academy of arts. He was a painter of very extensive abilities, and succeeded both in history and landscape. We have by him a great number of small subjects, to the amount of 150 or more, which he engraved from his own compositions, in the style, says Basan, of Ostade of Lairesse, and of Salvator Rosa. Sixty of these etchings are exceedingly rare.

DIETS, a town in the circle of the Upper Rhine in Germany, situated on the river Lohn, twenty miles north of Mentz, and subject to the house of Nassau-Orange. E. Long. 7. 40. N. Lat. 50. 28.

DIEU et mon droit, i. e. *God and my right*, the motto of the royal arms of England, first assumed by king Richard I. to intimate that he did not hold his empire in vassalage of any mortal.

It was afterwards taken up by Edward III. and was continued without interruption to the time of the late king William, who used the motto *Je main tiendray*, though the former was still retained upon the great seal. After him queen Anne used the motto *Semper eadem*, which had been before used by queen Elizabeth; but ever since queen Anne *Dieu et mon droit* continues to be the royal motto.

DIFF, is the name of an instrument of music among the Arabs, serving chiefly to beat time to the voice: it is a hoop, sometimes with pieces of brass fixed to it to make a jingling, over which a piece of parchment is distended. It is beat with the fingers, and is the true *tympanum* of the ancients.

DIFFARREATION, among the Romans, a ceremony whereby the divorce of their priests was solemnized. The word comes from the preposition *dis*; which is used in composition, for *division* or *separation*; and *farreatio*, a ceremony with wheat, of *far* "wheat."

Diffarreation was properly the dissolving of marriages contracted by confarreation; which were those of the pontifices or priests. Festus says, it was performed with a wheaten cake. Vigenere will have confarreation and diffarreation to be the same thing.

DIFFERENCE, in mathematics, is the remainder, when one number or quantity is subtracted from another.

Difference, in logic, an essential attribute belonging to some species, and not found in the genus; being the idea that defines the species. Thus, body and spirit are the two species of substance, which in their ideas include something more than is included in the idea of substance. In body, for instance, is found impenetrability and extension; in spirit, a power of thinking and reasoning; so that the difference of body is impenetrable extension, and the difference of spirit is cogitation.

Difference, in heraldry, a term given to a certain figure added to coats of arms, serving to distinguish one family from another; and to show how distant younger branches are from the elder or principal branch.

DIFFERENTIAL, differentiale, in the higher geometry, an infinitely small quantity, or a particle of quantity so small as to be less than any assignable one It is called a *differential*, or *differential quantity*, because frequently considered as the difference of two quantities; and, as such, is the foundation of the *differential calculus*: Sir Isaac Newton, and the English, call it a *moment*, as being considered as the momentary increase of quantity. See Fluxions.

DIFFORM, Difformis (from *forma* "shape"), is a word used in opposition to *uniform*; and signifies, that there is no regularity in the form or appearance of a thing. The botanists use it as a distinction of the flowers of several species of plants.

DIFFUSE, an epithet applied to such writings as are wrote in a prolix manner. Among historians, Sallust is reckoned sententious, and Livy diffuse. Thus also among the orators, Demosthenes is close and concise; Cicero, on the other hand, diffuse.

DIFFUSION, the dispersion of the subtile effluvia of bodies into a kind of atmosphere all round them.

This

Thus the light diffused by the rays of the sun, issues all round from that amazing body of fire.

DIGASTRICUS, in anatomy, a muscle of the lower jaw, called also *Biventer*. See ANATOMY, *Table of the Muscles*.

DIGBY (Sir Kenelm), became very illustrious in the 17th centry for his virtue and learning. He was descended of an ancient family in England. His great-grandfather, accompanied by six of his brothers, fought valiantly at Bosworth-field on the side of Henry VII. against the usurper Richard III. His father, Everard, suffered himself to be engaged in the gun-powder plot against king James I. and for that crime was beheaded. His son wiped of that stain, and was restored to his estate. King Charles I. made him gentleman of the bed-chamber, commissioner of the navy, and governor of the Trinity-house. He granted him letters of reprisal against the Venetians, by virtue whereof he took several prizes with a small fleet which he commanded. He fought the Venetians near the port of Scanderoon, and bravely made his way through them with his booty. He was a great lover of learning, and translated several authors into English; and his "Treatise of the Nature of Bodies and the Immortality of the Soul," discovers great penetration and extensive knowledge. He applied to chemistry; and found out several useful medicines, which he gave freely away to people of all sorts, especially to the poor. He distinguished himself particularly by his sympathetic powder for the cure of wounds at a distance; his discourse concerning which made a great noise for a while. He had conferences with Des Cartes about the nature of the soul.

In the beginning of the civil wars, he exerted himself very vigorously in the king's cause; but he was afterwards imprisoned, by the parliament's order, in Winchester house, and had leave to depart thence in 1643. He afterwards compounded for the estate, but was ordered to leave the nation; when he went to France, and was sent on two embassies to pope Innocent X. from the queen, widow of Charles I. whose chancellor he then was. On the restoration of Charles II. he returned to London; where he died in 1665, aged 60.

This eminent person was, for the early pregnancy of his parts, and his great proficiency in learning, compared to the celebrated Picus de Mirandola, who was one of the wonders of human nature. His knowledge, though various and extensive, appeared to be greater than it really was; as he had all the powers of elocution and address to recommend it. He knew how to shine in a circle of ladies or philosophers; and was as much attended to when he spoke on the most trivial subjects, as when he spoke on the most important. It is said that one of the princes of Italy, who had no child, was desirous that his princess should bring him a son by Sir Kenelm, whom he esteemed a just model of perfection.

DIGEST, DIGESTUM, a collection of the Roman laws, ranged and digested under proper titles, by order of the emperor Justinian.

That prince gave his chancellor Tribonianus a commission for this purpose; who, in consequence thereof, chose sixteen jurisconsulti, or lawyers, to work upon the same. These, accordingly, took out the best and finest decisions from the two thousand volumes of the ancient jurisconsulti, and reduced them all into one body; which was published in the year 533, under the name of the *Digest*. To this the emperor gave the force of a law, by a letter at the head of the work, which serves it as a preface.

The Digest makes the first part of the Roman law, and the first volume of the corpus or body of the civil law, contained in fifty books. It was translated into Greek under the same emperor, and called *Pandecta*. See PANDECTS.

Cujus says, that *Digest* is a common name for all books disposed in a good order and economy; and hence it is that Tertullian calls the Gospel of St Luke a Digest.

Hence also abridgements of the common law are denominated *digests* of the numerous cases, arguments, readings, pleadings, &c. dispersed in the year-books, and other reports and books of law, reduced under proper heads or common places. The first was that of Statham, which comes as low as Henry VI. That of Fitzherbert was published in 1516; Brook's in 1573, of which Hughes's, published in 1663, is a sequel. Rolls, Danvers, and Nelson, have also published Digests or abridgements of this kind, including the cases of later days; to which may be added the New Abridgement, Viner's Abridgement, &c.

DIGESTION, in the animal economy, is the dissolution of the aliments into such minute parts as are fit to enter the lacteal vessels, and circulate with the mass of blood. See ANATOMY, nº 102.

DIGESTION, in chemistry, is an operation which consists in exposing bodies to a gentle heat, in proper vessels, and during a certain time. This operation is very useful to favour the action of certain substances upon each other; as, for example, of well calcined, dry, fixed alkali upon rectified spirit of wine. When these two substances are digested together in a matrass, with a gentle sand-bath heat, the spirit of wine acquires a yellow-reddish colour, and an alkaline quality. The spirit would not so well acquire these qualities by a stronger and shorter heat.

DIGESTIVE, in medicine, such remedies as strengthen and increase the tone of the stomach, and assist in the digestion of foods. To this class belong all stomachics and strengtheners or corroborants.

DIGESTIVE, in surgery, denotes a sort of unguent, plaster, or the like, that ripens and prepares the matter of wounds, &c. for suppuration.

DIGGING, among miners, is appropriated to the operations of freeing any kind of ore from the bed or stratum in which it lies, where every stroke of their tools turns to account: in contradistinction to the openings made in search of such ore, which are called *hatches*, or *essay-hatches*; and the operation itself, *tracing of mines*, or *hatching*.

When a bed of ore is discovered, the beele-men, so called from the instrument they use, which is a kind of pick-ax, free the ore from the fossils around it; and the shovel-men throw it up from one shamble to another, till it reaches the mouth of the hatch.

In some mines, to save the expence as well as fatigue of the shovel-men, they raise the ore by means of a winder and two buckets, one of which goes up as the other comes down.

DIGIT, in astronomy, the twelfth part of the diameter of the sun or moon, used to express the quantity of an eclipse. Thus an eclipse is said to be of six digits, when six of these parts are hid.

DIGITS, or *Monades*, in arithmetic, signify any integer under 10; as 1, 2, 3, 4, 5, 6, 7, 8, 9.

DIGIT is also a measure taken from the breadth of the finger. It is properly $\frac{3}{4}$ths of an inch, and contains the measure of four barley-corns laid breadthwise.

DIGITALIS, FOX-GLOVE: A genus of the angiospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 28th order, *Luridæ*. The calyx is quinquepartite; the corolla campanulated, quinquefid, and ventricose; the capsule ovate and bilocular.—There are six species; five of which are hardy, herbaceous, biennial, and perennial plants, and the sixth a tender shrubby exotic. The herbaceous species rise two or three feet high, crowned with spikes of yellow iron-coloured or purple flowers. The shrubby sort rises five or six feet high, having spear-shaped rough leaves, four or five inches long, and half as broad; the branches being all terminated with flowers growing in loose spikes. All the species are easily raised by seeds. An ointment made of the flowers of purple fox-glove and May-butter, is much commended by some physicians for scrophulous ulcers which run much and are full of matter. Taken internally, this plant is a violent purgative and emetic; and is therefore only to be administered to robust constitutions. The country people in England frequently use a decoction of it with polypody of the oak in epileptic fits. An infusion of two drams of the leaf in a pint of water, given in half-ounce doses every two hours or so, till it begin to puke or purge, is recommended in dropsy, particularly that of the breast. It is said to have produced an evacuation of water so copious and sudden, in ascites, by stool and urine, that the compression of bandages was found necessary. The plentiful use of diluents is ordered during its operation. The remedy, however, is inadmissible in very weakly patients. But besides being given in infusion, it has also been employed in substance. And when taken at bed-time to the extent of one, two, or three, grains of the dried powder, it often in a short time operates as a very powerful diuretic, without producing any other evacuation. Even this quantity, however, will sometimes excite very severe vomiting, and that too occurring unexpectedly. During its operation it has often very remarkable influence in rendering the pulse slower; and it frequently excites very considerable vertigo, and an affection of vision. Fox-glove has of late also been employed in some instances of hæmoptysis, of phthisis, and of mania, with apparent good effects: but its use in these diseases is much less common than in dropsy.

DIGITATED, among botanists. See BOTANY, p. 445, n° 230, and Plate CV. fig. 102.

DIGLYPH, in architecture, a kind of imperfect triglyph, console, or the like; with two channels or engravings, either circular or angular.

DIGNE, an episcopal town of Provence in France, famous for the baths that are near it. It is seated on a river called Marderic, in E. Long. 5. 27. N. Lat. 44. 45.

DIGNITARY, in the canon law, a person who holds a dignity, that is, a benefice which gives him some pre-eminence over mere priests and canons. Such is a bishop, dean, arch-deacon, prebendary, &c.

DIGNITY, as applied to the titles of noblemen, signifies honour and authority. And dignity may be divided into superior and inferior; as the titles of duke, earl, baron, &c. are the highest names of dignity; and those of baronet, knight, serjeant at law, &c. the lowest. Nobility only can give so high a name of dignity as to supply the want of a surname in legal proceedings; and as the omission of a name of dignity may be pleaded in abatement of a writ, &c. so it may be where a peer who has more than one name of dignity, is not named by the Most Noble. No temporal dignity of any foreign nation can give a man a higher title here than that of ESQUIRE.

DIGNITY, in the human character, the opposite of *Meanness*.

Man is endued with a SENSE of the worth and excellence of his nature: he deems it more perfect than that of the other beings around him; and he perceives that the perfection of his nature consists in virtue, particularly in virtues of the highest rank. To express that sense, the term *dignity* is appropriated. Further, to behave with dignity, and to refrain from all mean actions, is felt to be, not a virtue only, but a duty; it is a duty every man owes to himself. By acting in that manner, he attracts love and esteem: by acting meanly, or below himself, he is disapproved and contemned.

This sense of the dignity of human nature reaches even our pleasures and amusements. If they enlarge the mind by raising grand or elevated emotions, or if they humanize the mind by exercising our sympathy, they are approved as suited to the dignity of our nature: if they contract the mind by fixing it on trivial objects, they are contemned as not suited to the dignity of our nature. Hence, in general, every occupation, whether of use or amusement, that corresponds to the dignity of man, is termed *manly*; and every occupation below his nature, is termed *childish*.

To those who study human nature, there is a point which has always appeared intricate: How comes it that generosity and courage are more esteemed, and bestow more dignity, than good-nature, or even justice; though the latter contribute more than the former to private as well as to public happiness? This question, bluntly proposed, might puzzle even a philosopher; but, by means of the foregoing observations, will easily be solved. Human virtues, like other objects, obtain a rank in our estimation, not from their utility, which is a subject of reflection, but from the direct impression they make on us. Justice and good-nature are a sort of negative virtues, that scarce make any impression but when they are transgressed: courage and generosity, on the contrary, producing elevated emotions, enliven greatly the sense of a man's dignity, both in himself and in others; and for that reason, courage and generosity are in higher regard than the other virtues mentioned: we describe them as grand and elevated, as of greater dignity, and more praise-worthy.

This leads us to examine more directly emotions and passions with respect to the present subject: and it will not be difficult to form a scale of them, beginning with the

Dignity. the meanest, and ascending gradually to those of the highest rank and dignity Pleasure felt as at the organ of sense, named *corporeal pleasure*, is perceived to be low; and when indulged to excess, is perceived also to be mean: for that reason, persons of any delicacy dissemble the pleasure they take in eating and drinking. The pleasures of the eye and ear, having no organic feeling, and being free from any sense of meanness, are indulged without any shame: they even rise to a certain degree of dignity and when their objects are grand or elevated. The same is the case of the sympathetic passions: a virtuous person behaving with fortitude and dignity under cruel misfortunes, makes a capital figure; and the sympathising spectator feels in himself the same dignity. Sympathetic distress at the same time never is mean: on the contrary, it is agreeable to the nature of a social being, and has general approbation. The rank that love possesses in the scale, depends in a great measure on its object: it possesses a low place when founded on external properties; and is mean when bestowed on a person of inferior rank without any extraordinary qualification: but when founded on the more elevated internal properties, it assumes a considerable degree of dignity. The same is the case of friendship. When gratitude is warm it animates the mind; but it scarce rises to dignity. Joy bestows dignity when it proceeds from an elevated cause.

If we can depend upon induction, dignity is not a property of any disagreeable passion; one is slight, another severe; one depresses the mind, another animates it; but there is no elevation, far less dignity, in any of them. Revenge, in particular, though it enflame and swell the mind, is not accompanied with dignity, not even with elevation: it is not however felt as mean or groveling, unless when it takes indirect measures for gratification. Shame and remorse, though they sink the spirits, are not mean. Pride, a disagreeable passion, bestows no dignity in the eye of a spectator. Vanity always appears mean; and extremely so where founded, as commonly happens, on trivial qualifications.

We proceed to the pleasures of the understanding, which possess a high rank in point of dignity. Of this every one will be sensible, when he considers the important truths that have been laid open by science; such as general theorems, and the general laws that govern the material and moral worlds. The pleasures of the understanding are suited to man as a rational and contemplative being, and they tend not a little to ennoble his nature; even to the Deity he stretcheth his contemplations, which, in the discovery of infinite power, wisdom, and benevolence, afford delight of the most exalted kind. Hence it appears, that the fine arts, studied as a rational science, afford entertainment of great dignity; superior far to what they afford as a subject of taste merely.

But contemplation, however in itself valuable, is chiefly respected as subservient to action; for man is intended to be more an active than a contemplative being. He accordingly shows more dignity in action than in contemplation: generosity, magnanimity, heroism, raise his character to the highest pitch: these best express the dignity of his nature, and advance him nearer to divinity than any other of his attributes. Dignity.

Having endeavoured to assign the efficient cause of dignity and meanness, by unfolding the principle on which they are founded, we proceed to explain the final cause of the dignity or meanness bestowed upon the several particulars abovementioned, beginning with corporeal pleasures. These, as far as useful, are, like justice, fenced with sufficient sanctions to prevent their being neglected: hunger and thirst are painful sensations; and we are incited to animal love by a vigorous propensity: were corporeal pleasures dignified over and above with a place in a high class, they would infallibly overturn the balance of the mind, by outweighing the social affections. This is a satisfactory final cause for refusing to these pleasures any degree of dignity: and the final cause is not less evident of their meanness when they are indulged to excess. The more refined pleasures of external sense, conveyed by the eye and the ear from natural objects and from the fine arts, deserve a high place in our esteem, because of their singular and extensive utility: in some cases they rise to a considerable dignity; and the very lowest pleasures of the kind are never esteemed mean or groveling. The pleasure arising from wit, humour, ridicule, or from what is simply ludicrous, is useful, by relaxing the mind after the fatigue of more manly occupation: but the mind, when it surrenders itself to pleasure of that kind, loses its vigour, and sinks gradually into sloth. The place this pleasure occupies in point of dignity, is adjusted to these views: to make it useful as a relaxation, it is not branded with meanness; to prevent its usurpation, it is removed from that place but a single degree: no man values himself for that pleasure, even during gratification; and if it have engrossed more of his time than is requisite for relaxation, he looks back with some degree of shame.

In point of dignity, the social emotions rise above the selfish, and much above those of the eye and ear; man is by his nature a social being; and to qualify him for society, it is wisely contrived, that he should value himself more for being social than selfish.

The excellency of man is chiefly discernible in the great improvements he is susceptible of in society: these by perseverence, may be carried on progressively, above any assignable limits; and even abstracting from revelation, there is great probability, that the progress begun here will be completed in some future state. Now, as all valuable improvements proceed from the exercise of our rational faculties, the Author of our nature, in order to excite us to a due use of these faculties, hath assigned a high rank to the pleasures of the understanding; their utility, with respect to this life as a well as a future, intitles them to that rank.

But as action is the aim of all our improvements, virtuous actions justly possess the highest of all the ranks. These, we find, are by nature distributed into different classes, and the first in point of dignity assigned to actions that appear not the first in point of use: generosity for example, in the sense of mankind, is more respected than justice, though the latter is undoubtedly more essential to society; and magnanimity, heroism,

heroism, undaunted courage, rise still higher in our esteem: The reason of which is explained above.

DIGNITY, in oratory, is one of the three parts of general elocution; and consists in the right use of tropes and figures. See ORATORY, n° 48.

DIGON, an ancient, handsome, rich, and very considerable town of France; capital of Burgundy, and of the Digonois; with a parliament, bishop's see, a mint, an university, academy of sciences, an abbey, and a citadel: most part of the churches and public structures are very beautiful, and in one of the squares there is an equestrian statue of Louis XIV. It is seated in a very pleasant plain between two small rivers, which produces excellent wine. E. Long. 5. 7. N. Lat. 47. 19.

DIGRESSION, in oratory, is defined by Quintilian, agreeably to the etymology of the word, to be, a going off from the subject we are upon to some different thing, which, however, may be of service to it. See ORATORY, n° 37.

DIGYNIA, (from δις *twice*, and γυνη a *woman*), the name of an order or secondary division in each of the first 13 clases, except the 9th, in Linnæus's sexual method; consisting of plants, which to the classic character, whatever it is, add the circumstance of having two styles or female organs.

DII, the divinities of the ancient inhabitants of the earth, were very numerous. Every object which caused terror, inspired gratitude, or bestowed affluence, received the tribute of veneration. Man saw a superior agent in the stars, the elements, or the trees, and supposed that the waters which communicated fertility to his fields and possessions, were under the influence and direction of some invisible power inclined to favour and to benefit mankind. Thus arose a train of divinities which imagination arrayed in different forms, and armed with different powers. They were endowed with understanding, and were actuated by the same passions which daily afflict the human race, and those children of superstition were appeased or provoked as the imperfect being which gave them birth. Their wrath was mitigated by sacrifices and incense, and sometimes human victims bled to expiate a crime, which superstition alone supposed to exist. The sun, from his powerful influence and animating nature, first attracted the notice and claimed the adoration of the uncivilized inhabitants of the earth. The moon also was honoured with sacrifices and addressed in prayers, and after immortality had been liberally bestowed on all the heavenly bodies, mankind classed among their deities the brute creation, and the cat and the sow shared equally with Jupiter himself, the father of gods and men, the devout veneration of their votaries. This immense number of deities have been divided into different classes according to the will and pleasure of the mythologists. The Romans, generally speaking, reckoned two classes of the gods, the *dii majorum gentium*, or *dii consulentes*, and the *dii minorum gentium*. The former were 12 in number, six males and six females. [*Vid.* CONSENTES.] In the class of the latter were ranked all the gods which were worshipped in different parts of the earth. Besides these there were some called *dii selecti*, sometimes classed with the 12 greater gods; these were Janus, Saturn, the Genius, the Moon, Pluto, and Bacchus. There were also some called demi-gods, that is, who deserved immortality by the greatness of their exploits, and for their uncommon services to mankind. Among these were Priapus, Vertumnus, Hercules, and those whose parents were some of the immortal gods. Besides these, all the passions and the moral virtues were reckoned as powerful deities, and temples were raised to a goddess of concord, peace, &c. According to the authority of Hesiod, there were no less than 30,000 gods that inhabited the earth, and were guardians of men, all subservient to the power of Jupiter. To these, succeeding ages have added an almost equal number; and indeed they were so numerous, and their functions so various, that we find temples erected, and sacrifices offered, to unknown gods. It is observable, that all the gods of the ancients have lived upon earth as mere mortals; and even Jupiter, who was the ruler of heaven, is represented by the mythologists as a helpless child; and we are acquainted with all the particulars that attended the birth and education of Juno. In process of time, not only good and virtuous men, who had been the patrons of learning and the supporters of liberty, but also thieves and pirates, were admitted among the gods, and the Roman senate courteously granted immortality to the most cruel and abandoned of their emperors.

DIJAMBUS, in poetry, the foot of a Latin verse of four syllables; it is compounded of two *iambics*, as *sĕvērĭtās*.

DIKE, a ditch or drain, made for the passage of waters.—The word seems formed from the verb to *dig*; tho' others choose to drive it from the Dutch, *diik*, a dam, sea-bank, or wall.

DIKE, or *Dyke*, also denotes a work of stone, timber or fascines, raised to oppose the entrance or passage of the waters of the sea, a river, lake, or the like.—The word comes from the Flemish *dyk*, or *diik*, a heap of earth to bound or stem the water. Junius and Menage take the Flemish to have borrowed their word from the Greek τειχος *wall*. Guichard derives it from the Hebrew *daghah*. These dikes are usually elevations of earth, with hurdles of stakes, stones, and other matters.

The dike of Rochelle is made with vessels fastened to the bottom. The dikes of Holland are frequently broke through, and drown large tracts of land.

DILAPIDATION, in English law, a wasteful destroying or letting buildings, especially parsonage houses, &c. run to decay, for want of necessary reparation. If the clergy neglect to repair the houses belonging to their benefices, the bishop may sequester the profits thereof for that purpose. And in these cases, a prosecution may be brought either in the spiritual court or at common law, against the incumbent himself, or against his executor or administrator.

DILATATION, in physics, a motion of the parts of any body, by which it is so expanded as to occupy a greater space. This expansive motion depends upon the elastic power of the body; whence it appears that dilatation is different from rarefaction, this last being produced by the means of heat.

DILATATORES, in anatomy a name given to several muscles in the human body. See ANATOMY, *Table of the Muscles*.

DILATORY PLEAS, in law, are such as are put in merely for delay; and there may be a demurrer to a dilatory plea, or the defendant shall be ordered to plead better, &c. The truth of dilatory pleas is to be made out by affidavit of the fact, &c. by stat. 4 and 5 Anne. See PLEA.

DILATRIS, in botany: A genus of the monogynia order, belonging to the triandria class of plants. There is no calyx; the corolla has six petals, and is shaggy; the stigma simple.

DILEMMA, in logic, an argument equally conclusive by contrary suppositions. See LOGIC.

DILIGENCE, in Scots law, signifies either that care and attention which parties are bound to give, in implementing certain contracts or trusts, and which varies according to the nature of the contract; as to which, see LAW, N° clxi. 12, 13, clxxiii. 8. & clxxxi. 18. Or it signifies certain forms of law, whereby the creditor endeavours to operate his payment, either by affecting the person or estate of the debtor; *ibid.* N° clxxi. clxxii.

DILL, in botany. See ANETHUM.

DILLEMBURG, a town of Germany, in Wetteravia, and capital of a county of the same name. It is subject to a prince of the house of Nassau, and is situated in E. Long. 8. 24. N. Lat. 50. 45.

DILLENGEN, a town of Germany, in the circle of Suabia, with an university, and where the bishop of Augsburg resides. It is seated near the Danube, in E. Long. 11. 35. N. Lat. 48. 38.

DILLENIA, in botany, a genus of the polygynia order, belonging to the polyandria class of plants. The calyx is pentaphyllous; the petals five; the capsules numerous, polyspermous, coalited, and full of pulp.

DILUTE. To dilute a body is to render it liquid; or, if it were liquid before, to render it more so, by the addition of a thinner thereto. These things thus added are called *diluents*, or *dilutors*.

DIMACHÆ, from δις *double*, and μαχω *I fight*,) in antiquity, a kind of horsemen, first instituted by Alexander. Their armour was lighter than that of the infantry, and at the same time heavier than that used by horsemen, so that they could act as horse or foot as occasion required.

DIMENTION, in geometry, is either length, breadth, or thickness; hence, a line hath one dimension, *viz.* length; a superfices two, *viz.* length, breadth; and a body, or solid, has three, viz. length, breadth, and thickness.

DIMINUTION, in architecture, a contraction of the upper part of a column, by which its diameter is made less than that of the lower part*.

*See *Architecture*, n° 38.

DIMINUTIVE, in grammar, a word formed from some other, to soften or diminish the force of it, or to signify a thing is little in its kind. Thus, *cellule* is a diminutive of *cell*, globule of *globe*, hillock of *hill*.

DIMISSORY LETTERS, *Literæ Dimissoriæ*, in the canon law, a letter given by a bishop to a candidate for holy orders, having a title in his diocese, directed to some other bishop, and giving leave for the bearer to be ordained by him.

When a person produces letters of ordination or tonsure, conferred by any other than his diocesan, he must at the same time produce the letters dimissory given by his own bishop, on pain of nullity.

Letters dimissory cannot be given by the chapter, *sede vacante*; this being deemed an act of voluntary jurisdiction, which ought to be reserved to the successor.

DIMNESS *of sight*, in farriery, a disorder in horses, proceeding from blood-shotten eyes. If the ball of the eye be found the cure is effected by keeping the horse warm, with a hood of linen cloth fitted to his head, and anointing the eye-lids twice a-day with a composition of sugar candy, and white rose water. In two or three days the eyes will be well, after which the creature should be blooded.

In this disorder the bladders on any part of the eye ought by no means to be clipped, or meddled with.

DIMŒRITÆ, a name given to the appollinarists, who at first held that the word only assumed a human body without taking a reasonable soul like ours; but being at length convinced by formal texts of scripture, they allowed that he did assume a soul, but without understanding; the word supplying the want of that faculty. From this way of separating the understanding from the soul, they became denominated *dimœrites*, q. d. *dividers*, *separaters*, of δια and μοιραω, *I divide*.

DINDYMA-ORUM, (Virgil,) from Dindymus-i; a mountain allotted by many to Phrygia. Strabo has two mountains of this name; one in Mysia near Cyzicus; the other in Gallograecia near Pessinus and none in Phrygia. Ptolemy extends this ridge from the borders of Troas, through Phrygia to Gallograecia: though therefore there were two mountains called Dindymus in particular both sacred to the mother of the gods, and none of them in Phrygia Major; yet there might be several hills and eminences in it, on which this goddess was worshipped, and therefore called *Dindyma* in general. Hence Cybele is surnamed *Dindymane*, (Horace.)

DINGWAL, a parliament-town of Scotland in the shire of Ross, seated on the frith of Cromarty, 15 miles west of the town of Cromarty. Near it runs the river Conel, famous for producing pearls. W. Long. 4. 15. N. Lat. 57. 45. Dingwal was a Scotch barony in the person of the duke of Ormond in right of his lady, but forfeited in 1715.

DINNER, the meal taken about the middle of the day.—The word is derived from the French *disner*, which Du Cange derives from the barbarous Latin *disnare*. Henry Stephens derives it from the Greek δειπνειν; and will have it wrote *dipner*. Menage deduces it from the Italian *desinare*, "to dine;" and that from the Latin *desinere*, "to leave off work."

It is generally agreed to be the most salutary to make a plentiful dinner, to eat sparingly at supper. This is the general practice among us. The French, however, in imitation of the ancient Romans, defer their good cheer to the evening; and Bernardinus Paternus, an eminent Italian physician, maintains it to be the most wholesome method, in a treatise expressly on the subject.

The grand Tartar emperor of China, after he has dined, makes publication by his heralds, that he gives leave for all the other kings and potentates of the earth to go to dinner; as if they waited for his leave.

DINOCRATES, a celebrated architect of Macedonia, who rebuilt the temple of Ephesus, when burnt by Erostratus, with much more magnificence than before. Vitruvius informs us that Dinocrates proposed to Alexander the Great to convert mount Athos into the figure of a man, whose left hand should contain a walled city, and all the rivers of the mount flow into his right, and from thence into the sea! He also conceived a scheme for building the dome of the temple of Arsinoe at Alexandria, of loadstone; that should by its attraction uphold her iron image in the centre, suspended in the air! Projects which at least showed a vast extent of imagination.

DIO CHRYSOSTOM, that is, *Golden Mouth*, a celebrated orator and philosopher of Greece, in the first century, was born at Prusa in Bithynia. He attempted to persuade Vespasian to quit the empire: was hated by Domitian; but acquired the esteem of Trajan. This last prince took pleasure in conversing with him, and made him ride with him in his triumphal chariot. There are still extant, 80 of Dio's orations, and some other of his works: the best edition of which is that of Hermand Samuel Raimarus, in 1750, in folio.

DIOCESE, or DIOCESS, the circuit or extent of the jurisdiction of a BISHOP.—The word is formed from the Greek διοικησις, *government, administration;* formed of διοικεω, which the ancient glossaries render *administro, mederor, ordino:* hence διοικησις της πολεως, the *administration* or *government of a city*.

DIOCESE is also used in ancient authors, &c. for the province of a METROPOLITAN.

Diocæsis, διοικησις, was originally a civil government, or prefecture, composed of divers provinces.

The first division of the empire into dioceses is ordinarily ascribed to Constantine: who distributed the whole Roman state into four, viz. the diocese of Italy, the diocese of Illyria, that of the east, and that of Africa. And yet, long before Constantine, Strabo, who wrote under Tiberius, takes notice, lib. xiii. p. 432. that the Romans had divided Asia into dioceses; and complains of the confusion such a division occasioned in geography, Asia being no longer divided by people, but by dioceses, each whereof had a tribunal or court, where justice was administered. Constantine, then was only the institutor of those large dioceses, which comprehended several metropoles and governments; the former dioceses only comprehending one jurisdiction or district, or the country that had resort to one judge, as appears from this passage in Strabo, and (before Strabo) from Cicero himself, lib. iii. *epist. ad famil.* 9. and lib. xiii. *ep.* 67.

Thus, at first a province included divers dioceses; and afterwards a diocese came to comprise divers provinces. In after times the Roman empire became divided into 13 dioceses or prefectures; though, including Rome and the suburbicary regions, there were 14. These 14 dioceses comprehended 120 provinces; each province had a proconsul, who resided in the capital or metropolis; and each diocese of the empire had a consul, who resided in the principal city of the district.

On this civil constitution, the ecclesiastical one was afterwards regulated: each diocese had an ecclesiastical vicar or primate, who judged finally of all the concerns of the church within his territory.

At present there is some further alteration: for diocese does not now signify an assemblage of divers provinces; but is limited to a single province under a metropolitan, or more commonly to the single jurisdiction of a bishop.

Gul. Brito affirms diocese to be properly the territory and extent of a baptismal or parochial church; whence divers authors use the word to signify a simple parish. See PARISH.

DIOCLEIA, Διοκλεια, in antiquity, a solemnity kept in the spring at Megara, in memory of the Athenian hero, who died in the defence of the youth he loved.

DIOCLESIANUS (Caius Valerius Jovius), a celebrated Roman emperor born of an obscure family in Dalmatia in 245. He was first a common soldier, and by merit and success he gradually rose to the office of a general; and at the death of Numerian in 284 he was invested with imperial power. In this high station he rewarded the virtues and fidelity of Maximian, who had shared with him all the subordinate offices in the army, by making him his colleague on the throne. He created two subordinate emperors Constantius and Galerius, whom he called Cæsars, whilst he claimed for himself and his colleague the superior title of Augustus. Dioclesian has been celebrated for his military virtues: and though he was naturally unpolished by education and study, yet he was the friend and patron of learning and true genius. He was bold and resolute, active and diligent, and well acquainted with the arts, which will endear a sovereign to his people, and make him respectable even in the eyes of his enemies. His cruelty, however, against the followers of Christianity, has been deservedly branded with infamy. After he had reigned 22 years in the greatest prosperity, he publicly abdicated the crown at Nicomedia in 305, and retired to a private station at Salona. Maximian his colleague followed his example, but not from voluntary choice; and when he some time after endeavoured to rouse the ambition of Dioclesian, and presuade him to re-assume the imperial purple, he received for answer, that Dioclesian took now more delight in cultivating his little garden than he formerly enjoyed in a palace, when his power was extended over all the earth. He lived nine years after his abdication in the greatest security and enjoyment at Salona, and died in 314, in the 68th year of his age. Dioclesian is the first sovereign who voluntarily resigned his power. His bloody persecution of the Christians forms a chronological era, called the *era of Dioclesian*, or of the martyrs. It was for a long time in use in the theological writings, and is still followed by the Copts and Abyssinians. It commenced August 29, 284.

DIOCTAHEDRIA, in natural history, a genus of pellucid and crystalliform spars, composed of two octangular pyramids, joined base to base, without any intermediate column. Of these some have long pyramids, others short and sharp-pointed ones, and others short and obtuse-pointed ones; the two former species being found in the Hartz-forest, and the last in the mines of Cornwal.

DIODATI (John), a famous minister, and professor of theology at Geneva, was born at Lucca in 1579, and died at Geneva in 1652. He is distinguished by translations, 1. of the Bible into Italian, with notes, Geneva 1607, 4to. The best edition at Geneva in 1641, folio. This is said to be more a paraphrase than a translation, and the notes rather divine meditations than

than critical reflections. 2. Of the Bible into French, Geneva, 1644. 3. Of Father Paul's History of the Council of Trent into French.

DIODIA, in botany: A genus of the monogynia order, belonging to the tetrandria class of plants; and in the natural method ranking under the 47th order, *Stellatæ*. The corolla is monopetalous and funnel-shaped; the capsule bilocular and dispermous.

DIODON, or SUN-FISH, in ichthyology, a genus belonging to the order of amphibia nantes.

There are three species. 1. The oblong sun-fish grows to a great bulk: one examined by Sylvianus was above 100 pounds in weight; and Dr Borlase mentions another taken at Plymouth in 1734, that weighed 500. In form it resembles a bream or some deep fish cut off in the middle. The mouth is very small, and contains in each jaw two broad teeth, with sharp edges. The eyes are little; before each is a small semilunar aperture; the pectoral fins are very small, and placed behind them. The colour of the back is dusky, and dappled; the belly silvery: between the eyes and the pectoral fins are certain streaks pointing downwards. The skin is free from scales.

When boiled, it has been observed to turn into a glutinous jelly, resembling boiled starch when cold, and served the purposes of glue on being tried on paper and leather. The meat of this fish is uncommonly rank: it feeds on shell-fish.

There seems to be no satisfactory reason for the old English name. Care must be taken not to confound it with the sun-fish of the Irish (see SQUALUS), which differs in all respects from this.

2. The mola, or short sun-fish, differs from the former, in being much shorter and deeper. The back and the anal fins are higher, and the aperture to the gills not semilunar, but oval. The situation of the fins are the same in both.

Both kinds are taken on the western coasts of Britain, but in much greater numbers in the warmer parts of Europe.—Mr Brunnich informs us, that between Antibes and Genoa he saw one of this species lie asleep on the surface of the water: a sailor jumped overboard and caught it.

See plate CLXIV. 3. The levigatus, or globe, is common to Europe and South Carolina. As yet only a single specimen has been discovered in the British seas; taken at Penzance in Cornwal. The length was one foot seven; the length of the belly, when distended, one foot; the whole circumference in that situation two feet six. The form of the body is usually oblong; but when alarmed, it has the power of inflating the belly to a globular shape of great size. This seems designed as a means of defence against fish of prey; as they have less means of laying hold of it; and are besides terrified by the numbers of spines with which that part is armed, and which are capable of being erected on every part. The mouth is small: the irides white, tinged with red: the back from head to tail almost straight, or at least very slightly elevated; of a rich deep blue colour. It has the pectoral, but wants the ventral fins: the tail is almost even, divided by an angular projection in the middle; tail and fins brown. The belly and sides are white, shagreened or wrinkled; and beset with innumerable small sharp spines, adhering to the skin by four processes.

DIODORUS, an historian, surnamed *Siculus*, because he was born at Argyra in Sicily. He wrote an history of Egypt, Persia, Syria, Media, Greece, Rome, and Carthage; and it is said that he visited all the places of which he has made mention in his history. It was the labour of 30 years. He is, however, too credulous in some of his narrations, and often wanders far from the truth. He often dwells too long upon fabulous reports and trifling incidents; while events of the greatest importance to history are treated with brevity, and sometimes passed over in silence. He lived in the age of J. Cæsar and Augustus; and spent much time at Rome to procure information, and authenticate his historical narrations. This important work, which he composed in Greek, contained 40 books, of which there are only 15 remaining. The style is clear and neat, and very suitable to history. The best edition is that of Amsterdam, 1743, in 2 vols folio.

DIOECIA, (from δις *twice*, and οικια a *house* or *habitation*) two houses. The name of the 22d class in Linnæus's sexual method, consisting of plants, which having no hermaphrodite flowers, produce male and female flowers on separate roots. These latter only ripen seeds; but require for that purpose, according to the sexualists, the vicinity of a male plant; or the aspersion, that is, sprinkling, of the male dust. From the seeds of the female flowers are raised both male and female plants. The plants then in the class diœcia are all male and female; not hermaphrodite, as in the greater number of classes; nor with male and female flowers upon one root, as in the class monœcia of the same author. See BOTANY, p. 430.

DIOGENES of Apollonia, in the island of Crete, held a considerable rank among the philosophers who taught in Ionia before Socrates appeared at Athens. He was the scholar and successor of Anaximenes, and in some measure rectified his master's opinion concerning air being the cause of all things. It is said, that he was the first who observed that air was capable of condensation and rarefaction. He passed for an excellent philosopher, and died about the 450th year before the Christian era.

DIOGENES the Cynic, a famous philosopher, was the son of a banker of Sinope in Pontus. Being banished with his father for coining false money, he retired to Athens, where he studied philosophy under Antisthenes. He added new degrees of austerity to the sect of the Cynics, and never did any philosopher carry so far a contempt for the conveniences of life. He was one of those extraordinary men who run every thing to extremity, without excepting even reason itself; and who confirm the saying, that "there is no great genius without a tincture of madness." He lodged in a tub; and had no other moveables besides his staff, wallet, and wooden bowl, which last he threw away on seeing a boy drink out of the hollow of his hand. He used to call himself a vagabond, who had neither house nor country: was obliged to beg, was ill clothed, and lived from hand to mouth: and yet, says Ælian, he took as much pride in these things as Alexander could in the conquest of the world. He was not indeed a jot more humble than those who are clothed in rich apparel, and fare sumptuously every day. He looked down on all the world with scorn; he magisterially censured all mankind, and thought himself unquestionably superior to all other philosophers. Alexander one day paid him

Diogenes. a visit, and made him an offer of riches or any thing else: but all that the philosopher requested of him was, to stand from betwixt the sun and him. As if he had said, "Do not deprive me of the benefits of nature, and I leave to you those of fortune." The conqueror was so affected with the vigour and elevation of his soul, as to declare, that "if he was not Alexander, he would choose to be Diogenes:" that is, if he was not in possession of all that was pompous and splendid in life, he would, like Diogenes, heroically despise it. Diogenes had great presence of mind, as appears from his smart sayings and quick repartees; and Plato seems to have hit off his true character when he called him a Socrates run mad. He spent a great part of his life at Corinth, and the reason of his living there was as follows: As he was going over to the island of Ægina, he was taken by pirates, who carried him into Crete, and there exposed him to sale. He answered the crier, who asked him what he could do, that "he knew how to command men:" and perceiving a Corinthian who was going by, he showed him to the crier, and said, "Sell me to that gentleman, for he wants a master." Xeniades, for that was the Corinthian's name, bought Diogenes, and carried him with him to Corinth. He appointed him tutor to his children, and entrusted him also with the management of his house. Diogenes's friends being desirous of redeeming him, "You are fools, (said he); the lions are not the slaves of those who feed them, but they are the servants of the lions." He therefore plainly told Xeniades, that he ought to obey him, as people obey their governors and physicians. Some say, that Diogenes spent the remainder of his life in Xeniades's family; but Dion Chrysostom asserts that he passed the winter at Athens, and the summer at Corinth. He died at Corinth when he was about 90 years old: but authors are not agreed either as to the time or manner of his death. The following account, Jerom says, is the true one. As he was going to the Olympic games, a fever seized him in the way; upon which he lay down under a tree, and refused the assistance of those who accompanied him, and who offered him either a horse or a chariot. "Go you to the games, (says he), and leave me to contend with my illness. If I conquer, I will follow you: If I am conquered, I shall go to the shades below." He dispatched himself that very night; saying, that "he did not so properly die, as get rid of his fever." He had for his disciples Onesicrites, Phocion, Stilpo of Megara, and several other great men. His works are lost.

Diogenes Laertius, so called from Laerta in Cilicia where he was born, an ancient Greek author, who wrote ten books of the Lives of the Philosophers, still extant. In what age he flourished, is not easy to determine. The oldest writers who mention him are Sopater Alexandrinus, who lived in the time of Constantine the Great; and Hesychius Milesius, who lived under Justinian. Diogenes often speaks in terms of approbation of Plutarch and Phavorinus; and therefore, as Plutarch lived under Trajan, and Phavorinus under Hadrian, it is certain that he could not flourish before the reigns of those emperors. Menage has fixed him to the time of Severus; that is, about the year of Christ 200. From certain expressions in him some have fancied him to have been a Christian; but, as Menage observes, the immoderate praises he bestows upon Epicurus will not suffer us to believe this, but incline us rather to suppose that he was an Epicurean. He divided his Lives into books, and inscribed them to a learned lady of the Platonic school, as he himself intimates in his life of Plato. Montaigne was so fond of this author, that instead of one Laertius he wishes we had a dozen: and Vossius says, that his work is as precious as gold. Without doubt we are greatly obliged to him for what we know of the ancient philosophers; and if he had been as exact in the writing part, as he was judicious in the choice of his subject, we had been more obliged to him still. Bishop Burnet, in the preface to his Life of Sir Matthew Hale, speaks of him in the following proper manner: "There is no book the ancients have left us (says he), which might have informed us more than Diogenes Laertius's Lives of the Philosophers, if he had had the art of writing equal to that great subject which he undertook: for if he had given the world such an account of them as Gassendus has done of Peiresc, how great a stock of knowledge might we have had, which by his unskilfulness is in a great measure lost? since we must now depend only on him, because we have no other and better author who has written on that argument." There have been several editions of his Lives of the Philosophers; but the best is that printed in two volumes 4to, at Amsterdam, 1693. This contains the advantages of all the former, besides some peculiar to itself: the Greek text and the Latin version corrected and amended by Meibomius; the entire notes of Henry Stephens, both the Casaubons, and of Menage; 24 copper-plates of philosophers elegantly engraved: to which is added, The History of the Female Philosophers, written by Menage, and dedicated to Madam Dacier. Besides this, Laertius wrote a book of Epigrams upon illustrious Men, called Pammetrus, from its various kinds of metre: but this is not extant.

Diogenes, Diomedia.

DIOMEDIA, in ornithology, a genus belonging to the order of anseres. The bill is strait; the superior mandible is crooked at the point, and the lower one is truncated; the nostrils are oval, open, a little prominent, and placed on the sides. There are two species, viz. 1. The exulans, has pennated wings, and three toes on each foot. It is the albatross of Edwards; and is about the size of a pelican. These birds are found in the ocean betwixt the tropics and at the Cape of Good Hope. They are also often seen in vast flocks in Kamtschatka, and adjacent islands, about the end of June, where they are called *Great Gulls*; but it is chiefly in the bay of Penschinensi, the whole inner sea of Kamtschatka, the Kurile isles, and that of Bering; for on the eastern coast of the first they are scarce, a single straggler only appearing now and then. Their chief motive for frequenting these places seems to be plenty of food; and their arrival is a sure presage of shoals of fish following. At their first coming they are very lean, but soon grow immensely fat. Are very voracious birds, and will often swallow a salmon of four or five pounds weight; but as they cannot take the whole of it into their stomachs at once, part of the tail end will often remain out of the mouth; and the natives, finding the bird in this situation, make no difficult matter of knocking it on the head on the spot. Before the middle of

August

Diomedia, Diomenes.

August they migrate elsewhere. They are often taken by means of a hook baited with a fish; but it is not for the sake of their flesh that they are valued, it being hard and unsavoury, but on account of the intestines, a particular part of which they blow up as a bladder, to serve as floats to buoy up their nets in fishing. Of the bones they make tobacco-pipes, needle-cases, and other useful things. When caught they defend themselves stoutly with the bill. Their cry is harsh and disagreeable, not unlike the braying of an ass. The breeding places of the albatross, if at all in the northern hemisphere, have not yet been pointed out; but we are certain of their multiplying in the southern, viz. Patagonia and Falkland islands: to this last place they come about the end of September or beginning of October, among other birds, in great abundance. The nests are made on the ground with earth, are round in shape, a foot in height, indented at top. The egg larger than that of a goose, four inches and a half long, white, marked with dull spots at the bigger end; and is thought to be good food, the white never growing hard with boiling. While the female is sitting, the male is constantly on the wing, and supplies her with food: during this time they are so tame as to suffer themselves to be shoved off the nest while their eggs are taken from them; but their chief destruction arises from the hawk, which, the moment the female gets off the nest, darts thereon, and flies away with the egg. The albatross itself likewise has its enemy, being greatly persecuted while on the wing by the dark grey gull called *skua*.

This bird attacks it on all sides, but particularly endeavours to get beneath, which is only prevented by the first settling on the water; and indeed they do not frequently fly at a great distance from the surface, except obliged so to do by high winds or other causes. As soon as the young are able to remove from the nest, the penguins take possession, and hatch their young in turn. It is probable that they pass from one part of the globe to another according to the season; being now and then met with by different voyagers at various times in intermediate places. The food is supposed to be chiefly small marine animals, especially of the molluscæ or blubber class, as well as flying fish. 2. The demersa, has no quill-feathers on the wings; and the feet have four toes, connected together by a membrane. It is the black penguin of Edwards, about the size of a goose, and is found at the Cape of Good Hope. It is an excellent swimmer and diver; but hops and flutters in a strange aukward manner on the land, and, if hurried, stumbles perpetually, and frequently runs for some distance like a quadruped, making use of the wings instead of the legs, till it can recover its upright posture; crying out at the same time like a goose, but in a much hoarser voice. It is said to clamber some way up the rocks in order to make the nest; in doing which, has been observed to assist with the bill. The eggs are two in number, white, as large as those of a duck, and reckoned delicious eating, at least are thought so at the Cape, where they are brought in great numbers for that purpose. At this place the birds are often seen kept tame; but in in general they do not survive the confinement many months.

DIOMEDES, son of Tydeus and Deiphyle, was king of Ætolia, and one of the bravest of the Grecian chiefs in the Trojan war. He often engaged Hector and Æneas, and obtained much military glory. He went with Ulysses to steal the Paladium from the temple of Minerva in Troy; and assisted in murdering Rhesus king of Thrace, and carrying away his horses. At his return from the siege of Troy, he lost his way in the darkness of night, and landed in Attica, where his companions plundered the country and lost the Trojan Palladium. During his long absence, his wife Ægiale forgot her marriage vows, and prostituted herself to Cometes one of her servants. This lasciviousness of the queen was attributed by some to the resentment of Venus, whom Diomedes had severely wounded in a battle before Troy. The infidelity of Ægiale was highly displeasing to Diomedes. He resolved to abandon his native country which was the seat of his disgrace; and the attempts of his wife to take away his life, according to some accounts, did not a little contribute to hasten his departure. He came to that part of Italy which has been called *Magna Græcia*, where he built a city, which he called *Argyrippa*, and married the daughter of Daunus the king of the country. He died there in extreme old age; or, according to a certain tradition, he perished by the hand of his father-in-law. His death was greatly lamented by his companions, who in the excess of their grief were changed into birds resembling swans. These birds took flight into a neighbouring island in the Adriatic, and became remarkable for the tameness with which they approached the Greeks, and for the horror with which they shunned all other nations. They are called the birds of Diomedes. Altars were raised to Diomedes, as to a god, one of which Strabo mentions at Timavus.

Diomedes || Dion.

DION, a Syracusan, son of Hipparinus, famous for his power and abilities. He was related to Dionysius, and often advised him together with the philosopher Plato, who at his request had come to reside at the tyrant's court, to lay aside the supreme power. His great popularity rendered him odious in the eyes of the tyrants, who banished him to Greece. There he collected a numerous force, and resolved to free his country from tyranny. This he easily effected on account of his uncommon popularity. He entered the port of Syracuse only in two ships; and in three days reduced under his power an empire which had already subsisted for 50 years, and which was guarded by 500 ships of war, and above 100,000 troops. The tyrant fled to Corinth, and Dion kept the power in his own hands, fearful of the aspiring ambition of some of the friends of Dionysius: but he was shamefully betrayed and murdered by one of his familiar friends called *Callicrates*, or *Callippus*, 354 years before the Christian era.

DION CASSIUS, a native of Nicæa in Bithynia. His father's name was Apronianus. He was raised to the greatest offices of state in the Roman empire by Pertinax, and his three successors. He was naturally fond of study, and he improved himself by unwearied application. He was ten years in collecting materials for an history of Rome, which he made public in 80 books, after a laborious employment of 12 years in composing it. This valuable history began with the arrival

arrival of Æneas in Italy, down to the reign of the emperor Alexander Severus. The 34 first books are totally loſt, the 20 following, that is from the 35th to the 54th, remain entire, the ſix following are mutilated, and fragments is all that we poſſeſs of the laſt 20. In the compilation of this extenſive hiſtory, Dion propoſed himſelf Thucydides for a model, but he is not perfectly happy in his imitation. His ſtyle is pure and elegant, and his narrations are judiciouſly managed, and his reflections learned; but upon the whole, he is credulous, and the begoted ſlave of partiality, ſatyr, and flattery. He inveighs againſt the republican principles of Brutus and Cicero, and extols the cauſe of Cæſar. Seneca is the object of his ſatyr, and he repreſents him as debauched and licentious in his morals.

DIONIS (Peter), a famous ſurgeon, born at Paris, diſtinguiſhed himſelf by his ſkill in his profeſſion, and by his works; the principal of which are, 1. A courſe of operations in ſurgery; 2. The anatomy of man; and, 3. A treatiſe on the manner of aſſiſting women in child-birth. He died in 1718.

DIONÆA MUSCIPULA, or *Venus's Fly-trap*, in botany, a newly diſcovered ſenſitive plant.

Every one ſkilled in natural hiſtory knows, that the mimoſæ, or ſenſitive plants, cloſe their leaves, and bend their joints, upon the leaſt touch: and this has aſtoniſhed us; but no end or deſign of nature has yet appeared to us from theſe ſurpriſing motions: they ſoon recover themſelves again, and their leaves are expanded as before. But the plant we are now going to deſcribe, ſhows that nature may have ſome view towards its nouriſhment, in forming the upper joint of its leaf like a machine to catch food: upon the middle of this lies the bait for the unhappy inſect that becomes its prey. Many minute red glands that cover its inner ſurface, and which perhaps diſcharge ſome ſweet liquor, tempt the poor animal to taſte them; and the inſtant theſe tender parts are irritated by its feet, the two lobes riſe up, graſp it faſt, lock the two rows of ſpines together, and ſqueeze it to death. And further, leaſt the ſtrong efforts for life, in the creature thus taken, ſhould ſerve to diſengage it, three ſmall erect ſpines are fixed near the middle of each lobe among the glands, that effectually put an end to all its ſtruggles. Nor do the lobes ever open again, while the dead animal continues there. But it is nevertheleſs certain, that the plant cannot diſtinguiſh an animal from a mineral ſubſtance; for, if we introduce a ſtraw or a pin between the lobes, it will graſp it full as faſt as if it was an inſect.—The plant is one of the monogynia order, belonging to the decandria claſs. It grows in America, about 35 deg. N. Lat. in wet ſhady places, and flowers in July and Auguſt. The largeſt leaves are about three inches long, and an inch and a half acroſs the lobes: the glands of thoſe expoſed to the ſun are of a beautiful red colour; but thoſe in the ſhade are pale, and inclining to green. The roots are ſquamous, ſending forth but few fibres, and are perennial. The leaves are numerous, inclining to bend downwards, and are placed in a circular order; they are jointed and ſucculent; the lower joint, which is a kind of ſtalk, is flat, longiſh, two-edged, and inclining to heart-ſhaped. In ſome varieties they are ſerrated on the edges near the top. The upper joint conſiſts of two lobes; each lobe is of a ſemi-oval form, with their margins furniſhed with ſtiff hairs like eye-brows, which embrace or lock in each other when they cloſe; this they do when they are inwardly irritated. The upper ſurfaces of theſe lobes are covered with ſmall red glands; each of which appears, when highly magnified, like a compreſſed arbutus berry.—Among the glands about the middle of each lobe, are three very ſmall erect ſpines. When the lobes incloſe any ſubſtance, they never open again while it continues there. If it can be ſhoved out ſo as not to ſtrain the lobes, they expand again; but if force is uſed to open them, ſo ſtrong has nature formed the ſpring of their fibres, that one of the lobes will generally ſnap off rather than yield. The ſtalk is about ſix inches high, round, ſmooth, and without leaves; ending in a ſpike of flowers. The flowers are milk-white, and ſtand on footſtalks, at the bottom of which is a little painted bractea or flower-leaf. The ſoil in which it grows, is a black, light, mould, intermixed with white ſand. Being a ſwamp plant, a north-eaſt aſpect will be propereſt for it at firſt, to keep it from the direct rays of the ſun; and in winter, in cold climates where it is not a native, it will be neceſſary to ſhelter it with a bell glaſs, ſuch as is uſed for melons. This ſhould be covered with ſtraw or a mat in hard froſts. By this means ſeveral of theſe plants have been preſerved through the winter in a very vigorous ſtate. Its ſenſitive quality will be found in proportion to the heat of the weather, as well as the vigour of the plant.

DIONYSIA, in Grecian antiquity, ſolemnities in honour of Bacchus, ſometimes called by the general name of *Orgia;* and by the Romans *Bacchanalia*, and *Liberalia*. See BACCHANALIA and BACCHUS.

DIONYSIACA, in antiquity, was a deſignation given to plays and all manner of ſports acted on the ſtage; becauſe play-houſes were dedicated to Dionyſius, i. e. Bacchus, and Venus, as being the deities of ſports and pleaſure.

DIONYSIAN PERIOD. See CHRONOLOGY, n° 31.

DIONYSIUS I. from a private ſecretary became general and tyrant of Syracuſe and all Sicily. He was likewiſe a poet; and having, by bribes, gained the tragedy-prize at Athens, he indulged himſelf ſo immoderately at table from exceſs of joy, that he died of the debauch, 386 B. C. but ſome authors relate that he was poiſoned by his phyſicians.

DIONYSIUS II. (his ſon and ſucceſſor) was a greater tyrant than his father: his ſubjects were obliged to apply to the Corinthians for ſuccour: and Timoleon their general having conquered the tyrant, he fled to Athens, where he was obliged to keep a ſchool for ſubſiſtence. He died 343 B. C.

DIONYSIUS (Halicarnaſſenſis), a celebrated hiſtorian, and one of the moſt judicious critics of antiquity, was born at Halicarnaſſus; and went to Rome after the battle of Actium, where he ſtaid 22 years under the reign of Auguſtus. He there compoſed in Greek his Hiſtory of the Roman Antiquities, in 20 books, of which the firſt 11 only are now remaining. There are alſo ſtill extant ſeveral of his critical works. The beſt edition of the works of this author is that of Oxford, Dionysius, Diophantine. Oxford, in 1704, in Greek and Latin, by Dr Hudson.

DIONYSIUS, a learned geographer, to whom is attributed a Periegesis, or Survey of the Earth, in Greek verse. Some suppose that he lived in the time of Augustus; but Scaliger and Saumasius place him under the reign of Severus, or Marcus Aurelius. He wrote many other works, but his Periegesis is the only one we have remaining; the best and most useful edition of which is that improved with notes and illustrations by Hill.

DIONYSIUS (Areopagita), was born at Athens, and educated there. He went afterwards to Heliopolis in Egypt; where, if we may believe some writers of his life, he saw that wonderful eclipse which happened at our Saviour's passion, and was urged by some extraordinary impulse to cry out, *Aut Deus patitur, aut cum patiente dolet;* "either God himself suffers, or condoles with him who does." At his return to Athens he was elected into the court of Areopagus, from whence he derived his name of *Areopagite*. About the year 50 he embraced Christianity; and, as some say, was appointed first bishop of Athens by St Paul. Of his conversion we have an account in the 17th chapter of the Acts of the Apostles.—He is supposed to have suffered martyrdom; but whether under Domitian, Trajan, or Adrian, is not certain. We have nothing remaining under his name, but what there is the greatest reason to believe spurious.

DIONYSIUS (the Lesser), a Scythian, became abbot of a monastery at Rome: he was the first who computed time from the birth of Dionysius to Christ, and fixed that great event, according to the vulgar æra. He was also a learned canon-law writer, and died about the year 540.

DIOPHANTINE PROBLEMS, in mathematics, certain questions relating to square and cube numbers, and right-angled triangles, &c. the nature of which was determined by Diophantus, a mathematician of Alexandria, who is believed to have lived about the third century. We have his works, which were published with notes at Paris, in 1621, by Bachet de Meziriac; and another edition in 1670, with observations on every question, by M. Fermat. Diophantine.

In these qustions it is endeavoured to find commensurable numbers to answer indeterminate problems; which bring out an infinite number of incommensurable quantities. For example, it is proposed to find a right-angled triangle, whose sides x, y, z, are expressed by commensurable numbers: it is known that $x^2+y^2=z^2$, z being the supposed hypothenuse. But it is possible to assume x and y, so that z will be incommensurable; for if $x=1$, and $y=2$, $z=\sqrt{5}$.

The art of resolving such problems consists in so managing the unknown quantity or quantities in such a manner, that the square or higher power may vanish out of the equation, and then by means of the unknown quantity in its first dimension, the equation may be resolved without having recourse to incommensurables; *e. gr.* let it be supposed to find x, y, z, the sides of a right-angled triangle, such as will give $x^2+y^2=z^2$. Suppose $z=x+u$, then $x^2+y^2=x^2+2xu+u^2$; out of which equation x^2 vanishes, and $x=\frac{y^2-u^2}{2u}$: then assuming y and u equal to any numbers at pleasure, the sides of the triangle will be $y, \frac{y^2-u^2}{2u}$, and the hypothenuse $x+u=\frac{y^2+u^2}{2u}$; if $y=3$, and $u=1$, then $\frac{y^2-u^2}{2u}=4$, and $x+u=5$. It is evident that this problem admits of an infinite number of solutions.

For the resolution of such kind of problems, see Saunderson's Algebra, vol. ii. book 6.

DIOPTRICS,

THAT part of OPTICS which treats of the laws of refraction, and the effects which the refraction of light has in vision. The word is originally Greek, formed of δια per, "through," and οπτομαι *I see*.

As this and the other branches of OPTICS are fully treated under the collective name, we shall here, 1. Just give a summary of the general principles of the branch, in a few plain aphorisms, with some preliminary definitions; and, 2. Present our readers with a set of entertaining experiments illustrative of or dependent upon, those principles.

DEFINITIONS.

1. When a ray of light passing out of one medium into another of a different density, is turned from that straight line in which it would otherwise proceed into one of a different direction, it is said to be refracted. Plate CLXII. fig. 1. Thus the rays AB, AC, &c. by passing out of air into the glass BGC, are turned from their natural course into that of BF, CF, &c. and are therefore said to be refracted by the lens BGC.

2. Any spherical transparent glass, that converges or diverges the rays of light as they pass through it, is called a *lens*.

3. Of lenses there are five sorts: 1. A plane or single convex lens, which is plane on one side and convex on the other; as AZ, fig. 3. 2. A double convex lens, as B. 3. A plano-concave lens, that is, plane on one side and concave on the other, as C. 4. A double concave, as D. And, 5. A meniscus, which is convex on one side and concave on the other, as E.

4. The point C, round which the spherical surface of a lens, as AZ, is described, is called its *centre;* the line XY, drawn from that centre perpendicular to its two surfaces, is the axis; and the point V, to which the axis is drawn, is the vertex of that lens. Fig. 2.

5. When the rays of light that pass through a single or double convex lens are brought into their smallest compass, that point is the focus of the lens.

6. In optical instruments, that lens which is next the object is called the *object glass;* and that next the eye, the *eye-glass*.

7. The distance between the line AB and the perpendicular EF, is called the *angle of incidence;* and the distance between the line BD and the perpendicular EF, is called the *angle of refraction*. Fig. 3.

APHO-

Plate CLXII. Fig. 3.

APHORISMS.

1. A ray of light paſſing obliquely out of one medium into another that is denſer, will be refracted toward the perpendicular; as the ray A B, by paſſing out of air into glaſs, is refracted into B F, inclined to the perpendicular A F. On the contrary, a ray paſſing out of a denſer into a rarer medium, will be refracted from the perpendicular; as the ray B C, paſſing out of the glaſs G H into air, is refracted into D I.

2. The ſines of the angles of incidence and refraction, when the lines that contain them are all equal, will have a determinate proportion to each other, in the ſame mediums: which between air and water will be as 4 to 3; between air and glaſs, as 3 to 2, nearly; and in other mediums in proportion to their denſities.

3. Any object viewed through a glaſs, whoſe two ſurfaces are parallel, will appear of its natural ſhape and dimenſions, provided it be only of the ſize of the pupil of the eye, and the light proceeding from it be received directly through the glaſs by one eye only. In all other ſituations an alteration will be perceived not only in its apparent ſituation, but its dimenſions alſo. This alteration will be greater in proportion to the thickneſs of the glaſs, and the obliquity of the rays; in general, it is ſo ſmall as to be overlooked.

4. All the rays of light which fall upon a convex lens, whether parallel, converging, or diverging to a certain degree, will be made to meet in a focus on the other ſide; but if they diverge exceſſively, they will not do ſo. Thus if rays diverge from a point placed before the glaſs, at the focal diſtance from it, they will become parallel after paſſing through it; and if the point from which they proceed be nearer the glaſs than its focal diſtance, they will ſtill continue to diverge, though in a leſs degree than before.

5. When parallel rays fall upon a concave lens, they will be made to diverge after paſſing through it. If they are diverging already before they fall upon the glaſs, they will diverge more after paſſing through it; or even if they are converging to a certain degree, they will diverge upon paſſing through a concave lens; but if the convergence is very great, they will converge after paſſing through the glaſs, though to a more diſtant point than that at which they would otherwiſe have met.

6. When an object is viewed through two convex lenſes, its apparent diameter ought to be to its real one as the diſtance of the focus of the object-glaſs is to that of the eye-glaſs; but by reaſon of the aberration of the rays of light, the magnifying power will be ſomewhat greater or leſs in proportion to the diameter of the object.

By theſe aphoriſms we are enabled to account for the various effects of dioptric machines, as refracting teleſcopes, microſcopes, the camera obſcura, &c. See Optics.

ENTERTAINING EXPERIMENTS.

I. *Optical Illuſions.*

Fig. 4. On the bottom of the veſſel ABCD, place three pieces of money, as a ſhilling, a half-crown, and crown; the firſt at E, the ſecond at E, and the laſt at G. Then place a perſon at H, where he can ſee no further into the veſſel than I: and tell him, that by pouring water into the veſſel you will make him ſee three different pieces of money; bidding him obſerve carefully whether any money goes in with the water. Plate CLXII.

Here you muſt obſerve to pour in the water very gently, or contrive to fix the pieces, that they may not move out of their places by its agitation.

When the water comes up to K, the piece at E will become viſible; when it comes up to L, the pieces at E and F will appear; and when it riſes to M, all the three pieces will be viſible.

From what has been ſaid of the refraction of light, the cauſe of this phenomenon will be evident: for while the veſſel is empty, the ray HI will naturaly proceed in a ſtraight line: but in proportion as it becomes immerſed in water, it will be neceſſarily refracted into the ſeveral directions NE, OF, PG, and conſequently the ſeveral pieces muſt become viſible.

II. *Optical Augmentation.*

Take a large drinking glaſs of a conical figure, that is ſmall at bottom and wide at top; in which put a ſhilling, and fill the glaſs about half full with water: then place a plate on the top of it, and turn it quickly over, that the water may not get out. You will then ſee on the plate, a piece of the ſize of a half crown; and ſomewhat higher up, another piece of the ſize of a ſhilling.

This phenomenon ariſes from ſeeing the piece thro' the conical ſurface of the water at the ſide of the glaſs, and through the flat ſurface at the top of the water at the ſame time: for the conical ſurface dilates the rays, and makes the piece appear larger; but by the flat ſurface the rays are only refracted, by which the piece is ſeen higher up in the glaſs, but ſtill of its natural ſize. That this is the cauſe will be further evident by filling the glaſs with water; for as the ſhilling cannot be then ſeen from the top, the large piece only will be viſible.

III. *Optical Subtraction.*

Against the wainſcot of a room fix three ſmall pieces of paper, as A, B, C, at the height of your eye; and placing yourſelf directly before them, ſhut your right eye and look at them with the left; when you will ſee only two of thoſe papers, ſuppoſe A and B; but altering the poſition of your eye, you will then ſee the third and one of the firſt, ſuppoſe A; and by altering your poſition a ſecond time, you will ſee B and C; but never all three of them together. Fig. 5.

The cauſe of this phenomenon is, that one of the three pencils of rays that come from theſe objects, falls conſtantly on the optic nerve at D; whereas to produce diſtinct viſion, it is neceſſary that the rays of light fall on ſome part of the retina E, F, G, H. We ſee by this experiment, one of the uſes of having two eyes; for he that has one only, can never ſee three objects placed in this poſition, nor all the parts of one object of the ſame extent, without altering the ſituation of his eye.

IV. *Alternate Illuſion.*

With a convex lens of about an inch focus, look

atten

Plate CLXII. attentively at a ſilver ſeal, on which a cipher is engraved. It will at firſt appear cut in, as to the naked eye; but if you continue to obſerve it ſome time, without changing your ſituation, it will ſeem to be in relief, and the lights and ſhades will appear the ſame as they did before. If you regard it with the ſame attention ſtill longer, it will again appear to be engraved: and ſo on alternately.

If you look off the ſeal for a few moments, when you view it again, inſtead of ſeeing it, as at firſt, engraved, it will appear in relief. If, while you are turned toward the light, you ſuddenly incline the ſeal, while you continue to regard it, thoſe parts that ſeemed to be engraved will immediately appear in relief: and if, when you are regarding theſe ſeeming prominent parts, you turn yourſelf ſo that the light may fall on the right hand, you will ſee the ſhadows on the ſame ſide from whence the light comes, which will appear not a little extraordinary. In like manner the ſhadows will appear on the left, if the light fall on that ſide. If, inſtead of a ſeal, you look at a piece of money, theſe alterations will not be viſible, in whatever ſituation you place yourſelf.

It has been ſuſpected that this illuſion ariſes from the ſituation of the light: and in fact, "I have obſerved (ſays M. Guyot, from whom this article is taken), that when I have viewed it with a candle on the right, it has appeared engraved; but by changing the light to the left ſide, it has immediately appeared in relief." It ſtill, however, remains to be explained, why we ſee it alternately hollow and prominent, without changing either the ſituation or the light. Perhaps it is in the ſight itſelf that we muſt look for the cauſe of this phenomenon; and this ſeems the more probable, as all theſe appearances are not diſcernible by all perſons.

Mr William Jones of Holborn, has remarked to us, that this illuſion is ſtill more extraordinary and permanent, when you look at a cavity in a ſeal or other object through the three eye-glaſſes of a common four glaſs refracting teleſcope: all cavities viewed thro' theſe glaſſes appear conſtantly reliefs, in almoſt all ſituations of the light you ſee them with.

V. *The Dioptrical Paradox.*

A NEW and curious optical, or what may be called properly a *dioptrical*, deception, has been made by Mr W. Jones. Its effect is, that a print, or an ornamented drawing, with any object, ſuch as an *ace of diamonds*, &c. in the centre F, will be ſeen as the *ace of clubs* when it is placed in the machine ABDC, and viewed through a ſingle glaſs only contained in the tube E. The conſtruction of this machine is truly ſimple. The glaſs in the tube F, which brings about this ſurpriſing change, is ſomewhat on the principle of the common multiplying glaſs, as repreſented at G, which by the number of its inclined ſurfaces, and from the refractive power of the rays proceeding from the objects placed before it, ſhows it in a multiplied ſtate or quantity. Its only difference is, that the ſides of this glaſs are flat, and diverge upwards from the baſe to a point in the axis of the glaſs like a cone: the number of the ſides is ſix; and each ſide, from its angular poſition to the eye, has the property of refracting from the border of the print F ſuch a portion of it (deſignedly there placed), as will make a part in the compoſition of the figure to be repreſented: for the hexagonal and conical figure of this glaſs prevents any ſight of the ace of diamonds in the centre being ſeen; conſequently the ace of clubs being previouſly and mechanically drawn in the circle of refraction in ſix different parts of the border, at 1, 2, 3, 4, 5, 6, and artfully diſguiſed in the ornamental border by blending them with it, the glaſs in the tube at E will change the appearance of the ace of diamonds F into the ace of clubs G. In the ſame manner may other prints undergo ſimilar changes, according to the will of an ingenious draughtſman who may deſign them. The figure of the glaſs is clearly ſhown at H.

Fig. 6.

VI. *The Camera Obſcura, or Dark Chamber.*

MAKE a circular hole in the ſhutter of a window, from whence there is a proſpect of the fields, or any other object not too near; and in this hole place a convex glaſs, either double or ſingle, whoſe focus is at the diſtance of five or ſix feet (A). Take care that no light enter the room but by this glaſs: at a diſtance from it, equal to that of its focus, place a paſteboard, covered with the whiteſt paper; which ſhould have a black border, to prevent any of the ſide rays from diſturbing the picture. Let it be two feet and a half long, and 18 or 20 inches high: bend the length of it inwards, to the form of part of a circle, whoſe diameter is equal to double the focal diſtance of the glaſs. Then fix it on a frame of the ſame figure, and put it on a moveable foot, that it may be eaſily fixed at that exact diſtance from the glaſs where the objects paint themſelves to the greateſt perfection. When it is thus placed, all the objects that are in the front of the window will be painted on the paper, in an inverted poſition (B), with the greateſt regularity and in the moſt natural colours.

(A) The diſtance ſhould not be leſs than three feet; for if it be, the images will be too ſmall, and there will not be ſufficient room for the ſpectators to ſtand conveniently. On the other hand, the focus ſhould never be more than 15 or 20 feet, for then the images will be obſcure, and the colouring faint. The beſt diſtance is from 6 to 12 feet.

(B) This inverted poſition of the images may be deemed an imperfection, but it is eaſily remedied: for if you ſtand above the board on which they are received, and look down on it, they will appear in their natural poſition: or if you ſtand before it, and, placing a common mirror againſt your breaſt in an oblique direction, look down in it, you will there ſee the images erect, and they will receive an additional luſtre from the reflection of the glaſs; or place two lenſes, in a tube that draws out; or, laſtly, if you place a large concave mirror at a proper diſtance before the picture, it will appear before the mirror, in the air, and in an erect poſition.

Plate CLXII.

If you place a moveable mirror without the window; by turning it more or lefs, you will have on the paper all the objects that are on each fide of the window (c).

If inftead of placing the mirror without the window you place it in the room, and above the hole (which muft then be made near the top of the fhutter), you may receive the reprefentation on a paper placed horizontally on a table; and draw, at your leifure, all the objects that are there painted.

Nothing can be more pleafing than this experiment, efpecially when the objects are ftrongly enlightened by the fun: and not only land-profpects, but a fea-port, when the water is fomewhat agitated, or at the fetting of the fun, prefents a very delightful appearance.

This reprefentation affords the moft perfect model for painters, as well for the tone of colours, as that degradation of fhades, occafioned by the interpofition of the air, which has been fo juftly expreffed by fome modern painters.

It is neceffary that the paper have a circular form; for otherwife, when the centre of it was in the focus of the glafs, the two fides would be beyond it, and confequently the images would be confufed. If the frame were contrived of a fpherical figure, and the glafs were in its centre, the reprefentation would be ftill more accurate. If the object without be at the diftance of twice the focal length of the glafs, the image in the room will be of the fame magnitude with the object.

The lights, fhades, and colours, in the camera obfcura, appear not only juft, but, by the images being reduced to a fmaller compafs, much ftronger than in nature. Add to this, that thefe pictures exceed all others, by reprefenting the motion of the feveral objects: thus we fee the animals walk, run, or fly; the clouds float in the air; the leaves quiver; the waves roll, &c.; and all in ftrict conformity to the laws of nature. The beft fituation for a dark chamber is directly north, and the beft time of the day is noon.

VII. *To fhow the Spots on the Sun's Difk, by its Image in the Camera Obfcura.*

Put the object-glafs of a 10 or 12 feet telefcope into the fcioptric ball, and turn it about till it be directly oppofite to the fun (D). Then place the pafteboard, mentioned in the laft experiment, in the focus of the lens; and you will fee a clear bright image of the fun, of about an inch diameter, in which the fpots on the fun's furface will be exactly defcribed.

As this image is too bright to be feen with pleafure by the naked eye, you may view it through a lens whofe focus is at fix or eight inches diftance; which at the fame time that it prevents the light from being offenfive, will, by magnifying both the image and the fpots, make them appear to greater advantage.

Plate CLXII.

VIII. *To magnify fmall Objects by means of the Sun's Rays let into a Dark Chamber.*

Let the rays of light that pafs through the lens in the fhutter be thrown on a large concave mirror, properly fixed in a frame. Then take a flip or thin plate of glafs; and fticking any fmall object on it, hold it in the incident rays, at a little more than the focal diftance from the mirror; and you will fee, on the oppofite wall, amidft the reflected rays, the image of that object, very large, and extremely clear and bright. This experiment never fails to give the fpectator the higheft fatisfaction.

IX. *The Portable Camera Obfcura.*

The great pleafure produced by the camera obfcura in the common form, has excited feveral to render it more univerfally ufeful by making it portable; eafily fixed on any fpot, and adapted to every profpect. We fhall not here examine the merits of the various forts that have been invented; but content ourfelves with defcribing two of late improved conftructions, as made and fold by the opticians of the prefent time, and that appear in their conftruction the moft convenient and advantageous of any yet contrived.

The pocket or portable camera obfcura, with a drawer to draw out in the front, is reprefented in fig. 7. Fig. 7.
The images of the objects before the inftrument are reflected upon a glafs ground rough on its upper fide, and that is placed at top of the hinder part of the box, under the moveable cover reprefented in the figure. The images reprefented thereon will afford a moft beautiful and perfect piece of perfpective or landfcape of whatever is before the camera, and more particularly fo if the fun fhines upon the objects. The outlines of them may eafily be traced on the glafs by a black-lead pencil. There is fometimes a fcale of proportions placed in the upper furface of the drawer, by which any particular building or other object may be drawn in a given proportion or magnitude, and according to the figures inferted on the fcale, which are adapted to the focus or foci of the lenfes made ufe of in the camera. The glaffes that are made ufe of in this camera are only three, and are reprefented in fig. 8. The convex Fig. 8.
glafs A is placed in the front of the drawer of the camera, and is of a focus agreeable to the length of the box. The mirror CE reclines in the box in an angle of 45 degrees from a perpendicular fituation. The rays flowing from the object F through the convex glafs A to the plane mirror CE, will be reflected from it, and meet in points on the glafs placed horizontally

(c) There is another method of making the dark chamber; which is by a fcioptric ball, that is, a ball of wood, through which a hole is made, in which hole a lens is fixed: this ball is placed in a wooden frame, in which it turns freely round. The frame is fixed to the hole in the fhutter; and the ball, by turning about, anfwers, in great part, the ufe of the mirror on the outfide of the window. If the hole in the window be no bigger than a pea, the objects will be reprefented without any lens, though by no means fo diftinctly, or with fuch vivid colours.

(D) When the fun is directly oppofite to the hole, the lens will itfelf be fufficient: or by means of the mirror on the outfide of the window, as in Experiment VI. the lens will anfwer the purpofe at any time.

Plate CLXII. zontally in the direction CD, and will form thereo the aforementioned images. If on this glass an oiled paper or any other transparent substance be placed, the images will be clearly represented, and sufficiently so to delineate them by a black lead pencil or crayon. Instead of the glass CD, or sometimes underneath it, is often placed a double convex lens of a focus somewhat shorter than the length of the box: this alteration considerably brightens the appearance of the images, and renders them as vivid as the objects themselves, though not quite so accurate in their contours or outlines as by the preceding method.

Another kind of portable camera obscura, is where the images are formed upon white paper, and the several parts of the camera fold up out of a box shaped like a book or chest. This way of the images being formed on paper is a much preferable one to the preceding method, and admits of their being traced on the paper with the utmost readiness. This instrument, as open out of its case and ready for use, is represented in fig. 9. The front and sides fold up to the height of about two feet from the case EFG, by means of hinges placed at P, H, &c. The head ABCD, about five inches square and high, containing the mirror L and the convex lens beneath it, fits on at CD, and the inner square tube of it is moved up and down by rack-work and a pinion NM. This motion serves to adjust the convex lens *d* to its proper focal distance from the white paper placed within side at the bottom of the box EFG, so that the images may be formed with the greatest possible distinctness. In tracing these images the face is applied close to the hole in the front at K, and the hand in the sleeve in the front at the bottom of FG. When the sides and front are unhooked and folded down, they all lie close in the box EFG, and the lid O folds down as a top on them close, and the box remains then the size of a common folio book, and is covered with calf leather and lettered on the back in perfect imitation of one.

Fig. 9.

By the diagonal position of a plane mirror the curious opera-glass is constructed, by which any person may be viewed in a theatre or public company, and yet know nothing of it. It consists only in placing a concave glass near the plane mirror, in the end of a short round tube, and a covex glass in a hole in the side of the tube. Then holding the end of the tube with the glass to the eye, all objects next to the hole in the side will be reflected so as to appear in a direct line forward, or in a position at right angles to the person's situation who is looked at. Plane glasses instead of a concave and convex may be used; but in this case there will be no magnitude of the object, but it will appear brighter. It is called by opticians the *diagonal opera-glass*.

X. *The Magic Lantern.*

This very remarkable machine, which is now known all over the world, caused great astonishment at its origin. It is still beheld with pleasing admiration; and the spectator very frequently contents himself with wondering at its effects, without endeavouring to investigate their cause. The invention of this ingenious illusion is attributed to the celebrated P. Kercher, who has published on various sciences, works equally learned, curious, and entertaining. Its design is to represent at large, on a cloth or board, placed in the dark, the images of small objects, painted with transparent colours on plates of glass. Plate CLXII.

The construction is as follows. Let ABCD be the side of a tin box, eight inches high, eight inches long, and ten broad (or any other similar dimensions), the top of which must have a funnel, with a cover, as represented in fig. 11; which at the same time it gives a passage to the smoke, prevents the light from coming out of the box. In the middle of the bottom of the box must be placed below a tin lamp E, which is to be moveable. It should have three or four lights, which must be at the height of the centre of the glasses in the tubes N and O. In the largest of these tubes must be placed a glass semiglobular lens N, about four inches diameter; and in the smaller one a double convex lens o, about $2\frac{1}{4}$ inches diameter, and six inches focus, the length of the tubes holding them about $4\frac{1}{2}$ inches each: the inner tube containing the small lens o must be a sliding one, in order to adjust it at a proper distance from the pointed sliders, so that the objects thereon may be distinctly represented on the cloth or white wall. A slit or opening between the glass N and the front side BGDH of the box must be made large enough to admit the sliders to be passed through, (as in fig. 11.) The clearness of the light, and the objects upon the cloth, will depend much upon the light of the lamp: it will therefore be proved best, to place, instead of the common lamp E, a kind of the new or Argant's Patent Lamp, which will be found considerably to improve the effect of the lantern by its superior strength of light. Fig. 10.

From the construction of this lantern it is evident, that when the glass sliders, with the painted figures, are placed in the groove or slit in the lantern for that purpose, and the room darkened, a quantity of light from the lamp E will be collected by the lens N, and refracted upon the cloth placed opposite; and that by moving the sliding tube containing the small lens o gradually in or out as occasion may require, this lens will form images of the figures on the sliders in their distinct colours and proportions with the appearance of life itself, and of any size from six inches to 7 feet according to the distance of the lantern from the cloth. The lantern, with one of the sliders ready for use, is clearly represented in fig. 11. By the aid of the new patent lamp aforementioned, considerable useful improvements are made to this lantern. Mr Jones optician of Holborn has contrived an apparatus to be applied to it, that converts it into a microscope by night; and it shows all the variety of transparent and many of the opaque objects magnified upon a cloth or skreen opposite, similar to the figures abovementioned, but not in so large a degree; about one or two feet diameter is the utmost that can at present be obtained.

Method of Painting the Glasses for the Lantern. Draw on the paper the subject you desire to paint, and fix it at each end to the glass. Provide a varnish with which you have mixed some black paint: and with a fine pencil draw on the other side of the glass, with very light touches, the design drawn on the paper. If you are desirous of making the painting as perfect as possible, you should draw some of the outlines in their proper

Plate CLXII. proper colours, provided they are the strongest tints of these colours that are used. When the outlines are dry, you colour the figures with their proper tints or degradations. Transparent colours are most proper for this purpose, such as carmine, lake, Prussian blue, verdigris, &c. and these must be tempered with a strong white varnish, to prevent their peeling off. You are then to shade them with black mixed with the same varnish or with bistre, as you find convenient. You may also leave strong lights in some parts, without any colours, in order to produce a more striking effect. Observe in particular, not to use more than four or five colours, such as blue, red, green, and yellow. You should employ, however, a great variety of tints, to give your painting a more natural air; without which they will represent vulgar objects, which are by no means the more pleasing because they are gawdy.

When the lamp in this lantern is lighted, and, by drawing out the tube to a proper length, the figures painted on the glass appear bright and well defined, the spectator cannot fail of being highly entertained by the succession of natural or grotesque figures that are painted on the glasses. This piece of optics may be rendered much more amusing, and at the same time more marvellous, by preparing figures to which different natural motions may be given (E), which every one may perform according to his own taste; either by movements in the figures themselves, or by painting the subject on two glasses, and passing them at the same time through the groove, as will be seen in the next experiment.

XI. *To represent a Tempest by the Magic Lantern.*

Provide two plates of glass, whose frames are so thin that they may both pass freely through the slit or groove of the common magic lantern at the same time.

On one of these glasses you are to paint the appearance of the sea, from the slightest agitation to the most violent commotion. Representing from A to B a calm; from B. to C. a small agitation, with some clouds; and so on to F and G, which should exhibit a furious storm. Observe, that these representations are not to be distinct, but run into each other, that they may form a natural gradation: remember also, that great part of the effect depends on the perfection of the painting, and the picturesque appearance of the design. Fig. 12.

On the other glass you are to paint vessels of different forms and dimensions, and in different directions, together with the appearance of clouds in the tempestuous parts. Fig. 13.

You are then to pass the glass slowly through the groove; and when you come to that part where the storm begins, you are to move the glass gently up and down, which will give it the appearance of a sea that begins to be agitated: and so increase the motion till you come to the height of the storm. At the same time you are to introduce the other glass with the ships, and moving that in like manner, you will have a natural representation of the sea, and of ships in a calm and in a storm. As you draw the glasses slowly back the tempest will seem to subside, the sky grow clear, and the ships glide gently over the waves.—By means of two glasses disposed in this manner you may likewise represent a battle, or sea-fight, and numberless other subjects, that every one will contrive according to his own taste. They may also be made to represent some remarkable or ludicrous action between different persons, and many other amusements that a lively imagination will easily suggest. Plate CLXII.

XII. *The Nebulous Magic Lantern.*

The light of the magic lantern, and the colour of images, may not only be painted on cloth, but also reflected by a cloud of smoke.

Provide a box of wood or pasteboard (fig. 14.) of about four feet high, and of seven or eight inches square at bottom, but diminishing as it ascends, so that its aperture at top is but six inches long, and half an inch wide. At the bottom of this box there must be a door Fig. 14. that shuts quite close, by which you are to place in the box a chafing-dish with hot coals, on which is to be thrown incense, whose smoke goes out in a cloud at the top of the box. It is on this cloud that you are to throw the light that comes out of the lantern, and which you bring into a smaller compass by drawing out the moveable tube. The common figures will here serve. It is remarkable in this representation, that the motion of the smoke does not at all change the figures; which appear so conspicuous, that the spectator thinks he can grasp them with his hand.

Note, In this experiment some of the rays passing through the smoke, the representation will be much less vivid than on the cloth; and if care be not taken to reduce the light to its smallest focus, it will be still more imperfect.

XIII. *To produce the Appearance of a Phantom upon a Pedestal placed on the middle of a Table.*

Inclose a common small magic lantern in a box ABCD, that is large enough to contain also an in- Fig. 15. clined mirror M; which must be moveable, that it may reflect the cone of light thrown on it by the lantern, in such a manner that it may pass out at the aperture made in the top of the box. There should be a flap with hinges to cover the opening, that the inside of the box may not be seen when the experiment is making. This aperture should likewise be oval, and of a size adapted to the cone of light that is to pass thro' it. There must be holes made in that part of the box which is over the lantern, to let out the smoke; and over that part must be placed a chafing-dish of an oblong figure, and large enough to hold several lighted coals. This chafing-dish may be inclosed in a painted tin box of about a foot high, and with an aperture at top something like fig. 14. It should stand on four short feet to give room for the smoke of the lamp to pass out. There must also be a glass that will ascend and descend at pleasure in a vertical groove *ab*. To this glass let there be fixed a cord, that, going over a pulley

(E) There are in the Philosophical Essays of M. Muschenbroek, different methods of performing all these various movements, by some mechanical contrivances that are not difficult to execute.

Plate CLXII. ley *c*, passes out of the box at the side CD, by which the glass may be drawn up, and will descend by its own weight. On this glass may be painted a spectre, or any other more pleasing figure. Observe that the figures must be contracted in drawing, as the cloud of smoke does not cut the cone of light at right angles, and therefore the figures will appear longer than they do on the glass.

After you have lighted the lamp in the lantern, and put the mirror in a proper direction, you place the box or pedestal ABCD on a table; and putting the chafing-dish in it, throw some incense in powder on the coals. You then open a trap-door, and let down the glass slowly; and when you perceive the smoke diminish you draw up the glass, that the figure may disappear, and shut the trap-door. This appearance will occasion no small surprise, as the spectre will seem to rise gradually out of the pedestal, and on drawing up the glass will disappear in an instant. Observe, that when you exhibit this experiment, you must put out all the lights in the room; and the box should be placed on a high table, that the spectators may not perceive the aperture by which the light comes out. Tho' we have mentioned a small magic lantern, yet the whole apparatus may be so enlarged, that the phantom may appear of a formidable size.

XIV. *The Magic Theatre.*

By making some few additions to the magic lantern with the square tube, used in Experiment X. various scenes, characters, and decorations of a theatre may be represented in a lively manner. In this experiment it is quite necessary to make the lantern much larger than common, that the objects painted on the glasses, being of a larger size, may be represented with greater precision, and consequently their several characters more strongly marked.

Fig. 16. Let there be made a wooden box ABCD, a foot and a half long, 15 inches high, and 10 wide. Let it be placed on a stand EF, that must go round it, and by which it may be fixed with two screws to a table. Place over it a tin cover, as in the common lantern. Make an opening in its two narrowest sides; in one of which place the tube H, and in the other the tube I: let each of them be six inches wide, and five inches high: in each of these tubes place another that is moveable, in order to bring the glasses, or concave mirror, that are contained in them, to a proper distance. In the middle of the bottom of this box place a tin lamp M; which must be moveable in a groove, that it may be placed at a proper distance with regard to the glasses and mirror: this lamp should have five or six lights, each of them about an inch long. At the beginning of the tube H, toward the part N, make an opening of an inch wide, which must cross it laterally: another of three quarters of an inch, that must cross it vertically, and be nearer the box than the first; and a third of half an inch, that must be before the first. The opening made laterally must have three or four grooves, the second two, and the third one: that different subjects of figures and decorations may be passed, either sidewise, ascending or descending, so that the scenes of a theatre may be the more exactly imitated (F). Inclose these grooves between two convex rectangular glasses, of six inches long, and five inches high, and of about 20 inches focus; one of which must be placed at O, and the other toward P. Have another tube Q, of about a foot long, which must enter that marked H; and at its outward extremity place a lens of about 15 inches focus. There must also be a third tube R, four inches long, into which that marked I is to enter: to the exterior end of this adjust a concave mirror, whose focus must be at seven or eight inches from its reflecting surface. Plate CLXII.

The magic lantern being thus adjusted, nothing more is necessary than to provide glasses, painted with such subjects as you would represent, according to the grooves they are to enter. The lamp is then to be lighted; and placing a glass in one of the grooves, you draw out the moveable tubes till the object paints itself on a cloth to the most advantage: by which you determine the distance of the lantern and the size of the image. You then make a hole in the partition of that size, and fix in it a plate of clear glass, over which you paste a very thin paper, which must be varnished, that it may be as transparent as possible.

On this paper are to be exhibited the images of all those objects, that, by passing successively through the grooves, are to represent a theatric entertainment. The exhibition will be very agreeable; because the magic lantern being concealed behind the partition, the cause of the illusion cannot by any means be discovered.

In order to show more clearly in what manner a subject of this sort should be painted, and the glasses disposed, we will here make choice of the siege of Troy for a theatric subject; in which will be found all the incidents necessary to the exhibition of any other subject whatever.—In the first act, the theatre may represent, on one side, the ramparts of Troy; toward the back-part, the Grecian camp; and at a further distance the sea, and the isle of Tenedos. We will suppose the time to be that when the Greeks feigned to raise the siege; and embarked, leaving behind them the wooden horse, in which were contained the Grecian soldiers.—On a glass, therefore, of the same width with the aperture made in the side AC of the box, you are to paint a deep blue curtain, lightly charged with ornaments quite transparent. This glass is to be placed in the first vertical groove; so that by letting it gently down, its image may appear to rise in the same manner as the curtain of a theatre. All the glasses that are to ascend or descend must be bordered with thin pieces of wood, and so exactly fill the grooves, that they may not slide down of themselves.—You must have several glasses of a proper size to pass through the horizontal grooves, and of different lengths according to the extent of the subject. You may paint, on the first, the walls of Troy. On the second, the Grecian camp. On the third, the sea, the isle of Tenedos, and a serene sky. On the fourth, the Grecian troops

(F) In the decorations, the clouds and the palaces of the gods should descend; caves and infernal palaces should ascend; earthly palaces, gardens, &c. enter at the sides.

Plate CLXII.

Plate CLXII.

troops by detached figures. On the fifth, other troops, diſpoſed in battalions, and placed at a diſtance. On the ſixth, divers veſſels, which as the glaſs advances in the groove diminiſh in ſize. On the ſeventh, the wooden horſe and Sinon. On the eighth, Trojan men and women.

Theſe glaſſes being properly painted, you place in the horizontal grooves the firſt, ſecond, third, and fourth. Then draw up the curtain, by letting down the glaſs on which it is painted, and draw away gently the fourth glaſs, and after that the ſecond; then advance very gently the fifth, that repreſents the embarkment, and paſs it quite through. Next paſs, the oppoſite way, the ſixth, which repreſents the Grecian fleet. The objects painted on the fourth, fifth, and ſixth, quite diſappearing, you are to advance the ſeventh, on which is painted the wooden horſe; and at the ſame time the eighth, where the Trojans will appear to draw the horſe into the city. The curtain is then to be let down, that you may withdraw the ſcenes of the firſt act, and place in the grooves thoſe that are to compoſe the ſecond.—In the ſecond act may be repreſented the interior part of the city of Troy: on one ſide may be ſeen the wooden horſe, and in the back part the temple of Pallas. The glaſſes for this act may be painted in the following manner. On the firſt may be palaces and houſes, repreſenting the inſide of a city. On the ſecond, the temple of Pallas in the centre, with a clear night and the moon. In the front may be ſeen the wooden horſe, that the Trojans have placed near the temple of Pallas. On the third, a troop of Greeks, with Sinon at their head, who are going to open the gates of the city to the Grecians. On the fourth, different troops of armed Greeks; painted on a long glaſs, to afford variety. On the fifth, ſeveral troops of Trojans. On the ſixth, various appearances of fire and ſmoke, ſo diſpoſed, that, this glaſs being drawn up above the others, the objects painted on the firſt glaſs may appear in a conflagration.

Before you draw up the curtain, you ſhould place the firſt and ſecond glaſſes. You then paſs the whole third glaſs ſlowly; a little after, the fourth, on which are painted the different bodies of armed Greeks; and at the ſame time, from the oppoſite ſide, the ſixth glaſs, that repreſents the Trojan troops; obſerving to move them ſlowly both in advancing and retreating, to imitate a combat (G). Then draw up, by degrees, the ſixth, on which are painted the fire, flame, and ſmoke, ſo that the palaces and houſes painted on the firſt glaſs may appear to take fire gradually, and at laſt preſent a general conflagration. After having repreſented theſe incidents with the greateſt attention, you let fall the curtain to prepare for the third act. In this may be repreſented the inſide of Priam's palace; where is ſeen an altar, round which ſeveral Trojan princeſſes appear, who have fled thither for ſafety. On the firſt glaſs may be painted the palace. On the ſecond, a view of the back part of the palace, with the altar. On the third, Priam with ſeveral Trojan men and women. On the fourth, Pyrrhus and a troop of Greeks. On the fifth, the ſame actors, with the palace in flames. On the ſixth, a conflagration.—The two firſt glaſſes which are to be drawn up, ſhould be placed before you raiſe the curtain. Then paſs the third; next advance the fourth; which being drawn up, diſcovers on the fifth the palace in flames; then drawing up the ſixth, let down the firſt, that the palace may appear entirely deſtroyed by the conflagration.

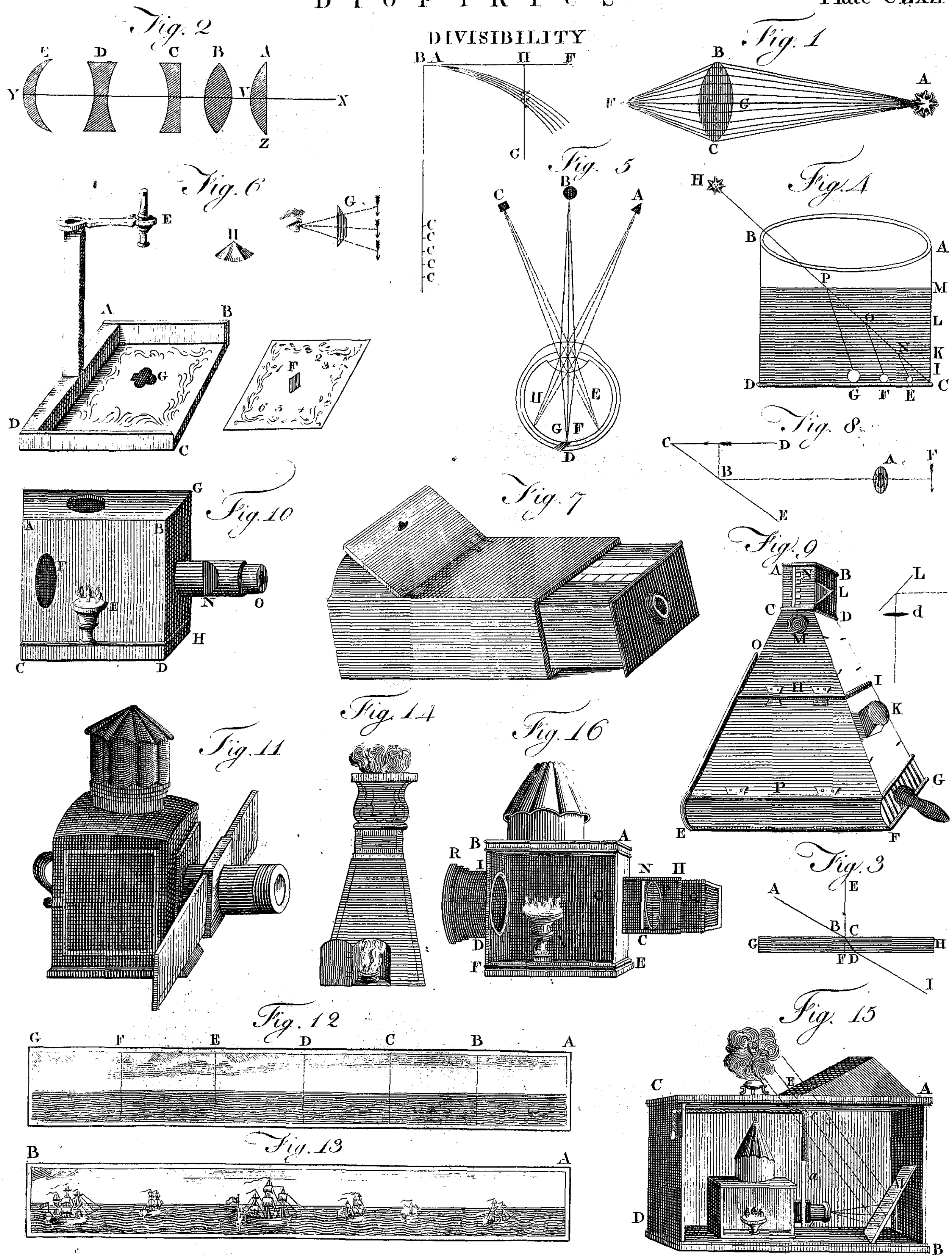
The fourth act may repreſent the environs of Troy, with a diſtant proſpect of the ſea. The firſt and third glaſſes of the firſt act may be here uſed; to which may be added a third, repreſenting Æneas bearing his father Anchiſes, followed by his ſon Iulus and ſome Trojans. With this glaſs may be repreſented the flight of the Trojans and the embarkment of Æneas; with another glaſs on which are painted certain veſſels.—To this act the following ſcenes may be added: cave of Æolus; the back part of the cave; Æolus; the winds; Juno in her chariot.

The fifth act ſhould repreſent the open ſea, with the fleet of Æneas ſailing for Italy. On the firſt glaſs muſt be painted the ſea, as in the eleventh Experiment, or elſe the waves ſhould be imitated by another glaſs under the firſt. On the ſecond, the Trojan fleet. On the third, Neptune in his car. On the fourth, the palace of Jupiter. On the fifth, the inſide of the palace; the gods aſſembled in council, with Venus obtaining leave of Jupiter for Æneas to land in Italy.—After having placed the firſt glaſs, that repreſents a calm ſea, the curtain is raiſed, and the ſecond ſcene is advanced, which contains the Trojan fleet. The firſt is then brought forward, to repreſent a violent tempeſt; then raiſing the third glaſs, Neptune appears, who commands the waves to be ſtill, which is done by making the tempeſt ſubſide by degrees. The fleet then advances, and paſſes over the whole theatre: preſently after the fourth and fifth ſcenes deſcend, that repreſent Olympus, and finiſh the exhibition.

Note, We muſt here repeat, that if you would repreſent a ſubject of this ſort to advantage, it is quite neceſſary that the glaſſes be well painted; and thoſe that are to be in front ſhould be in ſtronger and more opaque colours, that the images of thoſe behind may not appear mixed with them, which will be the caſe if they are all equally tranſparent. The glaſſes ſhould alſo be of different lengths; that ſome being placed before the others are drawn away, their extremities may not be perceived.

The larger theſe ſubjects are repreſented, the better effect they will have: the front of the theatre ſhould appear to be about three feet wide; and if ſome parts of the figures were moveable, it would ſtill add to the variety of the entertainment.

(G) He that moves the glaſſes, ſeeing the effect they produce, is the better able to render the repreſentation as natural as poſſible



Scot Philad.a

DIOSCOREA, in botany: A genus of the hexandria order, belonging to the diœcia claſs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. The male calyx is ſexpartite; there is no corolla: The female calyx is ſexpartite; no corolla; three ſtyles; the capſule trilocular and compreſſed; and there are two membranaceous ſeeds. There are eight ſpecies, of which the only remarkable one is the bulbifera, or yam. This hath triangular winged ſtalks, which trail upon the ground, and extend a great way: theſe frequently put out roots from their joints as they lie upon the ground, by which the plants are multiplied. The roots are eaten by the inhabitants of both the Indies; and are particularly ſerviceable in the Weſt India iſlands, where they make the greateſt part of the negroes food. The plant is ſuppoſed to have been brought from the Eaſt to the Weſt Indies; for it has never been obſerved to grow wild in any part of America; but in the iſland of Ceyon, and on the coaſt of Malabar, it grows in the woods, and there are in thoſe places a great variety of ſorts. It is propagated by cutting the root in pieces, obſerving to preſerve an eye in each, as is practiſed in planting potatoes. One plant will produce three or four large roots. The ſkin of theſe roots is pretty thick, rough, unequal, covered with many ſtringy fibres or filaments, and of a violet colour approaching to black. The inſide is white, and of the conſiſtence of red beet. It reſembles the potatoe in its mealineſs, but is of a cloſer texture. When raw the yams are viſcous, and clammy: when roaſted or boiled, they afford very nouriſhing food; and are often preferred to bread by the inhabitants of the Weſt Indies, on account of their lightneſs and facility of digeſtion. When firſt dug out of the ground, the roots are placed in the ſun to dry: after which, they are either put into ſand, dry garrets, or caſks; where, if kept from moiſture, they may be preſerved whole years, without being ſpoiled or diminiſhed in their goodneſs. The root commonly weighs two or three pounds; tho' ſome yams have been found upwards of 20 pounds weight.

DIOSCORIDES, a phyſician of Cilicia, who lived, as ſome ſuppoſe, in the age of Nero. He was originally a ſoldier; but afterwards he applied himſelf to ſtudy, and wrote a book upon medicinal herbs.

DIOSCURIA Διοσκουρια, from Διος *Jupiter*, and κουροι *infants*), in antiquity, a feſtival in honour of the Διοσκουροι, or Caſtor and Pollux, who were reputed to be ſons of Jupiter. It was obſerved by the Cyreneans, but more eſpecially by the Spartans, whoſe country was honoured by the birth of theſe heroes. The ſolemnity was full of mirth, being a time wherein they ſhared plentifully of the gifts of Bacchus, and diverted themſelves with ſports, of which wreſtling matches always made a part.

DIOSMA, African spiræa: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The corolla is pentapetalous, the nectarium crown-ſhaped above the germen; there are five capſules coalited; the ſeeds hooded. There are nine ſpecies; of which the moſt remarkable are the hirſuta, with narrow hairy leaves; and the oppoſitifolia, with leaves placed in the form of a croſs. The firſt is a very handſome ſhrub, growing to the height of five or ſix feet: the ſtalks are of a fine coral colour: the leaves come out alternately on every ſide of the branches, and are narrow-pointed and hairy: the flowers are produced in ſmall cluſters at the end of the ſhoots, and are of a white colour. They are ſucceeded by ſtarry ſeed-veſſels having five corners; in each of which corners is a cell, containing one ſmooth, ſhining, oblong, black ſeed: theſe ſeed-veſſels abound with a reſin which emits a grateful ſcent, as doth alſo the whole plant.—The ſecond ſpecies riſes to the height of three or four feet: the branches are ſlender, and produced from the ſtem very irregularly: the leaves are placed croſs-ways; the flowers are produced at the ends of the branches, between the leaves: the plants continue a long time in flower, and make a fine appearance when they are intermixed with other exotics in the open air. Both ſpecies are propagated by cuttings; which may be planted during any of the ſummer-months in pots, and plunged into a moderate hot-bed, where they ſhould be ſhaded from the ſun, and frequently watered. In about two months they will have taken root; when each ſhould be tranſplanted into a ſmall pot where they are to remain; but during winter, like moſt other exotic plants, they muſt be preſerved in a green-houſe.

DIOSPOLIS (anc. geog.), a city of the Delta, or Lower Egypt; to the ſouth of the Buſiritic branch, before it divides into two.—Another of Bithynia, in the territory of Heraclea.—A third, called *Magna*, denoting Thebæ of the Higher Egypt.—A fourth, *Dioſpolis Parva*, the metropolis of the Nomos Dioſpolites of the Higher Egypt.—A fifth, *Dioſpolis* of Samaria, the ſame with Lydda.—A ſixth *Dioſpolis*, the ancient name of Laodicea of Phrygia on the Lycus.

DIOSPOLITES nomos (Ptolemy) a diviſion of Thebais or the Higher Egypt, to diſtinguiſh it from another of the Lower Egypt, or the Delta; to the ſouth of the Nomos Thinites, on the weſt ſide of the Nile.

DIOSPYROS, the Indian date-plum: A genus of the diœcia order, belonging to the polygamia claſs of plants; and in the natural method ranking under the 18th order, *Bicornes*. The calyx is hermaphrodite and quadrifid; the corolla urceolated and quadrifid; there are eight ſtamina; the ſtyle quadrifid; the berry octoſpermous: the male calyx, corolla and ſtamina, as in the former. There are two ſpecies. 1. The lotus, which is ſuppoſed to be a native of Africa, from whence it was tranſplanted into ſeveral parts of Italy, and alſo into the ſouth of France. The fruit of this tree is ſuppoſed to be the lotus with which Ulyſſes and his companions were enchanted, and which made thoſe who eat of it forget their country and relations: (See alſo Rhamnus.) In the warm parts of Europe this tree grows to the height of 30 feet. In the botanic garden at Padua, there is one very old tree which has been deſcribed by ſome of the former botantiſts under the title of *guaiacum patavinum*. This tree produces plenty of fruit every year; from the ſeeds of which many plants have been raiſed. 2. The Virginiana, pinſhamin, perſimon, or pitchumon plum, is a native of America, but particularly of Virginia and Carolina. The ſeeds of this ſort have been frequently exported to Britain, and the trees are common in many nurſeries about London. It riſes to the height of 12 or 14 feet; but generally divides into many irregular trunks

trunks near the ground, so that it is very rare to see a handsome tree of this sort. Though plenty of fruit is produced on these trees, it never comes to perfection in Britain. In America the inhabitants preserve the fruit till it is rotten, as is practised with medlars in England; when they are esteemed very pleasant. Both species are propagated by seeds: and the plants require to be treated tenderly while young; but when they are grown up, they resist the greatest cold of this country.

DIPHTHONG, in grammar, a double vowel, or the mixture of two vowels pronounced together, so as to make one syllable.

The Latins pronounced the two vowels in their diphthongs ae, or æ, oe or œ, much as we do; only that the one was heard much weaker than the other, tho' the division was made with all the delicacy imaginable. Diphthongs, with regard to the eyes, are distinguished from those with regard to the ears: In the former, either the particular sound of each vowel is heard in the pronunciation; or the sound of one of them is drowned; or, lastly, a new sound, different from either, results from both: the first of these only are real diphthongs, as being such both to the eye and ear. Diphthongs with regard to the ear are either formed of two vowels meeting in the same syllable, or whose sounds are severally heard; or of three vowels in the same syllable, which only afford two sounds in the pronunciation.

English diphthongs, with regard to the eye and ear, are *ai, au, ea, ee, oi, oo, ou*. Improper English diphthongs, with regard to the eye only, are *aa, ea, eo, eu, ie, ei, oa, oe, ue, ui*.

DIPLOE, in anatomy, the soft meditullium, or medullary substance, which lies between the two laminæ of the bones of the cranium. See ANATOMY, nº 11.

DIPLOMA, See DIPLOMATICS.

In a peculiar sense, it is used for an instrument or licence given by colleges, societies, &c. to a clergyman to exercise the ministerial function, or to a physician to practise the profession, &c. after passing examination, or admitting him to a degree.

Bielfield's Elements.

DIPLOMATICS, the science of diplomas, or of ancient literary monuments, public documents, &c. It does not, however, nor can it, absolutely extend its researches to antiquity; but is chiefly confined to the middle age, and the first centuries of modern times. For though the ancients were accustomed to reduce their contracts and treaties into writing; yet they graved them on tables, or covered them over with wax, or brass, copper, stone, or wood, &c. And all that in the first ages were not traced on brass or marble, has perished by the length of time, and the number of destructive events.

1. The word *diploma* signifies, properly, a letter or epistle, that is folded in the middle, and that is not open. But in more modern times, the title has been given to all ancient epistles, letters, literary monuments, and public documents, and to all those pieces of writing which the ancients called *Syngrapha, Chirographa, Codicilli*, &c. In the middle age, and in the diplomas themselves, these writings are called *Litteræ, Præcepta, Placita, Chartæ Indiculæ, Sagilla*, and *Bullæ*; as also *Panchartæ, Pantochartæ, Tractoriæ, Descriptiones*, &c. The originals of these pieces are named *Examplaria*, or *Autographa, Chartæ authenticæ, Originalia*, &c. and the copies, *Apographa, Copiæ, Particulæ*, and so forth. The collections that have been made of them, are called *Chartaria* and *Chartulia*. The place where these papers and documents were kept, the ancients named *Scrinia, Tabularium* or *Ærarium*, words that were derived from the tables of brass, and, according to the Greek idiom, *Archeium* or *Archivum*.

2. In order to understand the nature of these ancient papers, diplomas, and manuscripts, and to distinguish the authentic from the conterfeit, it is necessary to know that the paper of the ancients came from Egypt, and was formed of thin leaves or membranes, taken from the branches of a tree named *Papyrus*, or *Biblum Ægyptiacum*, and which were pasted one over the other with the slime of the Nile, and were pressed and polished with a pumice-stone. This paper was very scarce; and it was of various qualities, forms, and prices, which they distinguished by the names of *charta hieratica, luria, augusta, amphitheatrica, saitica, tanirica, emporetica*, &c. They cut this paper into square leaves, which they pasted one to the other, in order to make rolls of them: from whence an entire book was called *volumen*, from *volvendo*; and the leaves of which it consisted, *paginæ*. Sometimes, also, they pasted the leaves all together by one of their extremities, as is now practised in binding; by this method they formed the back of a book, and these the learned call *codices*. They rolled the volume round a stick which they named *umbilicus*; and the two ends that come out beyond the paper, *cornua*. The title, wrote on parchment, in purple characters, was joined to the last sheet, and served it as a cover. They made use of all sorts of strings or ribbands, and even sometimes of locks, to close the book; and sometimes also it was put into a case. But there is not now to be found, in any library or cabinet whatever, any one of these volumes. We have been assured, however, by a traveller, that he had seen several of them in the ruins of Herculaneum; but so damaged, the paper so stiff and brittle, by the length of time, that it was impossible to unroll them, and consequently to make any use of them; for on the first touch they fell into shatters.

3. We are ignorant of the precise time when our modern paper was invented: and when they began to make use of pens in writing, instead of the stalks of reeds. The ink that the ancients used, was not made of vitriol and galls, like the modern, but of soot. Sometimes also they wrote with red ink made of vermilion; or in letters of gold, on purple or violet parchment. It is not difficult for those who apply themselves to this study, to distinguish the parchment of the ancients from that of the moderns, as well as their ink and various exterior characters: but that which best distinguishes the original from the counterfeit is the writing or character itself; which is so distinctly different from one century to another, that we may tell with certainty, within about 40 or 50 years, when any diploma was written. There are two works which furnish the clearest lights on this matter, and which may serve as sure guides in the judgments we may have occasion to make on what are called *ancient diplomas*. The one is the celebrated treatise on the Diplomatic, by F. Mabillon; and the other, the first volume of the Chronicon

nicon Gotvicense. We there find specimens of all the characters, the flourishes, and different methods of writing, of every age. For these matters, therefore, we must refer our readers to those authors; and shall here only add, that,

4. All the diplomas are wrote in Latin, and consequently the letters and characters have a resemblance to each other: but there are certain strokes of the pen which distinguish not only the ages, but also the different nations; as the writings of the Lombards, French, Saxon, &c. The letters in the diplomas are also usually longer, and not so strong as those of manuscripts. There has been also introduced a kind of court-hand, of a very disproportionate length, and the letters of which are called *Exiles litteræ, crispæ, ac protractiores*. The first line of the diploma, the signature of the sovereign, that of the chancellor, notary, &c. are usually wrote in this character.

5. The signature of a diploma consists either of the sign of the cross, or of a monogram or cipher, composed of the letters of the names of those who subscribed it. The initial letters of the name, and sometimes also the titles, were placed about this cross. By degrees the custom changed, and they invented other marks; as, for example, the sign of Charlemagne was thus:

R
K—A/V—S
L

They sometimes added also the dates and epoch of the signature, the feasts of the church, the days of the kalendar, and other like matters. The successive corruption of the Latin language, the style and orthography of each age, as well as their different titles and forms; the abbreviations, accentuation, and punctuation, and the various methods of writing the diphthongs; all these matters united, form so many characters and marks by which the authenticity of a diploma is to be known.

6. The seal annexed to a diploma was anciently of white wax, and artfully imprinted on the parchment itself. It was afterward pendent from the paper, and inclosed in a box or case, which they called *bulla*. There are some also that are stamped on metal, and even on pure gold. When a diploma bears all the characters that are requisite to the time and place where it is supposed to be written, its authenticity is not to be doubted: but, at the same time, we cannot examine them too scrupulously, seeing that the monks and priests of former ages have been very adroit in making of counterfeits; and the more, as they enjoyed the confidence of princes and statesmen, and were even sometimes in possession of their rings or seals.

7. With regard to manuscripts that were wrote before the invention of printing, it is necessary (1.), to know their nature, their essential qualities, and matter; (2.) to be able to read them freely, and without error; (3.) to judge of their antiquity by those characters which we have just mentioned with regard to the diplomas; and, (4.) to render them of use in the sciences. As there are scarce any of the ancient codes now remaining (see par. 2.), wrote on the Egyptian paper, or on wood, ivory, &c. we have only to consider those that are written on parchment or vellum *(membraneos)* and such as are wrote on our paper *(chartaceos)*. The former of these are in most esteem. With regard to the character, these codes are written either in square and capital letters, or in half square, or round and small letters. Those of the first kind are the most ancient. There are no intervals between the words, no letters different from the others at the beginning of any word, no points, nor any other distinction. The codes which are wrote in letters that are half square, resemble those we have in Gothic characters, as well for the age as the form of the letters. Such as are wrote in round letters are not so ancient as the former, and do not go higher than the ninth or tenth century. These have spaces between the words, and some punctuation. They are likewise not so well wrote as the preceding, and are frequently disfigured with comments. The codes are divided, according to the country, into Lombard, Italian, Gaulic, Franco-Gaulic, Saxon, Anglo-Saxon, &c.

8. In the ancient Greek books, they frequently terminated the periods of a discourse, instead of all other division, by lines; and these divisions were called, in Latin, *versus*, from *vertendo*: for which reason these lines are still more properly named *versus* than *lineæ*. At the end of a work they put down the number of verses of which it consisted, that the copies might be more easily collated: and it is in this sense we are to understand Trebonius, when he says, that the pandects contain 150,000 *pæne versuum*. These codes were likewise *vel probæ vel deterioris notæ*, more or less perfect, not only with regard to the calligraphy or beauty of the character, but to the correction of the text also.

9. It is likewise necessary to observe, in ancient codes, the abbreviations, as they have been used in different centuries. Thus, for example, A. C. D. signifies, Aulus Caius Decimus; Ap. Cn. Appius Cneius; Aug. Imp Augustus Imperator. The characters that are called *notæ*, are such as are not to be found in the alphabet; but which, notwithstanding, signify certain words. All these matters are explained in a copious manner by Vossius, and in the Chronicon Gotvicense. Lastly, the learned divide all the ancient codes into *codices minus raros, rariores, editos, & anecdotos*. The critical art is here indispensably necessary: its researches, moreover, have no bounds; and the more, as the use of it augments every day, by the discoveries that are made in languages, and by the increase of erudition.

DIPONDIUS, in the scripture-language, is used by St Luke to signify a certain coin which was of very little value. Our translation of the passage is, *Are not two sparrows sold for two farthings?* In St Matthew, who relates the same thing, we read *Are not two sparrows sold for a farthing?* The Greeks reads *assarion* instead of *as*. Now *assarion*, as some say, was worth half an *as*, that is to say, four French deniers and $\frac{1}{8}$th; and, according to others, two deniers and $\frac{1}{17}$ths. *Dipondius* seems rather to signify half an *as*. Calmet, Diction. Bibl. Luke xii. 6. Matt. x. 29.

Dr Arbuthnot differs in opinion from the author last quoted. He says, that this coin was at first *libralis*, or of a pound weight; and even when diminished, it retained the name of *libella*. So that *dipondius* denotes two asses.

DIPPING, among miners, signifies the interrup-

tion

tion or breaking of the veins of ore; an accident that gives them a great deal of trouble before they can discover the ore again. A great deal of the ſkill of the miners conſiſts in the underſtanding this dipping of the veins, and knowing how to manage in it. In Cornwal they have this general rule to guide them in this reſpect: moſt of their tin-loads, which run from eaſt to weſt, conſtantly dip towards the north. Sometimes they underlie; that is, they ſlope down towards the north three feet in height perpendicular. This muſt carefully be obſerved by the miners, that they may exactly know where to make their air-ſhafts when occaſion requires; yet, in the higher mountains of Dartmaer, there are ſome conſiderable loads, which run north and ſouth; theſe always underlie toward the eaſt. Four or five loads may run nearly parallel to each other in the ſame hill; and yet, which is rare, they may meet altogether in one hatch, as it were a knot, which well tins the place, and ſo ſeparate again, and keep their former diſtances.

Dipping-Needle, an inſtrument uſed for obſerving the quantity of inclination towards the earth, aſſumed by any needle or other body after it has acquired the magnetic virtue. This was firſt obſerved by one Robert Norman, an Engliſhman, and maker of compaſſes for mariners, in the end of the 16th century; who finding that he was always obliged to counterbalance that end which turns to the north by a bit of wax or ſuch other ſubſtance, though the balance had been ever ſo exact before, publiſhed an account of his diſcovery as a matter of importance. The ſubject was inſtantly attended to; and inſtruments were not only contrived for aſcertaining the quantity of the dip, but various ſpeculations formed concerning the cauſe of ſuch a ſurpriſing phenomenon.

The general phenomena of the dipping-needle are: That about the equatorial parts of the earth it remains in an horizontal poſition, but depreſſes one end as we recede from theſe; the north end if we go towards the north, and the ſouth end if we proceed towards the ſouth pole. The farther north or ſouth that we go, the inclination becomes the greater; but there is no place of the globe hitherto diſcovered where it points directly downwards, though it is ſuppoſed that it would do ſo in ſome part very near the pole. Its inclination is likewiſe found to vary very conſiderably at different times in different places of the earth, and by ſome changes of ſituation in ſuch a manner as muſt appear at firſt ſight very unaccountable. Of all thoſe who have attempted the inveſtigation of this obſcure ſubject, none have been more ſucceſsful than M. Cavallo, who in his Treatiſe on Magnetiſm has given particular attention to all the phenomena, and accounted for them upon plain and rational principles, in the following manner.

The dip of the magnetical needle in general may be underſtood from the following eaſy experiment: Lay an oblong magnet horizontally upon a table, and over it ſuſpend another ſmaller magnet (a ſewing needle to which the magnetic virtue has been communicated will anſwer the purpoſe), in ſuch a manner as to remain in an horizontal poſition when not diſturbed by another magnet. Now, if this laſt ſmall magnet or ſewing needle, ſuſpended by the middle, be brought juſt over the middle of the large one, it will turn itſelf in ſuch a manner that the ſouth pole of the ſmall magnet will point towards the north pole of the large one; and if at an equal diſtance from both, will remain in an horizontal poſition. But if we move it nearer to one of the poles than the other, it will readily be underſtood that the correſponding end of the needle will be attracted by the pole to which it approaches, and of conſequence inclined downwards; the contrary end being proportionably elevated. It is likewiſe evident, that this inclination will be greater or leſs according to the diſtance at which the ſmall magnet is placed from the pole of the large one; the attraction of the neareſt pole having always the greateſt effect upon it. And it is equally plain, that when brought directly over one of the poles of the large magnet, it will turn its own contrary one directly towards it, and thus lie exactly in the axis of the large one.

The application of this experiment to the phenomena of the dipping-needle is obvious, as nothing more is requiſite for ſolving the whole myſtery than to ſuppoſe the earth itſelf to be the large magnet, and the magnetic needle or any other magnetic body the ſmall magnet in the experiment; for admitting that the *north* pole of the earth poſſeſſes a *ſouth* magnetiſm, and that the oppoſite pole is poſſeſſed of a north magnetical polarity: it appears, and the theory is confirmed by experiment, that when a magnet is ſuſpended properly in the equatorial parts of the world, it muſt remain in an horizontal poſition; but when removed nearer to one of the poles, it muſt incline one of its extremities, *viz.* that which is poſſeſſed of the contrary magnetic polarity; and that this inclination muſt increaſe in proportion as the magnet or magnetic-needle recedes from the equator of the earth; and, laſtly, when brought exactly upon either of the poles of the earth, it muſt ſtand perpendicular to the ground, or in the ſame direction with the axis of the earth.

The only difficulty in this explanation ariſes from the attributing a ſouth magnetiſm to the north pole of the earth: but by this our author means only that its magnetiſm is contrary to that end of the magnetic needle which turns towards it; and in the ſame manner it muſt be underſtood, that the ſouth pole of the earth has a north magnetic polarity.

If the extremities of the axis of the earth, or the poles about which it performs its diurnal revolution, coincided with its magnetic poles, or even if the magnetic poles were always at a certain diſtance from them, the inclination of the needle would be always the ſame at equal diſtances from the equator, and might be very uſeful for determining the latitudes. But it would ſeem, that theſe poles are perpetually ſhifting their place, ſince both the inclination and horizontal direction of the needle are continually varying even in the ſame place; ſo that its quantity of inclination cannot be exactly calculated. Two general remarks may be made upon this ſubject. 1. That the inclination of the needle does not alter regularly in going from north to ſouth, or from ſouth to north, in any meridian. 2. That its alteration in the ſame place, and at different times, is but ſmall. Thus, in London, about the year 1576, the dip was 71° 50′ below the horizon, and in 1775 it ſtood at 72° 3′; the alteration in near 200 years.

years scarce amounting to three quarters of a degree, which may be attributed to the errors of the instruments; as these were at first exceedingly erroneous, and even yet are far from being arrived at perfection.

The general method of constructing dipping-needles is, to pass an axis quite through the needle itself, and to let the extremities of the axis rest upon two supports, like the beam of a pair of scales, that the needle may move vertically round; and hence, when placed in the magnetic meridian, it will naturally assume that position which is called the *magnetic line, viz.* the two ends nearly north and south, and one of them inclined considerably to the horizon. The degrees of this inclination are shown upon a graduated circle; and when the instrument is made use of at land it has a stand, but at sea a ring is necessary to suspend it. When furnished with a stand, it has also a spirit-level; and the stand has three screws, by which the whole is adjusted in such manner as to let the centre of motion in the needle, and the mark of 90° on the lower part of the divided circle, be exactly in the same line perpendicular to the horizon.

The greatest imperfections attending this instrument are the balancing of the needle itself, and the difficulty of knowing whether, after being made magnetic, it be properly balanced or not. The inaccuracy here indeed can be but very small, as arising only from dust or moisture. The method recommended by Mr Cavallo to obviate these inconveniences, is first to observe the dip of the needle; then to reverse its magnetism by the application of magnets, so that the end of it which before was elevated above the horizon may now be below it; and, lastly, to observe its dip again; for a mean of the two observations will be pretty near the truth, though the needle may not be perfectly balanced. See MAGNETISM, and *MAGNETICAL Needle*.

DIPSACUS, TEAZEL, in botany: A genus of the monogynia order, belonging to the tetrandia class of plants; and in the natural method ranking under the 48th order, *Aggregatæ*. The common calyx is polyphyllous, proper above; the receptacle paleaceous. There are four species; the most remarkable of which is the carduus fullonum, which grows wild in many parts of England. It is of singular use in raising the knap upon woollen cloth. For this purpose the heads are fixed round the circumference of a large broad wheel, which is made to turn round, and the cloth is held against them. In the west of England, great quantities of the plant are cultivated for the use just now mentioned. It is propagated by sowing the seeds in March, upon a soil that is well prepared. About one peck of seed is sufficient for an acre, as the plants must have room to grow; otherwise the heads will not be large enough, nor in great quantity. When the plants come up, they must be hoed in the same manner as is practised for turnips, cutting down all the weeds, and thinning the plants to about eight inches distance; and as the plants advance, and the weeds begin to grow again, they must be hoed a second time, cutting out the plants to a wider distance, so that they may finally stand a foot distant from each other. The second year they will shoot up heads, which may be cut about the beginning of August. They are then to be tied up in bunches, and set in the sun if the weather is fair; or if not, in rooms to dry them. The common produce is about 160 bundles or staves upon an acre, which are sold for one shilling each.

The leaves of the common wild teazel, dried, and given in powder or infusion, are a very powerful remedy against flatuses and crudities in the stomach. There is also another, though somewhat whimsical use for which this plant is famous among the country people in England. If the heads are opened longitudinally, about September or October, there is generally found a small worm in them: one of these only is found in each head, whence naturalists have named it the *vermis solitarius dipsaci*. They collect three, five, or seven of these, always observing to make it an odd number; and sealing them up in a quill, give them to be worn as an amulet against the ague. This superstitious remedy is in much higher repute than the bark in many parts of England.

DIPSAS, a sort of serpent, the bite of which produces such a thirst as proves mortal; whence its name *dipsas*, which signifies thirsty. In Latin it is called *situla*, "a pail." Moses speaks of it in Deut. viii. 15.

DIPTERA (from δις and πτερον, *wing)*, in zoology, an order of insects, which have only two wings, and under each wing a style or oblong body, terminated by a protuberance or head, and called a *balancer*.

DIPTOTES, in grammar are such nouns as have only two cases, as *suppetæ*, *suppetias*, &c.

DIPTYCHA, in antiquity, a public register, wherein were written the names of the consuls, and other magistrates among the heathens; and of bishops, and defunct as well as surviving brethren, among the Christians.

The word is formed from the Greek διπτυχων, or διπτυχα, and that from διπτυξ, a masculine noun derived from πτυσσω *I fold* or *plait*. From its future πτυξω is formed πτυξ a *fold* or *plait*, to which is adding δισ *twice*, we have διπτυξ, in the genitive διπτυχος, whence the nominative neuter διπτυχον, p. q. *a book folded in two leaves*; though there were some in three, and others in four or five leaves. An ingenious author imagines this name to have been first given them to distinguish them from the books that were rolled, called *volumina*.

It is certain that there were profane diptycha in the Greek empire as well as sacred ones in the Greek church. The former were the matricula, or register, wherein the names of the magistrates were entered; in which sense diptycha is a term in the Greek chancery.

Sacred DIPTYCHA. The word is plural; diptycha being a double catalogue, in one whereof were written the names of the living, and in the other those of the dead, which were to be rehearsed during the office. We meet with something not unlike the sacred diptychs of the Greeks in the canon of the mass according to the Italian usage; where the people are enjoined to pray once for the living, and once for the dead; several saints are invoked in different times, &c. In these diptycha were entered the names of bishops, who had governed their flocks aright; and these were never expunged out of the same, unless they were convicted of heresy, or some other gross crime. In the diptycha were likewise entered the names of such as had done any signal service to the church, whether they were

living

living or dead, and mention was made of them in the celebration of the liturgy.

Casaubon, in his observations on Athenæus, lib. vi. cap. 14. supposes the Christians to have borrowed the custom of writing names in a book, and rehearsing them at mass, from the heathens, who entered the names of persons they would do any signal honour to, in the verses of the Salii: as was done to Germanicus and Verus, sons of the emperor Marcus Aurelius, and long time before, during the age of the republic, to Mamurcus Veturius, and Lucia Volumnia, as we are told by Tacitus, lib. ii. Spartian, Ovid, Festus, Plutarch, &c. But Fa. Rosweyd does not approve this notion of Casaubon. The prentended St Dionysius, a very ancient author, says the contrary, and asserts the first establishment of this usage to have been founded on Scripture, 2 Tim. ii. 19. Psalm cxvi. 15. Rosweyd adds Ecclesiastic. xliv. 1. and takes these to have been the passages the ancient church had a view to, rather than the Salian verses.

The profane diptycha were frequently sent as presents to princes, &c. on which occasion they were finely gilt, and embellished; as appears from Symmachus, lib. ii. ep. 81. Those presented were usually of ivory. The first law, De Expens. Ludor. C. Theod. forbids all magistrates below consuls to make presents of diptycha of ivory in the public ceremonies.

DIRCA, in botany: A genus of the monogynia order, belonging to the octandria class of plants; and in the natural method ranking under the 31st order, *Vepreculæ*. There is no calyx; the corolla is tubular, with the limb indistinct; the stamina are longer than the tube; the berry is monospermous.

DIRÆ, the general name of the three Furies in the Pagan system of theology. They were so called, as being *quasi Deorum iræ*, the ministers of divine vengeance in punishing guilty souls after death. They were the daughters of *Night* and *Acheron*. See FURIES.

DIRECTION, in mechanics, signifies the line or path of a body's motion, along which it endeavours to proceed according to the force impressed upon it. See MECHANICS.

DIRECTOR, in commercial polity, a person who has the management of the affairs of a trading company: thus we say, the directors of the India company, South-sea company, &c. See COMPANY.

The directors are considerable proprietors in the stocks of their respectives companies, being chosen by plurality of votes from among the body of proprietors. The Dutch East India company have 60 such directors; that of France, 21; the British East India company has 24, including the chairman, who may be re-elected for four years successively. These last have salaries of 150l. a-year each, and the chairman 200l. They meet at least once a-week, and commonly oftener, being summoned as occasion requires. The directors of the Bank of England are 24 in number, including governor and deputy governor.

DIRECTOR, in surgery, a grooved probe, to direct the edge of the knife or scissars in opening sinuses or fistulæ, that by this means the adjacent vessel, nerves, and tendons, may remain unhurt. See SURGERY.

DIRIBITORES, among the Romans, officers appointed to distribute tablets to the people at the comitia. See COMITIA.

DIRIGENT, or DIRECTRIX, a term in geometry, signifying the line of motion, along which the describent line or surface is carried in the genesis of any plane or solid figure.

DIS, an inseparable article prefixed to divers words; the effect whereof is either to give them a signification contrary to what the simple words have, as *disoblige*, *disobey*, &c; or to signify a separation, detachment, &c. as *disposing*, *distributing*.

DIS, a town of Norfolk, seated on the river Wayenay, on the side of a hill. It is a neat flourishing town, with one large church, a Presbyterian and a Quaker meeting. It has about 600 good houses, the streets are well paved, pretty wide, and always clean. At the west end of the town is a large meer or lake; but so muddy, that the inhabitants can make no other use of it but in catching of eels. In the town are carried on manufactories of sail-cloth, hose, and the making of stays. E. Long. 1. 16. N. Lat. 52. 25.

DIS, a god of the Gauls, the same as Pluto the god of hell. The inhabitants of Gaul supposed themselves descended from that deity.

DISA, in botany: A genus of the diandria order, belonging to the gynandria class of plants. The spatha is univalvular; the petals three; the third smaller than the rest, bifid, and gibbous at the base.

DISABILITY, in English law, is when a man is disabled, or made incapable to inherit any lands, or take that benefit which otherwise he might have done: and this may happen four ways; by the act of an ancestor, or of the party himself; by the act of God, or of the law. 1. Disability by the act of the ancestor, is where the ancestor is attainted of high treason, &c. which corrupts the blood of his children, so that they may not inherit his estate. 2. Disability by the act of the party, is where a man binds himself by obligation, that, upon surrender of a lease, he will grant a new estate to a lessee; and afterwards he grants over the reversion to another, which puts it out of his power to perform it. 3. Disability by the act of God, is where a man is *non sanæ memoriæ*, whereby he is incapable to make any grant, &c. So that, if he passeth an estate out of him, it may after his death be made void; but it is a maxim in law, "That a man of full age shall never be received to disable his own person." 4. Disability by the act of the law, is where a man by the sole act of the law, without any thing by him done, is rendered incapable of the benefit of the law; as an alien born, &c.

DISANDRA, in botany: A genus of the digynia order, belonging to the heptandria class of plants. The calyx has seven leaves; the corolla parted into seven, and flat; the capsule two-celled.

ISLANDS OF DISAPPOINTMENT, are a cluster of small islands, lying in S. Lat. 14. 10. W. Long. 141. 16. They were discovered by Commodore Byron in 1765, who gave them their name from the shores affording no anchorage for his ships; for which reason he was obliged to quit them without landing, or procuring any refreshments for his crew who were then languishing with sickness. They are inhabited by Indians, who appeared on the beach with spears in their hands, that were at least 16 feet long. They every where discovered hostile intentions, and seemed by signs to threaten the people in the boat with death if they

came

came ashore. There are cocoa-trees in great abundance, and the shore abounds with turtle.

DISC, in antiquity, a quoit made of stone, iron, or copper, five or six fingers broad, and more than a foot long, inclining to an oval figure, which they hurled in form of a bowl, to a vast distance, by the help of a leathern thong tied round the person's hand who threw it, and put through a whole in the middle. Homer has made Ajax and Ulysses great artists at this sport.

Disc, in astronomy, the body and face of the sun and moon, such as it appears to us on the earth; or the body and face of the earth, such as it appears to a spectator in the moon.

Disc, in optics, is the width of the aperture of telescopic glasses, whatever their form be, whether plain, convex, concave, &c.

DISCERNING, or Discernment, a faculty of the mind whereby it distinguishes between ideas. See Metaphysics.

DISCIPLE, one who learns any thing from another: thus, the followers of any teacher, philosopher, &c. are called *disciples*. In the Christian sense, they were followers of Jesus Christ, in general; but in a more restrained sense, the disciples denote those alone who were the immediate followers and attendants on his person, of which there were 70 or 72. The names *disciple* and *apostle* are often synonymously used in the gospel-history; but sometimes the apostles are distinguished from disciples, as persons selected out of the number of disciples, to be the principal ministers of his religion: of these there were only 12. The Latins kept the festival of the 70 or 72 disciples on July 15th, and the Greeks on January 4th.

DISCIPLINE, in a general sense, denotes instruction and government, as military discipline, ecclesiastical discipline, &c.

Ecclesiastical discipline consists in putting those laws in execution by which the church is governed, and inflicting the penalties enjoined by them against the several sorts of offenders that profess the religion of Jesus. The primitive church never pretended to exercise discipline upon any but such as were within her pale, in the largest sense, by some act of their own profession; and even upon these she never pretended to exercise her discipline so far as to cancel or disannul their baptism: all that she pretended to, was to deprive men of the benefits of external communion, such as public prayer, receiving the eucharist, and other acts of divine worship. The church-discipline was only confined to the admonition of the party, and to the lesser and greater excommunication.

As to the objects of ecclesiastical discipline, they were all such delinquents as fell into great and scandalous crimes after baptism.

Discipline, in a more peculiar sense, is used for the chastisement or bodily punishments inflicted on a religious of the Romish church who has been found a delinquent; or even for that which the religious voluntarily undergo or inflict on themselves, by way of modification.

Book of Discipline in the history of the church of Scotland, is a common order, drawn up by the assembly of ministers in 1650, for the reformation and uniformity to be observed in the discipline and policy of the church. In this book the government of the church by prelates is set aside, church-sessions are established, the superstitious observation of fast-days and saints days is condemned, and other regulations for the government of the church are determined. This book was approved by the privy council, and is called *the first book of discipline*.

DISCORD, in general, signifies disagreement, or opposition between different persons or things.

Discord, in music, every sound which, joined with another, forms an assemblage disagreeable to the ear; or rather, every interval whose extremes do not coalesce. Now, as there are no other concords or consonances, except those which form amongst themselves, and with their fundamental sound, perfect chords, it follows, that every other interval must be a real dissonance or discord: even the third and sixth were reckoned such among the ancients, who excluded them from the number of consonant chords.

The term *dissonance*, which is synonymous with discord, is compounded of two words, the inseparable preposition *dis* and the verb *sonare*; which, both in a literal and metaphorical sense, signifies *disagreement* or *disunion*. In reality, that which renders dissonances grating, is, that the sounds which form them, far from uniting in the ear, seem to repel each other, and are heard each by itself as two distinct sounds though produced at the same time.

This repulsion or violent oscillation of sounds is heard more or less as the vibrations which produce it are more or less frequently coincident. When two vocal strings are gradually tuned, till they approach a consonant interval, the pulsations become slower as the chord grows more just, till at last they are scarcely heard, if heard at all; from whence it appears certain, that the pleasure produced in us by harmony results from the more or less exact and frequent coincidence of vibrations; though the reason why this coincidence should give pleasure, more than any other modification or combination of sounds, appears to us inscrutable. The agreeable effects of dissonance in harmony, are no objection to this theory; since it is allowed, that the sensations excited by discord are not in themselves immediately and necessarily pleasing, but only please by auricular deception. The ear is surprised with the shock it receives, without being able to imagine how it should have happened; and in proportion as it is harsh and grating, we feel the pleasure of returning harmony enhanced, and the disappointment of being artfully and insensibly extricated more ageeeable.

The name of *dissonance*, is given sometimes to the interval, and sometimes to each of the two sounds which form it. But though two sounds equally form a dissonance between themselves, the name is most frequently given to that sound in particular which is most extraneous to the chord.

The number of possible dissonances is indefinite; but as in music we exclude all intervals which are not found in the system received, the number of dissonances is reduced to a very few: besides, in practice, we can only select from those few, such as are agreeable to the species, and the mode in which we compose; and from this

this last number we must exclude such as cannot be used consistently with the rules prescribed. But what are these rules? Have they any foundation in nature, or are they merely arbitrary? This is what Rousseau, whom in this article we have followed or abandoned as his observations appeared useful or frivolous, proposes to investigate as its principal object.

But where does his scrutiny terminate? Not in the abolition of the rules prescribed. These have still subsisted, and will still subsist, while the frame of man, and the nature of music, remain what they are. If then the rules be permanent and universal, the principle upon which they are founded may be latent or ambiguous; but the rules themselves can never be purely arbitrary. How else could it happen, that Rameau, D'Alembert, and Rousseau, should admit the force and effect of these rules, whilst each of those masters exerts his whole genius to give a different account of their cause and origin? Rousseau himself, as we have seen in a former article, inculcates the necessity of dissonances for the completion of harmony; (see CHORD). Now if this be true, the easiest methods of introducing and dismissing these discords must be the most eligible, and of consequence the rules for using them must be established. It it not then upon the subsistence or demolition of any particular theory that they depend. Should we attend to the particular objections which may be urged against any system whatever; where is the theory which will be found proof against the efforts of scepticism? After all, the objections of Rousseau against Rameau's theory, as applied by D'Alembert to the origin of consonances, (see MUSIC, art. 94, 95, 96, 97, 98, 99,) appear to be much more frivolous than the analogies from which he pretends this origin to be deduced. It appears from D'Alembert's exposition of this theory, that, if not for all, it affords a solution for the most material and essential phenomena in harmony; which is sufficient for its establishment, till another can be found, which gives a rational and consistent account of the whole: a discovery which has not yet been made. But, whilst we acknowledge the futility of Rousseau's objections against D'Alembert's explication of dissonances, we must at the same time admire the ingenuity with which he has deduced them from principles purely mechanical, without departing from the system of M. Rameau. This mechanical explication will be found in his Musical Dictionary, under the article *Dissonance*.

DISCORD, (the goddess of), in Pagan theology. She is represented by Aristides with fiery eyes, a pale countenance, livid lips, and wearing a dagger in her bosom. It was she who at the marriage of Peleus and Thetis threw in the golden apple, whereon was written "To the fairest:" which occasioned a contention between the goddesses Juno, Minerva, and Venus; each pretending a title to the apple. She was likewise called *Ate* and *Eris*.

DISCOVERY, in dramatic poetry, a manner of unravelling a plot or fable in tragedies, comedies, and romances; wherein, by some unforeseen accident, a discovery is made of the name, fortune, quality, &c. of a principal person, which were before unknown. See CATASTROPHE.

DISCOUNT, in commerce, a term among traders, merchants, and bankers. It is used by the two former on occasion of their buying commodities on the usual time of credit, with a condition that the seller shall allow the buyer a certain discount at the rate of so much *per cent. per annum*, for the time for which the credit is generally given, upon condition that the buyer pays ready money for such commodities, instead of taking the time of credit. Traders and merchants also frequently taking promissory notes for moneys due payable to them or order at a certain time, and sometimes having occasion for money before the time is elapsed, procure these notes to be discounted by bankers before the time of payment. Bills of exchange are also discounted by bankers; and in this consists one article of the profits of banking. See BANK.

DISCRETE, or DISJUNCT, PROPORTION, is when the ratio of two or more pairs of numbers or quantities is the same, but there is not the same proportion between all the four numbers. Thus if the numbers 3 : 6 : : 8 : 16 be considered, the ratio between 3 : 6 is the same as that between 8 : 16, and therefore the numbers are proportional: but it is only discreetly or disjunctly, for 3 is not to 6 as 6 to 8; that is, the proportion is broken off between 8 and 3, and is not continued as in the following continual proportionals, 3 : 6 : : 12 : 24.

DISCRETION, prudence, or knowledge to govern one's self.

There are many more shining qualities in the mind of man, but there is none so useful as discretion; it is this indeed that gives a value to all the rest, which sets them at work in their proper times and places; and turns them to the advantage of the person who is possessed of them. Without it learning is pedantry, and wit impertinence; virtue itself looks like weakness; the best parts only qualify a man to be more sprightly in errors, and active to his own prejudice.

Nor does discretion only make a man master of his own parts, but of other mens. The discreet man finds out the talents of those he converses with, and knows how to apply them to proper uses. Accordingly, if we look into particular communities and divisions of men, we may observe that it is the discreet man, not the witty, nor the learned, nor the brave, who guides the conversation, and gives measure to the society. A man with great talents, but void of discretion, is like Polyphemus in the fable, strong and blind, endued with an irresistible force, which for want of sight is of no use to him. Though a man has all other perfections, and wants discretion, he will be of no great consequence in the world; but if he has this single talent in perfection, and but a common share of others, he may do what he pleases in his particular station of life.

It is proper, however, to distinguish between *discretion* and *cunning*, the latter being the accomplishment only of little mean ungenerous minds. Discretion points out the noblest ends to us, and pursues the most proper and laudable methods of attaining them: cunning has only private selfish aims, and sticks at nothing which may make them succeed. Discretion has large and extended views, and, like a well-formed eye, commands a whole horizon: cunning is a kind of shortsightedness, that discovers the minutest objects which are near at hand, but is not able to discern things at a distance. Discretion, the more it is discovered, gives the greater authority to the person who possesses it: cunning,

cunning, when it is once detected, loses its force, and makes a man incapable of bringing about even those events which he might have done, had he passed only for a plain man. Discretion is the perfection of reason, and a guide to us in all the duties of life; cunning is a kind of instinct, that only looks out after our immediate interest and welfare. Discretion is only found in men of strong sense and good understanding: cunning is often to be met with in brutes themselves, and in persons who are but the fewest removes from them. In short, cunning is only the mimic of discretion, and may pass upon weak men, in the same manner as vivacity is often mistaken for wit, and gravity for wisdom.

DISCUS, in antiquity. See Disc.

Discus, in botany, the middle part of a radiated compound flower, generally consisting of small florets, with a hollow regular petal. It is commonly surrounded by large, plain, or flat, tongue-shaped petals, in the circumference or margin; as in daisy, groundsel, and leopards bane: sometimes the circumference is naked, as in cotton-weed and some species of colts-foot.

Discus Folii, the surface of the leaf.

DISCUSSION, in matters of literature, signifies the clear treating or handling of any particular point, or problem, so as to shake off the difficulties with which it is embarrassed: thus we say, *such a point was well discussed*, when it was well treated of and cleared up.

DISCUTIENTS, in medicine, are such remedies, as, by their subtilty, dissolve a stagnating or coagulated fluid, and dissipate the same without an external solution of continuity.

DISDIACLASTIC crystal, in natural history, a name given, by Bartholine and some others, to the pellucid fossile substance, more usually called, from the place whence it was first brought, *Island crystal;* tho' properly it is no crystal at all, but a fine pellucid spar, called by Dr Hill, from its shape, *parallelopipedum.* See *Island Crystal*,

DISDIAPASON, or Bisdiapason, in music, a compound concord, described by F. Parran, in the quadruple ratio of 4: 1, or 8: 2.

Disdiapason Diapente, a concord in a sextuple ratio of 1 : 6.

Disdiapason Semi-Diapente, a compound concord in the proportion of 16: 3.

Disdiapason Ditone, a compound consonance in the proportion of 10: 2.

Disdiapason Semi-Ditone, a compound concord in the proportion of 24: 5.

DISEASE, has been variously defined by physicians, almost every founder of a new system having given a definition of *disease*, differing in some respects from his predecessors. For a particular account of these definitions. See Medicine.

Of all animals, man is subject to the most diseases; and of men, the studious and speculative are most exposed thereto. Other animals have their diseases; but they are in small number: nor are plants without them; though their maladies scarce exceed half a score. The ancients deified their diseases. Some diseases only impair the use of the part immediately affected; as the ophthalmia, gout, &c. Others destroy it entirely; as the *gutta serena*, palsy, &c. Some affect the whole body; as the fever, apoplexy, epilepsy, &c. Others only impair a part; as the asthma, colic, dropsy, &c. Some only affect the body; as the gout: others disturb the mind; as melancholy, delirium, &c. Lastly, others affect both the body and mind; as the mania, phrensy, &c.

The colder the country, in general, the fewer and the less violent are the diseases. Scheffer tells us that the Laplanders know no such thing as the plague, or fevers of the burning kind, nor are subject to half the distempers we are. They are robust and strong, and live to 80, 90, and many of them to more than 100 years; and at this great age they are not feeble and decrepid as with us; but a man of 90 is able to work or travel as well as a man of 60 with us. They are subject, however, to some diseases more than other nations: thus they have often distempers of the eyes, which is owing to their living in smoke, or being blinded by the snow. Pleurisies and inflammations of the lungs are also very frequent among them; and the small-pox often rages with great violence. They have one general remedy against these and all other internal diseases; this is the root of that sort of moss, as Scheffer expresses it, which they call *jerth*. They make a decoction of this root in the whey of rein-deer milk, and drink very large doses of it warm, to keep up a breathing sweat; if they cannot get this, they use the stalks of angelica boiled in the same manner: they have not so great an opinion of this as of the other remedy; but the keeping in a sweat, and drinking plentifully of diluting liquors, may go a great way in the cure of their diseases, whether either the one or the other of the drugs have any virtue or not. They cure pleurisies by this method in a very few days; and get so well through the small-pox with it, that very few die of it.

It has been always observed, that people of particular places were peculiarly subject to particular diseases, which are owing to their manner of living, or to the air and effluvia of the earth and waters. Hoffman has made some curious observations on diseases of this kind. He observes, that swellings of the throat have always been common to the inhabitants of mountainous countries: and the old Roman authors say, Who wonders at a swelled throat in the Alps? The people of Swisserland, Carynthia, Styria, the Hartz forest, Transylvania, and the inhabitants of Cronstadt, he observes, are all subject to this disease from the same cause.

The French are peculiarly troubled with fevers, with worms, and with hydroceles and sarcoceles; and all these disorders seem to be owing originally to their eating very large quantities of chesnuts. The people of Britain are peculiarly afflicted with hoarsenesses, catarrhs, coughs, dysenteries, consumptions, and the scurvy; and the women with the *fluor albus* or whites; and children with a disease scarce known elsewhere; which we call the *rickets*. In different parts of Italy different diseases reign. At Naples the venereal disease is more common than in any other part of the world. At Venice, people are peculiarly subject to the bleeding piles. At Rome, tertian agues and lethargic distempers are most common. In Tuscany, the epilepsy or falling sickness. And in Apulia they are most subject to burning fevers, pleurisies, and to that sort of madness which is attributed to the bite of the tarantula,

tarantula, and which, it is said, is only to be cured by music. In Spain apoplexies are common, as also melancholy, hypochondriacal complaints, and bleeding piles. The Dutch are peculiarly subject to the scurvy, and to the stone in the kidneys. Denmark, Norway, Sweden, Pomerania, and Livonia, are all terribly afflicted with the scurvy: and it is remarkable, that in Denmark, Sweden, and Norway, fevers are very common; but in Iceland, Lapland, and Finland, there is scarce ever such a disease met with; though peripneumonies are very common in these places, as also diseases of the eyes and violent pains of the head. The Russians and Tartars are afflicted with ulcers, made by the cold, of the nature of what we call chilblains, but greatly worse; and in Poland and Lithuania there reigns a peculiar disease called the *plica polonica*, so terribly painful and offensive, that scarce any thing can be thought of worse. The people of Hungary are very subject to the gout and rheumatism: they are more infested also with lice and fleas than any other people in the world, and they have a peculiar disease which they call *cremor*. The Germans, in different parts of the empire, are subject to different reigning diseases. In Westphalia, they are peculiarly troubled with peripneumonies and the itch. In Silesia, Franconia, Austria, and other places thereabout, they are very liable to fevers of the burning kind, to bleedings at the nose and other hæmorrhages; and to the gout, inflammations, and consumptions. In Misnia they have purple fevers; and the children are peculiarly infested with worms. In Greece, Macedonia, and Thrace, there are very few diseases; but what they have are principally burning fevers and phrenzies. At Constantinople the plague always rages; and in the West Indian islands, malignant fevers, and the most terrible colics. These diseases are called *endemic*.

Diseases of Horses. See Farriery.

Diseases of Dogs. See Dogs.

Diseases of plants. See Agriculture, n° 69, *et seq*. and Blight, Mildew, &c.

DISEMBOGUE. When a ship passes out of the mouth of some great gulf or bay, they call it *disemboguing*. They say also of a river, that at such a place, or after it has run so many leagues, it disembogues itself into the sea.

DISFRANCHISING, among civilians, signifies the depriving a person of the rights and privileges of a free citizen or subject.

DISGUISE, a counterfeit habit. Persons doing unlawful acts in disguise are by the statutes sometimes subjected to great penalties, and even declared felons. Thus by an act, commonly called the *black act*, persons appearing disguised and armed in a forest or grounds inclosed, or hunting deer, or robbing a warren or a fish-pond, are declared felons.

DISH, in mining, is a trough made of wood, about 28 inches long, four inches deep, and six inches wide; by which all miners measure their ore. If any be taken selling their ore, not first measuring it by the bar-master's dish, and paying the king's duty, the seller forfeits his ore, and the buyer forfeits for every such offence 40 shillings to the lord of the field or farmer.

DISJUNCTIVE, something that separates or disjoins. Thus, *or*, *neither*, &c. which in connecting a discourse yet separate the parts of it, are called *disjunctive conjunctions*.

DISK. See Disc.

DISLOCATION, the putting a bone out of joint by some violence, usually called by the physicians *luxation*.

DISMISSION *of a Bill*, in chancery. If the plaintiff does not attend on the day fixed for the hearing, his bill is dismissed with costs. It may be also dismissed for want of prosecution, which is in the nature of a non-suit at law, if he suffers three terms to elapse without moving forward in the cause.

DISMOUNTING, in the military art, the act of unhorsing. Thus, to dismount the cavalry, the dragoons, or the like, is to make them alight. To dismount the cannon, is to break their carriages, wheels, and axletrees, so as to render them unfit for service. Horses are also dismounted when they are rendered unfit for service.

DISPARAGEMENT, in law, is used for the matching an heir, &c. in marriage, below his or her degree or condition, or against the rules of decency. The word is a compound of the privative particle *dis*, and *par*, "equal."

DISPART, in gunnery, is the setting a mark upon the muzzle-ring, or thereabouts, of a piece of ordnance, so that a sight-line taken upon the top of the base-ring against the touch-hole, by the mark set on or near the muzzle, may be parallel to the axis of the concave cylinder. The common way of doing this, is to take the two diameters of the base ring, and of the place where the dispart is to stand, and divide the difference between them into two equal parts, one of which will be the length of the dispart which is set on the gun with wax or pitch, or fastened there with a piece of twine or marlin. By means of an instrument it may be done with all possible nicety.

DISPATCH, a letter on some affair of state, or other business of importance, sent with care and expedition, by a courier express. The business of dispatches in England lies on the secretaries of state and their clerks. The king gives directions to his ministers abroad by dispatches. The word is also used for the packet or mail containing such letters. The French, during the reign of Louis XIV. had a *conseil des depeches*, "council of dispatches," held in the king's presence, at which the dauphin, the duke of Orleans, the chancellor, and four secretaries of state, assisted.

DISPAUPER. A person suing *in forma pauperis*, is said to be dispaupered, if, before the suit is ended, he has any lands or other estate fallen to him, or if he has any thing to make him lose his privilege. See the article *Forma Pauperis*.

DISPENSARY, or Dispensatory, denotes a book containing the method of preparing the various kinds of medicines used in pharmacy. Such are those of Bauderon, Quercetan, Zwelfer, Charas, Bates, Mesue, Salmon, Lemery, Quincy, &c. but the latest and most esteemed, beside the London and Edinburgh Pharmacopœias, is the Edinburgh New Dispensatory, being an improvement upon that of Dr Lewis's.

Dispensary, or *Dispensatory*, is likewise a magazine or office for selling medicines at prime cost to the poor. The college of physicians maintain three of these in London; one at the college itself in Warwick-lane; another in St Peter's alley, Cornhill; and a third in St Martin's lane. Dispensaries have also been established in several of the principal towns in Scotland and England; particularly in Edinburgh, Dundee, and Kelso; as also at Newcastle upon Tyne: and lately in Philadelphia in Pennsylvania.

DISPENSATION, in law, the granting a license of doing some certain action that otherwise is not permitted.

DISPERSION, in general, signifies the scattering or dissipating something. Hence,

DISPERSION, in optics, the same with the divergency of the rays of light.

Point of DISPERSION, in dioptrics, the point from which refracted rays begin to diverge, where their refraction renders them divergent.

DISPERSION of Inflammation, in medicine and surgery, is removing the inflammation, and restoring the inflamed part to its natural state.

DISPERSION of Mankind, in the history of the world, was occasioned by the confusion of tongues, and took place in consequence of the overthrow of Babel at the birth of Peleg: whence he derived his name; and it appears by the account given of his ancestors, Gen. chap. xi. 10—16. to have happened in the 101st year after the flood according to the Hebrew chronology, and by the Samaritan computation in the 401st. However, various difficulties have been suggested by chronologers concerning the true era of this event. Sir John Marsham and others, in order to reconcile the Hebrew and Egyptian chronologies, maintain a dispersion of mankind before the birth of Peleg. Others, unable to find numbers sufficient for the plantation of colonies in the space of 101 years, according to the Hebrew computation, fix the dispersion towards the end of Peleg's life, thus following the computation of the Jews. Petavius assigns the 153d year after the flood; Cumberland the 180th: and Usher, though he generally refers it to the time of Peleg's birth, in one place assigns the 131st after the flood for this event. Mr Shuckford supposes the dispersion to have been gradual, and to have commenced with the separation of some companies at the birth of Peleg, and to have been completed 31 years after. According to the calculation of Petavius, the number of inhabitants on the earth at the birth of Peleg amounted to 32,768; Cumberland makes them 30,000: Mr Mede states them at 7000 men besides women and children: and Mr Whiston, who supposes that mankind now double themselves in 400 years, and that they doubled themselves between the deluge and the time of David in 60 years at a medium, when their lives were six or seven times as long as they have been since, by his computation produce about 2389; a number much too inconsiderable for the purposes of separating and forming distinct nations. This difficulty induced Mr Whiston to reject the Hebrew and to adopt the Samaritan chronology, as many others have done; which, by allowing an interval of 401 years between the flood and the birth of Peleg, furnishes, by the last mentioned mode of computation, more than 240,000 persons.

As to the manner of the dispersion of the posterity of Noah from the plain of Shinar, it was undoubtedly conducted with the utmost regularity and order. The sacred historian informs us, that they were divided in their lands; every one according to his tongue, according to his family, and according to his nation, Gen. x. 5, 20, 31; and thus, as Mr Mede observes, they were ranged according to their nations, and every nation was ranged by their families; so that each nation had a separate lot, and each family in every nation. The following abstract will serve to give a general idea of their respective settlements: Japhet, Noah's eldest son, had seven sons: *viz* Gomer, whose descendants inhabited those parts of Asia which lie upon the Ægean Sea and Hellespont northward, containing Phrygia, Pontus, Bithynia, and a great part of Galatia. The Galatians, according to Josephus, were called *Gomeræi*; and the Cimmerii, according to Herodotus, occupied this tract of country: and from these Gomerians, Cimmerii, or Celts, Mr Camden derives our ancient Britons, who still retain the name *Cymro* or *Cymru*. Magog, the second son of Japhet, was probably the father of the Scythians on the east and north-east of the Euxine Sea. Madai planted Media, though Mr Mede assigns Macedonia to his share. Javan was the father of the Grecians about Ionia, whose country lies along upon the Mediterranean Sea; the radicals of Javan and Ionia being the same יון. To Tubal and Meshech belonged Cappadocia and the country which lies on the borders of the Euxine Sea; and from them, migrating over the Caucasus, it is supposed the Russians and Moscovites are descended. And Tiras occupied Thrace. The sons of Schem were five: Elam, whose country lay between the Medes and Mesopotamians, and was called by the Gentile writers *Elymais*; and Josephus calls the Elamites the founders of the Persians: Ashur, who was driven out of Shinar by Nimrod, afterwards settled in Assyria, and there built Nineveh and other cities: Arphaxad, who gave name to the country which Ptolemy calls *Arraphacitis*, a province of Assyria, though Josephus makes him the father of the Chaldees: Lud, who inhabited and gave name to the country of Lydia about the river Mæander, remarkble for its windings, in Asia Minor: and Aram, the father of the Syrians. Ham, the youngest son of Noah, had four sons; *viz.* Cush, whose posterity spread into the several parts of Arabia, over the borders of the land of Edom, into Arabia Felix, up to Midian and Egypt: Mizraim, the father of them who inhabited Egypt and other parts of Africa: Phut, to whom Bochart assigns the remaining part of Africa, from the lake Tritonides to the Atlantic Ocean, called *Lybia*: and Canaan, to whom belonged the land of Canaan, whence the Phœnicians derived their origin.

Dr Bryant has advanced a new hypothesis on this subject, and supported it with his usual acuteness and learning. He maintains, that the dispersion as well as the confusion of tongues was local, and limited to the inhabitants of the province of Babel; that the separation and distribution recorded to have taken place in the days of Peleg, Gen. x. 25, 31, 32, which was the result of Divine appointment, occasioned a general migration; and that all the families among the sons of men were concerned in it. The house of Shem, from which the Messiah was to spring, was particularly regarded in this distribution; the portion of his children was near the place of separation; they in general had Asia to their lot; as Japhet had Europe, and Ham the large continent of Africa. But the sons of Chus would not submit to the divine dispensation; they went off under the conduct of Nimrod, and seem to have been for a long time in a roving state. However, at last they arrived at the plains of Shinar; and having ejected Ashur and his sons, who were placed there by Divine appointment, seized his dominions, and laid their the foundation of a great monarchy. But afterwards fearing least they should be divided and scattered abroad, they built the tower of Babel as a landmark to which they might repair; and probably to answer the purposes of an idolatrous temple, or high altar, dedicated to the host of heaven, from which they were never long to be absent. They only, *viz.* the sons of Chus or the Cuthites, and their associates from other families, who had been guilty of rebellion against divine authority, and of wicked ambition and tyranny, were punished with the judgment of confounded speech through a failure in labial utterance, and of the dispersion recorded in Gen. x. 8, 9; in consequence of which they were scattered abroad from this city and tower, without any certain place of destination. The Cuthites invaded Egypt or the land of Mizraim in its infant state, seized the whole country, and held it for some ages in subjection; and they extended likewise to the Indies and Ganges, and still farther into China and Japan. From them the province of Cushan or Goshen in Egypt derived its name. Here they obtained the appellation of *royal shepherds*; and when they were by force driven out of the country, after having been in possession of it for 260 or 280 years, the land which they had been obliged to quit was given to the Israelites, who were also denominated *shepherds*, but should not be confounded with the former or the antecedent inhabitants of Goshen.

DISPLAYED, in heraldry, is understood of the position of an eagle, or any other bird, when it is erect, with its wings expanded or spread forth.

DISPONDEE, in the Greek and Latin poetry, a double spondee or foot, consisting of four long syllables; mǟcēnātēs, conclūdētēs.

DISPOSITION, in Scots law, is that deed or writing which contains the seale or grant of any subject; when applied to heritable subjects, it in some cases gets the name of *charter*, which differs from a disposition in nothing else than a few immaterial forms.

Disposition, in architecture, the just placing the several parts of an edifice according to their nature and office. See Architecture, n° 31, &c.

Disposition, in oratory. See Oratory, Part I.

Disposition, in painting. See Painting.

Disposition, in human nature.—In every man there is somthing original that serves to distinguish him from others, that tends to form a character, and to make him meek or fiery, candid or deceitful, resolute or timorous, cheerful or morose. This original bent, termed *disposition*, must be distinguished from a *principle*: the latter, signifying a law of human nature, makes part of the common nature of man; the former makes part of the nature of this or that man. *Propensity* is a name common to both; for it signifies a principle as well as a disposition.

DISQUISITION (from *dis* and *quæro* "I inquire"), an inquiry into the nature, kinds, and circumstances of any problem, question, or topic; in order to gain a right notion of it, and to discourse clearly about it.

DISSECTION, in anatomy, the cutting up a body with a view of examining the structure and use of the parts. See Anatomy.

Le Gendre observes, that the dissection of a human body, even dead, was held a sacrilege till the time of Francis I. And the same author assures us, he has seen a consultation held by the divines of Salamanca, at the request of Charles V. to settle the question whether or no it were lawful in point of conscience to dissect a human body in order to learn the structure thereof.

DISSEISIN, in law, an unlawful dispossessing a person of his lands or tenements.

DISSEPIMENTUM, in botany, the name by which Linnæus denominates the partitions which in dry seed-vessels, as capsules and pods (siliqua), divide the fruit internally into cells.

DISSENTERS, separatists from the service and worship of any established church.

DISSIDENTS, a denomination applied in Poland to those of the Lutheran, Calvinistic, and Greek profession. The king of Poland engages by the *pacta conventa* to tolerate them in the free exercise of their religion, but they have often had reason to complain of the violation of these promises. See (*History of*) Poland.

DISSIMILITUDE, unlikeness or want of similitude. See the article Resemblance *and dissimilitude*.

DISSIMULATION, in morals, the act of dissembling, by fallacious appearances, or false pretensions.

Good princes regard dissimulation as a necessary vice; but tyrants consider it as a virtue.

It is apparent that secrecy is often necessary, to oppose those who may be willing to circumvent our lawful intentions. But the necessity of precaution would become very rare, were no enterprises to be formed, but such as could be avowed openly. The frankness with which we could then act, would engage people in our interests. Marshal Biron would have saved his life, by dealing ingenuously with Henry IV.

With respect to dissimulation, three things are to be observed; 1. That the characters of those are not to be esteemed, who are reserved and cautious without distinction. 2. Not to make secrets of unimportant matters, 3. To conduct ourselves in such manner, as to have as few secrets as possible.

DISSIPATION, in physics, an insensible loss or consumption of the minute parts of the body; or that flux whereby they fly off, and are lost.

Circle of Dissipation, in optics, is used for that circular space within the retina, which is taken up by one of the extreme pencils or rays issuing from an object.

DISSOLVENT, in general, whatever dissolves or reduces a solid body into such minute parts as to be sustained in a fluid.

The principal dissolvents for metals are aqua-regia and aqua-fortis; for salts, earths, and gums, water; for coral, and other alkaline substances, distilled vinegar or spirits of wine. Dissolvents are the same with what the chemists call *menstruums*. See the article Menstruum.

Universal

Diſſolvent, Diſſolution

Univerſal DISSOLVENT. See the article ALKAHEST.

DISSOLUTION, in phyſics: a diſcontinuation, or analyſis, of the ſtructure of a mixed body; whereby, what was one, and contiguous, is divided into little parts, either homogeneous or heterogeneous.

Diſſolution, then, is a general name for all reductions of concrete bodies into their ſmalleſt parts, without any regard either to ſolidity or fluidity: though in the uſual acceptation of the word among authors, it is reſtrained to the reduction of ſolid bodies into a ſtate of fluidity; which is more properly expreſſed by *ſolution*, as a branch of *diſſolution*.

According to the opinion of Fr. Tertius de Lanis, Boerhaave, and ſome other learned men, the power or faculty of diſſolving is lodged in fire alone. See FIRE and HEAT.

According to this hypotheſis, other fluids commonly ſuppoſed diſſolvents, only produce their effect by means of the fiery ſpicula they abound with; and even air, which is judged a powerful menſtruum, owes all its force to the rays of light diffuſed therein.

Sir Iſaac Newton accounts for all diſſolutions, and the ſeveral phenomena thereof, from the great principle of attraction; and, in effect, the phenomena of diſſolution furniſh a great part of the arguments and conſiderations whereby he proves the reality of that principle. The following is a ſpecimen of that great author's way of philoſophiſing on the ſubject of diſſolution.

"When ſalt of tartar diſſolves by lying in a moiſt place, is not this done by an attraction between the particles of the ſalt of tartar and thoſe of the water which float in the air in form of vapours? and why does not common ſalt, or ſalt-petre, or vitriol, do the like, but for the want of ſuch an attraction? And when aqua-fortis, or ſpirit of vitriol, poured on ſteel-filings, diſſolves the filings with a great heat and ebullition; is not this heat and ebullition effected by a violent motion of the parts? and does not that motion argue, that the acid parts of the liquor ruſh towards the parts of the metal with violence, and run forcibly into its pores; till, getting between the utmoſt particles and the main maſs of metal, they looſen them therefrom, and ſet them at liberty to float off into the water? When a ſolution of iron in aqua-fortis diſſolves lapis calaminaris, and lets go the iron; or a ſolution of copper diſſolves iron immerſed in it, and lets go the copper; or a ſolution of mercury in aqua-fortis poured on iron, copper, tin, or lead, diſſolves the metal, and lets go the mercury; does not this argue, that the acid particles of the aqua-fortis are attracted more ſtrongly by the lapis calaminaris than by iron; by iron than by copper; by copper than by ſilver; and by iron, copper, tin, and lead, than by mercury? And is it not for the ſame reaſon, that iron requires more aqua-fortis to diſſolve it than copper, and copper more than the other metals; and that of all metals iron is diſſolved moſt eaſily, and is moſt apt to ruſt; and next after iron, copper? When aqua-fortis diſſolves ſilver, and not gold; and aqua-regia diſſolves gold, and not ſilver; may it not be ſaid, that aqua-fortis is ſubtile enough to penetrate the pores of gold as well as of ſilver, but wants the attractive force to give it entrance; and the ſame of aqua-regia and ſilver? And when metals are diſſolved in acid menſtruums, and the acids in conjunction with the metal act after a different manner, ſo as that the taſte of the compound is milder than that of the ſimples and ſometimes a ſweet one; is it not becauſe the acids adhere to the metallic particles, and thereby loſe much of their activity? And if the acid be in too ſmall a proportion to make the compound diſſoluble in water; will it not, by adhering ſtrongly to the metal, become unactive, and loſe its taſte, and the compound become a taſteleſs earth? for ſuch things as are not diſſoluble by the moiſture of the tongue are inſipid."

Diſſolution

Dr Friend gives us a mechanical account of diſſolution, in the inſtance of ſalt diſſolved in water, which is the moſt ſimple operation that falls under this head. This motion he aſcribes to that attractive force, which is ſo very extenſive in natural philoſophy, that there is no kind of matter but what is under its influence. It may be obſerved, ſays he, that the corpuſcles of ſalts, which are the moſt ſimple of any, are withal very minute, and for their bulk very ſolid; and therefore exert a very ſtrong attractive force, which *cæteres paribus*, is proportional to the quantity of matter. Hence it comes to paſs that the particles of water are more ſtrongly attracted by the ſaline particles than they are by one another: the particles of water, therefore, cohering but looſely, and being eaſily moveable, approach the corpuſcles of ſalts, and run, as it were, into their embraces: and the motion of them is quicker or ſlower, according to their leſs or greater diſtances; the attractive force in all bodies being ſtrongeſt, at the point of contact. Therefore, if ſalt be thrown into the middle of a diſh full of water, we ſhall find the aqueous particles which are in the middle of the diſh ſharp and pungent to the taſte, but the water upon the ſides of the veſſel almoſt inſipid; ſo that, when ſuch a motion once ariſes, the aqueous particles are carried with an equal force towards the ſalts, and the moment of them is to be eſtimated from the ratio of their weight and celerity conjunctly. By the force of this impulſe, they open to themſelves a paſſage into the pores of the ſalts, which are very numerous; and at length, ſo break and divide their texture, that all coheſion of their parts is deſtroyed: hereupon, being ſeparated, and removed to a convenient diſtance from one another, they are diſperſed, and float here and there about the water.

The ſimple diſſolution of ſaline ſubſtances of every kind in water, may indeed be plauſibly enough explained on the hypotheſis of attraction; but where the diſſolution is attended with heat, the emiſſion of vapour, &c. it ſeems neceſſary to ſeek for ſome other principle than mere attraction to ſolve theſe phenomena. When diluted oil of vitriol, for inſtance, is poured upon iron-filings, a great quantity of vapour ariſes, which, if it was attempted to be confined, would certainly break the containing veſſel.—It is impoſſible to imagine any connection between attraction and the emiſſion of a vapour; and what is ſtill more unaccountable, this vapour is inflammable, though neither the oil of vitriol nor the iron are ſo by themſelves. Another very ſtrong objection againſt the hypotheſis of attraction may be derived from the phenomena of metallic diſſolutions in general; for they do not diſſolve completely in acids, as ſalts do in water. By diſſolution they are always decompoſed, and cannot be recovered in their proper form without a good deal of trouble.

Dissolution

trouble. One metal, indeed, will very often precipitate another from an acid in its metalline form; but this is attended with the decomposition of the second metal; so that this can by no means be reckoned a fair experiment. But, whatever other method is used, the dissolved metal is always recovered in form of an earthy powder, that we could scarcely imagine capable of ever becoming malleable, and assuming the splendid appearance of a metal. Now, if there was a strong attraction between this and the acid, we might very justly conjecture, that the dissolution happened by means of that attraction; but so far from this, after a metal has been dissolved by any acid, and the calx has been separated from it, it is always difficult, and very often impossible, to procure a dissolution of the calx in the same acid. The action of the acid in this case seems not unlike that of fire upon wood or any other inflammable substance. Dry wood, thrown into the fire, burns and flames with great violence; but the same wood reduced to ashes, instead of burning, extinguishes fire already kindled. In like manner, a piece of clear metal thrown into an acid, dissolves with great violence: but the same metal, deprived of its phlogistic principle, and reduced to a calx, cannot be acted upon by acids, in whatever manner they are applied; at least, not without the greatest difficulty; and the more perfect the calx is, *i. e.* the more completely it is deprived of its inflammable principle, the greater the difficulty is of combining it afterwards with an acid.

Another thing in which the dissolution of metals by an acid resembles the burning of combustibles by fire is, that in both cases there is a separation of the principle of inflammability. In the case of oil of vitriol and iron-filings, this is exceedingly obvious; for there the vapour which arises from the mixture takes fire, and explodes with great vehemence. In all other cases it is very easily proved; for the calx is always capable of being revived into metal by the addition of any substance containing phlogiston. The calces prepared by fire, and by precipitation from acids, also resemble one another so much, that in many cases they are scarce to be distinguished.

These considerations seem to favour the hypothesis of Dr Boerhaave; and much more does the following, namely, that almost all metallic solutions produce some degree of sensible heat. In some metals this is very considerable; but the greatest heat producible by an aqueous solution of any substance is by dissolving quicklime in the nitrous acid. The heat here greatly exceeds that of boiling water. In some dissolutions of inflammable matters by a mixture of the vitriolic and nitrous acids, the heat is so great, that the whole mixture takes fire almost instantaneously. Hence the Boerhaavians think they have sufficient grounds to conclude, that fire alone is the agent by which all dissolutions are performed.

These appearances have also been explained on the principles of attraction; and it has been said, that the heat, &c. were owing to nothing but the violent action of the particles of the acid and metal upon each other. But the late discoveries made by Dr Black, with regard to heat, show, that it is capable of remaining concealed in substances for any length of time, and afterwards breaking out in its proper form. It is probable, therefore, that the heat produced in these dissolutions is no other than what existed before, either in the acid or in the metal. But for a full discussion of this subject see the articles COLD, CONGELATION, EVAPORATION, FIRE, HEAT, &c.

Dissonance ‖ Distillation

DISSONANCE, in music. See DISCORD.

DISSYLLABLE, among grammarians, a word consisting only of two syllables: such are nature, science, &c.

DISTAFF, an instrument about which flax is tied in order to be spun.

DISTANCE, in general, an interval between two things, either with regard to time or place. See METAPHYSICS.

Accessible DISTANCES, in geometry, are such as may be measured by the chain, &c. See GEOMETRY.

Inaccessible DISTANCES, are such as cannot be measured by the chain, &c. by reason of some river, or the like, &c. which obstructs our passing from one object to another. See GEOMETRY.

DISTANCE, in astronomy. The distance of the sun, planets, and comets, is found only from their parallax, as it cannot be found either by eclipses or their different phases; for from the theory of the motions of the earth and planets we know, at any time, the proportion of the distances of the sun and planets from us; and the horizontal parallaxes are in a reciprocal proportion to these distances. See ASTRONOMY.

DISTASTE properly signifies an aversion or dislike to certain foods; and may be either constitutional, or owing to some disorder of the stomach.

DISTEMPER, among physicians, the same with DISEASE.

DISTEMPER, in painting, a term used for the working up of colours with something besides water or oil. If the colours are prepared with water, that kind of painting is called *limning*; and if with oil, it is called, *painting in oil*, and simply *painting*. If the colours are mixed with size, whites of eggs, or any such proper glutinous or unctuous matter, and not with oil, then they say it is done in *distemper*.

DISTENSION, in general, signifies the stretching or extending a thing to its full length or breadth.

DISTICH, a couplet of verses making a complete sense. Thus hexameter and pentameter verses are disposed in distichs. There are excellent morals in Cato's distichs.

DISTICHIASIS, in surgery, a disease of the eyelids, when under the ordinary eye-lashes there grows another extraordinary row of hair, which frequently eradicates the former, and, pricking the membrane of the eye, excites pain, and brings on a defluxion.—It is cured by pulling out the second row of hairs with nippers, and cauterizing the pores out of which they issued.

DISTILLATION. See CHEMISTRY, *Index*.

1 Difference between distillers and rectifiers.

The objects of distillation, considered as a trade distinct from the other branches of chemistry, are chiefly spirituous liquors, and those waters impregnated with the essential oil of plants, commonly called *simple distilled* waters. The distilling compound spirits and waters is reckoned a different branch of business, and they who deal in that way are commonly called *rectifiers*. This

Distillation This difference, however, though it exists among commercial people, is not at all founded in the nature of the thing; compound spirits being made, and simple spirits being rectified, by the very same operations by which they are at first distilled, or at least with very trifling alterations.

2 Spirits perfectly flavourless, how obtained.

The great object with every distiller ought to be, to procure a spirit perfectly flavourless, or at least as well freed from any particular flavour as may be; and in Britain the procuring of such a spirit is no easy matter. The only materials for distillation that have been used in large quantitie, are malt and molasses or treacle. Both of these, especially the first, abound with an oily matter, which, rising along with the spirit, communicates a disagreeable flavour to it, and from which it can scarce be freed afterwards by any means whatever.—Some experiments have been made upon carrots, as a subject for the distillers: but these are not as yet sufficiently decisive; nor is it probable, that a spirit drawn from carrots would be at all devoid of flavour, more than one drawn from malt.—To dissipate the essential oil which gives the disagreeable flavour to malt spirits, it has been proposed to inspissate the wort into a rob, or thin extract like a syrup; afterwards to thin it with water, and ferment it in the usual manner. This certainly promises great success; there is no subject we know of that is possessed of any kind of essential oil, but what will part with it by distillation or by long boiling. The inspissating of the wort, however, does not seem to be either necessary or safe to be attempted; for, in this case, there is great danger of its contracting an empyreuma, which never could be remedied. The quantity lost by evaporation, therefore, might be occasionally added, with an equal certainty of dissipating the obnoxious oil. Whether the yield of spirit would be as great in this case as in the other, is a question that can by no means be discussed without further experiments.

3 Essential oil by some thought convertible into spirit.

According to a theory adopted by some distillers, namely, that essential oils are convertible into ardent spirits; and that the more oily any subject is, the greater quantity of spirit is obtainable from it; the practice of dissipating the oil before fermentation must certainly be a loss. But we are too little acquainted with the composition of vinous spirits, to have any just foundation for adopting such theories. Besides, it is certain, that the quantity of ardent spirit producible from any substance, malt for instance, very greatly exceeds the quantity of essential oil which can by any means be obtained from the same; nor do we find that those substances, which abound most in essential oil, yield the greatest quantity of spirits. So far from this, fine sugar, which contains little or no essential oil, yields a great deal of ardent spirit.

4 Directions concerning fermentation.

Previous to the operation of distilling, those of brewing and fermentation are necessary: but as these are fully treated of under the article Brewing, we shall here only observe, that unless the boiling of the wort, before fermentation, is found to dissipate the essential oil, so as to take away the flavour of the malt, there is no necessity for being at the trouble of that operation. The wort may be immediately cooled and fermented. —The fermentation ought always to be carried on as slowly as possible, and performed in vessels closely stopped; only having at the bung a valve pressed down by a spring, which will yield with less force than is sufficient to burst the vessel. It should even be suffered to remain till it has become perfectly fine and transparent; as by this means the spirit will not only be superior in quantity, but also in fragrance, pungency, and vinosity, to that commonly produced. Distillation

5 For distillation

With regard to performing the operation of distilling, there is only one general rule that can be given, namely, to let the heat, in all cases, be as gentle as possible. Accidents will be effectually prevented by having the worm of a proper wideness, and by rectifying the spirits in a water-bath; which, if sufficiently large, will perform the operation with all the dispatch requisite for the most extensive business.—The vessel in which the rectification is performed, ought to be covered with water up to the neck, and to be loaded with lead at the bottom, so that it may sink in the water. Thus the operation will go on as quickly as if it was on an open fire, and without the least danger of a miscariage; nor will it ever be necessary to make the water in the bath come to a boiling heat.

6 For rectification.

As the end of rectification is to make the spirit *clean* as well as *strong*, or to deprive it of the essential oil as well as the aqueous part, it will be proper to have regard to this even in the first distillation. For this purpose, the spirit, as it first comes over, should be received into a quantity of cold water: as by this means the connection betwixt it and the oily matter will be considerable lessened. For the same reason, after it has been once rectified in the water-bath, it should be again mixed with an equal quantity of water, and distilled a second time. Thus the spirit will be freed from most of the oily matter, even though it hath been very much impregnated with it at first. It is necessary to observe, however, that by using such a quantity of water, a considerable part of the water will be left in the residuum of each rectification. All these residuums, therefore, must be mixed together, and distilled on an open fire, with a brisk heat, that the remainder of the spirit may be got out.

After the spirit has been distilled once or twice in this manner from water, it may be distilled in a water-bath without any addition; and this last rectification will free it from most of the water it contains. But if it is required to be higly dephlegmated, a quantity of pure and dry salt of tartar must be added. The attraction betwixt this salt and water is greater than that betwixt water and spirit of wine. The salt therefore imbibes the water contained in the spirit, and sinks with it to the bottom. The spirit, by a single distillation, may then be rendered perfectly free from water, but there is great danger of some of the alkaline salt rising along with it, and impregnating it with what is called an *urinous flavour*. When this once happens, it is impossible to be remedied; and the only way to prevent it is, to make the heat with which the spirit is distilled as gentle as possible. It hath been proposed, indeed, to prevent the rising of any thing alkaline, by the admixture of some calcined vitriol, sal catharticus amarus, or other imperfect neutral salt; but this can scarce be supposed to answer any good purpose, as the alkali unites itself with the oily matter of the spirit, and forms a kind of saponaceous compound, which is not so easily affected by the acid of the vitriol or other salt, especially as these salts will not dissolve in the spirit itself.

One

Distillation

7 Of imitating foreign spirits.

One very great desideratum among the distillers of Britain is, a method of imitating the foreign spirits, brandy, rum, gin, &c. to a tolerable degree of perfection; and notwithstanding the many attempts that are daily made for this purpose, the success in general hath been but very indifferent. On this subject, Mr Cooper hath the following observations, in his Complete System of Distillation; which, as they are applicable to all other spirits as well as brandy, we shall here transcribe.—"The general method of distilling brandies in France need not be formally described, as it differs in nothing from that practised here in working from malt-wash or molases: nor are they in the least more cleanly or exact in the operation. They only observe more particularly to throw in a little of the natural ley into the still along with the wine, as finding this gives their spirit the flavour for which it is generally admired abroad.—But, though brandy is extracted from wine, experience tells us that there is a great difference in the grapes from which the wine is made. Every soil, every climate, every kind of grapes, varies with regard to the quantity and quality of the spirits extracted from them. There are some grapes which are only fit for eating; others for drying, as those of Damascus, Corinth, Provence, and Avignon, but not fit to make wine.—Some wines are very proper for distillation, and others much less so. The wines of Languedoc and Provence afford a great deal of brandy by distillation, when the operation is performed on them in their full strength. The Orleans wines, and those of Blois, afford yet more: but the best are those of the territories of Cogniac and Andaye; which are, however, in the number of those the least drunk in France. Whereas those of Burgundy and Champagne, though of a very fine flavour, are improper, because they yield but very little in distillation.

8 Method of making brandies in France.

"It must also be farther observed, that all the wines for distillation, as those of Spain, the Canaries, of Alicant, of Cyprus, of St Peres, of Toquet, of Grave, of Hungary, and others of the same kind, yield very little brandy by distillation; and consequently would cost the distiller considerably more than he could sell it for. What is drawn from them is indeed very good, always retaining the saccharine quality and rich flavour of the wine from whence it is drawn; but as it grows old, this flavour often becomes aromatic, and is not agreeable to all palates.

"Hence we see that brandies always differ according as they are extracted from different species of grapes. Nor would there be so great a similarity as there is between the different kinds of French brandies, were the strongest wines used for this purpose: but this is rarely the case; the weakest and lowest flavoured wines only are distilled for their spirit, or such as prove absolutely unfit for any other use.

"A large quantity of brandy is distilled in France during the time of the vintage; for all those poor grapes that prove unfit for wine, are usually first gathered, pressed, their juice fermented, and directly distilled. This rids their hands of their poor wines at once, and leaves their casks empty for the reception of better. It is a general rule with them not to distil wine that will fetch any price as wine; for, in this state, the profits upon them are vastly greater than when reduced to brandies. This large stock of small wines, with which they are almost over-run in France, sufficiently accounts for their making such vast quantities of brandy in that country, more than in others which lie in warmer climates and are much better adapted to the production of grapes.—Nor is this the only fund of their brandies: for all the wine that turns eager, is also condemned to the still; and, in short, all that they can neither export nor consume at home, which amounts to a large quantity; since much of the wine laid in for their family provision is so poor as not to keep during the time of spending.

Distillation

9 How brandy may be imitated in Britain.

"Hence many of our English spirits, with proper management, are convertible into brandies that shall hardly be distinguished from the foreign in many respects, provided the operation be neatly performed.

"The common method of rectifying spirits from alkaline salts destroys their vinosity, and in its stead introduces an urinous or lixivious taste. But as it is absolutely necessary to restore, or at least to substitute in its room, some degree of vinosity, several methods have been proposed, and a multitude of experiments performed, in order to discover this great desideratum. But none has succeeded equal to the spirit of nitre; and accordingly this spirit, either strong or dulcified, has been used by most distillers to give an agreeable vinosity to their spirits, several difficulties, however, occur in the method of using it; the principal of which is, its being apt to quit the liquor in a short time, and consequently depriving the liquor of that vinosity it was intended to give. In order to remove this difficulty, and prevent the vinosity from quitting the goods, the dulcified spirit of nitre, which is much better than the strong spirit, should be prepared by a previous digestion, continued for some time, with alcohol; the longer the digestion is continued the more intimately will they be blended, and the compound rendered the milder and softer.

"After a proper digestion, the dulcified spirit should be mixed with the brandy, by which the vinosity will be intimately blended with the goods, and not disposed to fly off for a very considerable time.—No general rule can be given for the quantity of this mineral acid requisite to be employed; decause different proportions of it are necessary in different spirits. It should, however, be carefully attended to, that though a small quantity of it will undoubtedly give an agreeable vinosity resembling that naturally found in the fine subtile spirits drawn from wines, yet an over large dose of it will not only cause a disagreeable flavour, but also render the whole design abortive, by discovering the imposition. Those, therefore, who endeavour to cover a foul taste in goods by large doses of dulcified spirit of nitre, will find themselves deceived.

"But the best and indeed the only method of imitating French brandies to perfection, is by an essential oil of wine; this being the very thing that gives the French brandies their flavour. It must, however, be remembered, that, in order to use even this ingredient to advantage, a pure tasteless spirit must first be procured; for it is ridiculous to expect that this essential oil should be able to give the agreeable flavour of French brandies to our fulsome malt spirit, already loaded with its own nauseous oil, or strongly impregnated with a lixivious taste from the alkaline salts used

in

in rectification. How a pure insipid spirit may be obtained, has already been considered; it only therefore remains to show the method of procuring this essential oil of wine, which is this:

"Take some cakes of dry wine-lees, such as are used by our hatters, dissolve them in six or eight times their weight of water, distil the liquor with a slow fire, and separate the oil with a separating glass; reserving for the nicest uses only that which comes over first, the succeeding oil being coarser and more resinous.—Having procured this fine oil of wine, it may be mixed into a quintessence with pure alcohol: by which means it may be preserved a long time fully possessed of all its flavour and virtues; but, without such management, it will soon grow resinous and rancid.

"When a fine essential oil of wine is thus procured, and also a pure and insipid spirit, French brandies may be imitated to perfection, with regard to the flavour. It must, however, be remembered, and carefully adverted to, that the essential oil be drawn from the same kind of lees as the brandy to be imitated was procured from; we mean, in order to imitate Coniac brandy, it will be necessary to distil the essential oil from Coniac lees; and the same for any other kind of brandy. For, as different brandies have different flavours, and as these flavours are entirely owing to the essential oil of the grape, it would be preposterous to endeavour to imitate the flavour of Coniac brandy with an essential oil procured from the lees of Bourdeaux wine.—When the flavour of the brandy is well imitated by a proper dose of the essential oil, and the whole reduced into one simple and homogeneous fluid, other difficulties are still behind: The flavour, though the essential part, is not, however, the only one; the colour, the proof, and the softness, must also be regarded, before a spirit that perfectly resembles brandy can be procured. With regard to the proof, it may be easily hit, by using a spirit rectified above proof; which after being intimately mixed with the essential oil of wine, may be let down to a proper standard with fair water. And the softness may, in a great measure, be obtained by distilling and rectifying the spirit with a gentle fire; and what is wanting of this criterion in the liquor when first made, will be supplied by time; for it must be remembered, that it is time alone that gives this property to French brandies; they being at first acrid, foul, and fiery. But, with regard to the colour, a particular method is required to imitate it to perfection.

10 Spirits how coloured.

"The art of colouring spirits owes its rise to observations on foreign brandies. A pipe of French brandy that has acquired by age a great degree of softness and ripeness, is observed at the same time to have acquired a yellowish brown colour; and hence our distillers have endeavoured to imitate this colour in such spirits as are intended to pass for French brandy. And in order to this, a great variety of experiments have been made on different substances. But in order to know a direct and sure method of imitating this colour to perfection, it is necessary we should be informed whence the French brandies themselves acquire their colour. This discovery is very easily made. The common experiment of trying whether brandy would turn blackish with a solution of iron, shows that the colour is owing to some of the resinous matter of the oak-cask dissolved in the spirit. There can be no difficulty, therefore, in imitating this colour to perfection. A small quantity of the extract of oak, or the shavings of that wood, properly digested, will furnish us with a tincture capable of giving the spirit any degree of colour required But it must be remembered, that as the tincture is extracted from the cask by brandy, that is, alchol and water, it is necessary to use both in extracting the tincture; for each of these dissolves different parts of the wood. Let, therefore, a sufficient quantity of oak shavings be digested in strong spirit of wine, and also at the same time other oak-shavings be digested in water; and when the liquors have acquired a strong tincture from the oak, let both be poured off from the shavings into different vessels, and both placed over a gentle fire till reduced to the consistence of treacle. In this condition let the two extracts be intimately mixed together; which may be effectually done by adding a small quantity of loaf-sugar, in fine powder, and rubbing the whole well together. By this means a liquid essential extract of oak will be procured, and always ready to be used as occasion shall require.

"There are other methods in use for colouring brandies; but the best, besides the extract of oak abovementioned, are treacle and burnt sugar. The treacle gives the spirit a fine colour, nearly resembling that of French brandy; but as its colour is dilute, a large quantity must be used: this is not, however, attended with any bad consequences; for notwithstanding the spirit is really weakened by this addition, yet the bubble proof, the general criterion of spirits, is greatly mended by the tenacity imparted to the liquor by the treacle. The spirit also acquires from the mixture a sweetish or luscious taste, and a fullness in the mouth; both which properties render it very agreeable to the palates of the common people, who are in fact the principal consumers of these spirits. A much smaller quantity of burnt sugar than of treacle will be sufficient for colouring the same quantity of spirits: the taste is also very different; for instead of the sweetness imparted by the treacle, the spirit acquires from the burnt sugar an agreeable bitterness, and by that means recommends itself to nicer palates, which are offended by a luscious spirit. The burnt sugar is prepared by dissolving a proper quantity of sugar in a little water, and scorching it over the fire till it acquires a black colour. Either treacle or burnt sugar will nearly imitate the genuine colour of old French brandy; but neither of them will succeed when put to the test of the vitriolic solution.

"The spirit distilled from molasses or treacle is very clean or pure. It is made from common treacle dissolved in water, and fermented in the same manner as the wash for the common malt spirit. But if some particular art is not used in distilling this spirit, it will not prove so vinous as the malt spirit, but more flat and less pungent and acid, though otherwise much cleaner tasted, as its essential oil is of a much less offensive flavour. Therefore, if good fresh wine lees, abounding in tartar, be added and duly fermented with the molasses, the spirit will acquire a much greater vinosity and briskness, and approach much nearer to the nature of foreign spirits. Where the molasses spirit is brought to the common proof-strength, if it is found not to have a sufficient vinosity, it will be very proper to add some good dulcified spirit of nitre; and if the spirit be clean worked, Distillation worked, it may, by this addition only, be made to paſs on ordinary judges for French brandy. Great quantities of this ſpirit are uſed in adulterating forign brandy, rum, and arrack. Much of it is alſo uſed alone in making cherry-brandy and other drams by infuſion; in all which many, and perhaps with juſtice, prefer it to foreign brandies. Molaſſes, like all other ſpirits, is entirely colourleſs when firſt extracted; but diſtillers always give it as nearly as poſſible the colour of foreign ſpirits."

11 Rum how imitated.

If theſe principles hold good, the imitation of foreign ſpirits of all kinds muſt be an eaſy matter. It will only coſt the procuring of ſome of thoſe ſubſtances from which the ſpirit is drawn: and diſtilling this with water, the eſſential oil will always give the flavour deſired. Thus, to imitate Jamaica rum, it will only be neceſſary to procure ſome of the tops, or other uſeleſs parts, of the ſugar-canes; from which an eſſential oil being drawn, and mixed with clean molaſſes ſpirit, will give it the true flavour. The principal difficulty muſt lie in procuring a ſpirit totally, or nearly, free of all flavour of its own. The ſpirit drawn from the refuſe of a ſugar-houſe is by our author commended as ſuperior to that drawn from molaſſes: though even this is not entirely devoid of ſome kind of flavour of its own; nor indeed is that drawn from the beſt refined ſugar entirely flavourleſs. It is very probable, therefore that to procure an abſolutely flavourleſs ſpirit is impoſſible. The only method, therefore, of imitating foreign ſpirits is, by chooſing ſuch materials as will yield a ſpirit flavoured as much like them as poſſible. The materials moſt recommended by our author in this caſe, and probably the beſt that can be uſed, are raiſins. Concerning theſe he gives the following directions: "In order to extract this ſpirit, the raiſins muſt be infuſed in a proper quantity of water, and fermented in the manner already directed. When the fermentation is completed, the whole is to be thrown into the ſtill, and the ſpirit extracted by a ſtrong fire. The reaſon why we here direct a ſtrong fire is, becauſe by that means a greater quantity of the eſſential oil will come over the helm with the ſpirit, which will render it fitter for the diſtiller's purpoſe: for this ſpirit is commonly uſed to mix with common malt goods: and it is ſurpriſing how far it will go in this reſpect, ten gallons of it being often ſufficient to give a determining flavour and agreeable vinoſity to a whole piece of malt ſpirits. It is therefore well worth the diſtiller's while to endeavour at improving the common method of extracting ſpirits from raiſins; and perhaps the following hint may merit attention. When the fermentation is compleated, and the ſtill charged with fermented liquor as above directed, let the whole be drawn off with as briſk a fire as poſſible; but, inſtead of the caſk or can generally uſed by diſtillers for a receiver, let a large glaſs, called by chemiſts a *ſeparating glaſs*, be placed under the noſe of the worm, and a common receiver applied to the ſpout of the ſeparating glaſs: by this means the eſſential oil will ſwim upon the top of the ſpirit, or rather low wine, in the ſeparating glaſs, and may be eaſily preſerved at the end of the operation. The uſe of this limpid eſſential oil is well known to diſtillers; for in this reſides the whole flavour, and conſequently may be uſed to the greateſt advantage in giving that diſtinguiſhing taſte and true vinoſity to the common malt ſpirits. After the oil is ſeparated from the low-wine, the liquor may be rectified in balneo mariæ into a pure and almoſt taſtleſs ſpirit, and therefore well adapted to make the fineſt compound cordials, or to imitate or mix with the fineſt French brandies, arracks, &c. In the ſame manner a ſpirit may be obtained from cyder. But as its particular flavour is not ſo deſirable as that obtained from raiſins, it ſhould be diſtilled in a more gentle manner, and carefully rectified according to the directions we have already given."

12 Raiſins the beſt material for procuring pure ſpirit.

13 Directions for diſtilling compound ſpirits.

Theſe directions may ſuffice for the diſtillation of any kind of ſimple ſpirits. The diſtillation of compound ones depends on the obſervation of the following general rules, which are very eaſy to be learned and practiſed.

1. The artiſt muſt always be careful to uſe a well cleanſed ſpirit, or one freed from its own eſſential oil. For, as a compound water is nothing more than a ſpirit impregnated with the eſſential oil of the ingredients, it is neceſſary that the ſpirit ſhould have depoſited its own.

2. Let the time of previous digeſtion be proportioned to the tenacity of the ingredients, or the ponderoſity of their oil.

3. Let the ſtrength of the fire alſo be proportioned to the ponderoſity of the oil intended to be raiſed with the ſpirit.

4. Let only a due proportion of the fineſt parts of the eſſential oil be united with the ſpirit; the groſſer and leſs fragrant parts of the oil not giving the ſpirit ſo agreeable a flavour, and at the ſame time rendering it unſightly. This may in a great meaſure be effected by leaving out the faints, and making up to proof with fine ſoft water in their ſtead.

A careful obſervation of theſe four rules will render this part of diſtillation much more perfect than it is at preſent. Nor will there be any occaſion for the uſe of burnt alum, white of eggs, iſinglaſs, &c. to fine down cordial waters; for they will preſently be fine, ſweet, and pleaſant taſted, without any further trouble. We ſhall now ſubjoin particular receipts for making ſome of thoſe compound waters, or ſpirits, that are moſt commonly to be met with, and are in the moſt general eſtimation.

14 Receipts for a number of compound ſpirits.

Strong Cinnamon-water. Take eight pounds of fine cinnamon bruiſed, 17 gallons of clean rectified ſpirit, and two gallons of water. Put them into your ſtill, and digeſt them 24 hours with a gentle heat; after which draw off 16 gallons with a prety ſtrong heat.— A cheaper ſpirit, but of an inferior quality, may be obtained by uſing caſſio lignea inſtead of cinnamon. If you would dulcify your cinnamon water, take double-refined ſugar in what quantity you pleaſe; the general proportion is about two pounds to a gallon; and diſſolve it in the ſpirit, after you have made it up proof with clean water. One general caution is here neceſſary to be added; namely, that near the end of the operation, you carefully watch the ſpirit as it runs into the receiver, in order to prevent the faints from mixing with the goods. This you may diſcover by often catching ſome of it as it runs from the worm in a glaſs and obſerving whether it is fine and tranſparent; for as ſoon as ever the faints begin to riſe, the ſpirit will have an azure or bluiſh caſt. As ſoon as this alteration

Distillation tion in colour is perceived, the receiver must be immediately changed; for if the faints are suffered to mix themselves with the rest, the value of the goods will be greatly lessened.—Here we may observe, that the distillers call such goods as are made up proof, *double goods;* and those below proof, single.

Clove-water. Take of cloves bruised, four pounds; pimento, or all-spice, half a pound; proof-spirit, 16 gallons. Digest the mixture 12 hours in a gentle heat, and then draw off 15 gallons with a pretty brisk fire. The water may be coloured red, either by a strong tincture of cochineal, alkanet, or corn-poppy flowers. It may be dulcified at pleasure with double refined sugar.

Lemon-water. Take of dried lemon-peel, four pounds; clean proof-spirit, ten gallons and a half, and one gallon of water. Draw off ten gallons by a gentle fire, and dulcify with fine sugar.

Citron-water. Take of dry yellow rhinds of citrons, three pounds; of orange peel, two pounds; nutmegs bruised, three quarters of a pound; clean proof spirit, ten gallons and a half; water, one gallon: digest with a gentle heat; then draw off ten gallons in balneo mariæ, and dulcify with fine sugar.

Aniseed-water. Take of aniseed bruised, two pounds; proof-spirit, 12 gallons and a half; water, one gallon: draw off ten gallons with a moderate fire.—This water should never be reduced below proof; because the large quantity of oil with which it is impregnated, will render the goods milky and foul when brought down below proof. But if there is a necessity for doing this, their transparency may be restored by filtration.

Orange-water. Take of the yellow part of fresh orange-peel, five pounds; clean proof-spirit, ten gallons and a half; water, two gallons: draw off ten gallons with a gentle fire.

Cedrat-water. The cedrat is a species of citron, and very highly esteemed in Italy where it grows naturally. The fruit is difficult to be procured in this country; but as the essential oil is often imported from Italy, it may be made with it according to the following receipt.—Take of the finest loaf-sugar reduced to powder, a quarter of a pound; put it into a glass mortar, with 120 drops of the essence of cedrat; rub them together with a glass pestle; and put them into a glass alembic, with a gallon of fine proof-spirits and a quart of water. Place the alembic in balneo mariæ, and draw off one gallon, or till the faints begin to rise; and dulcify with fine sugar. This is reckoned the finest cordial yet known; it will therefore be necessary to be particularly careful that the spirit is perfectly clean, and, as much as possible, freed from any flavour of its own.

Orange Cordial-water, or *Eau de Bigarade.* Take the outer or yellow part of the peels of 14 bigarades, (a kind of oranges); half an ounce of nutmegs, a quarter of an ounce of mace, a gallon of fine proof-spirit, and two quarts of water. Digest all these together two days in a close vessel; after which draw off a gallon with a gentle fire, and dulcify with fine sugar. This cordial is greatly esteemed abroad, but is not so well known in this country.

Ros Solis Take of the herb called *Ros Solis,* picked clean, four pounds; cinnamon, cloves, and nutmegs, of each three ounces and a half; marigold flowers, one pound; caraway-seeds, ten ounces; proof-spirit, ten gallons; water, three gallons. Distil with a pretty strong fire, till the faints begin to rise. Then take of liquorice-root sliced, half a pound; raisins stoned, two pounds; red saunders, half a pound: digest these three days in two quarts of water; then strain out the clear liquor, in which dissolve three pounds of fine sugar, and mix it with the spirit drawn by distillation.

Usquebaugh. Take nutmegs, cloves, and cinnamon, of each two ounces; the seeds of anise, caraway, and coriander, of each four ounces; of liquorice-root sliced, half a pound. Bruise the seeds and spices; and put them, together with the liquorice, into the still with 11 gallons of proof-spirits, and two gallons of water. Distil with a pretty brisk fire till the faints begin to rise. But, as soon as the still begins to work, fasten to the nose of the worm two ounces of English saffron tied up in a cloth, that the liquor may run thro' it, and extract all its tincture; and in order to this, you should frequently press the saffron with your fingers. When the operation is finished, dulcify your goods with fine sugar.

Ratafia. Is a liquor prepared from different kinds of fruits, and is of different colours according to the fruits made use of. Of red ratafia there are three kinds, the fine, the dry or sharp, and the common. The fruits most proper for making red ratafia, are the black heart-cherry, the common red cherry, the black cherry, the mery or honey-cherry, the strawberry, the raspberry, the red gooseberry, and the mulberry. These fruits should be gathered when in their greatest perfection, and the largest and most beautiful of them chosen for the purpose.—The following is a receipt for making red ratafia, fine and soft. Take of the black heart-cherries 24 pounds; black cherries, four pounds; raspberries and strawberries, of each three pounds. Pick the fruits from their stalks, and bruise them; in which state let them continue 12 hours: press out the juice; and to every pint of it add a quarter of a pound of sugar. When the sugar is dissolved, run the whole through the filtrating bag, and add to it three quarts of clean proof-spirits. Then take of cinnamon, four ounces; of mace, one ounce; and of cloves, two drams. Bruise these spices; put them into an alembic with a gallon of clean proof-spirits and two quarts of water, and draw off a gallon with a brisk fire. Add as much of this spicy spirit to your ratafia as will render it agreeable to your palate; about one-fourth is the usual proportion.

Ratafia made according to the above receipt will be of a very rich flavour and elegant colour. It may be rendered more or less of a spicy flavour, by adding or diminishing the quantity of spirit distilled from the spices.—Some, in making ratafia, suffer the expressed juices of their fruits to ferment several days: by this means the vinosity of the ratafia is increased; but, at the same time, the elegant flavour of the fruits is greatly diminished. Therefore, if the ratafia is desired stronger or more vinous, it may be done by adding more spirits to the expressed juice; by which means the flavour of the fruits may be preserved, as well as the ratafia rendered stronger. It is also a method with some to tie the spices in a linen bag, and suspend them in the ratafia.

tafia. But if this method is taken, it will be necessary to augment the quantity of spirit first added to the expressed juice. There is no great difference in the two methods of adding the spices, except that by suspending them in the ratafia the liquor is rendered less transparent.

Dry or sharp Ratafia. Take cherries and gooseberries, of each 30 pounds; mulberries, seven pounds; raspberries, ten pounds. Pick all these fruits clean from their stalks, &c. bruise them, and let them stand 12 hours; but do not suffer them to ferment. Press out the juice, and to every point add three ounces of sugar. When the sugar is dissolved, run it through the filtrating bag, and to every five pints of liquor add four pints of clean proof-spirit; together with the same proportion of spirit drawn from the spices in the foregoing composition.

Common Ratafia. Take of nutmegs, eight ounces; bitter almonds, ten pounds: Lisbon sugar, eight pounds; ambergrease, ten grains: infuse these ingredients three days in ten gallons of clean proof-spirit, and filter through a flannel bag for use. The nutmegs and bitter almonds must be bruised, and the ambergrease rubbed with the Lisbon sugar in a marble mortar, before they are infused in the spirit.

Gold Cordial. Take of the roots of angelica, four pounds; raisins stoned, two pounds; coriander seeds, half a pound; caraway-seeds and cinnamon, of each half a pound: cloves, two ounces; figs and liquorice-root, of each one pound; proof-spirit, eleven gallons; water, two gallons. The angelica, liquorice, and figs, must be sliced before they are added. Digest two days; and draw off by a gentle heat till the faints begin to rise; hanging in a piece of linen, fastened to the mouth of the worm, an ounce of English saffron. Then dissolve eight pounds of sugar in three quarts of rose-water, and add to it the distilled liquor.—This liquor derives its name of *Gold Cordial*, from a quantity of leaf-gold being formerly added to it; but this is now generally disused, as it cannot possibly add any virtue.

Cardamum, or *All-fours.* Take of pimento, caraway, and coriander seeds, and lemon-peel, each three pounds; of malt spirits, eleven gallons; water, three gallons. Draw off with a gentle fire, dulcify with common sugar, and make up to the strength desired with clear water.—This is a dram greatly used by the poorer sort of people in some countries.

Geneva. There was formerly sold in the apothecaries shops a distilled spirituous water of juniper; but the vulgar being fond of it as a dram, the distillers supplanted the apothecaries, and sold it under the name of *Geneva.* The common kind, however, is not made from juniper-berries, but from oil of turpentine; and indeed it is surprising, that people should accustom themselves to drink such liquors for pleasure.—The receipt for making this kind of spirit, sold in the ginshops at London, is as follows. Take of the ordinary malt spirits, ten gallons; oil of turpentine, two ounces; bay-salt, three handfuls. Draw of by a gentle fire till the faints begin to rise; and make up your goods to the strength required with clear water.

The best kind is made by the following recipe.—Take of juniper-berries, three pounds; proof-spirit, ten gallons; water, four gallons: Draw off by a gentle fire till the faints begin to rise, and make up your goods to the strength required with clean water.

There is a sort of this liquor called *Hollands Geneva*, from its being imported from Holland, which is greatly esteemed.—The ingredients used by the Dutch are the same with those given in the last recipe; only instead of malt-spirits, they use French brandy. But from what has been already observed concerning the nature of these kind of spirits, it is easy to see, that by the help of a well rectified spirit, geneva may be made in Britain at least nearly equal to the Dutch, provided it is kept to a proper age; for all spirituous liquors contract a softness and mellowness by age, impossible to be imitated any other way.

DISTILLERY, the art of distilling brandy and other spirits. This art was first brought into Europe by the Moors of Spain, about the year 1150: they learned it of the African Moors, who had it from the Egyptians: and the Egyptians are said to have practised it in the reign of the emperor Dioclesian, though it was unknown to the ancient Greeks and Romans. See DISTILLATION, and FERMENTATION.

DISTINCTION, in logic, is an assemblage of two or more words, whereby disparate things, or their conceptions, are denoted.

DISTORTION, in medicine, is when any part of the human body remarkably deviates from its natural shape or position. Distortions of different parts may arise either from a convulsion or palsy; though sometimes a terrible distortion in the shape of the whole body hath arisen merely from carelessness and ill habits. Mr Winslow, in the memoirs of the Academy of Sciences at Paris, gives a very remarkable account of a lady of quality, whom he had known to be perfectly straight for several years; but who taking afterwards to a sedentary course of life, got a custom of dressing herself very carelessly, and of leaning as she sat, either forwards or to a side. It was not many months before she found it painful and troublesome to stand or sit upright; and soon afterwards she found an inequality in the lower part of the back-bone. Alarmed at this, she consulted the gentleman who gave the account. To prevent the increase of the malady, he ordered her to wear a particular sort of jumps instead of stays, and had a pad of a proper size applied: but this was soon neglected; and the consequence was, that in a little time the back-bone became more and more crooked, and at length bent itself sidewise in two contrary directions, so as to represent the figure of the Roman S; and the lady, still refusing to take the proper measures, lost a fourth part of her height; and continued for the remainder of her life, not only crooked from right to left and from left to right, but so oddly folded together, that the first of the false ribs on one side approached very near the crest of the os ilium on that side, and the viscera of the lower belly became strangely pushed out of their regular places to the opposide side; and the stomach itself was so strongly compressed, that whatever she swallowed seemed to her to fall into two separate cavities.

DISTRESS, in its ordinary acceptation, denotes calamity, misery, or painful suffering.

The contemplation of DISTRESS, *a source of pleasure.* On this subject we have a very pleasing and ingenious essay by Dr Barnes, in the Memoirs of the Literary and

Distress.

and Philosophical Society of Manchester *. It is introduced with the following motto:

* Vol. I. p. 144, &c.

Suave mari magno, turbantibus æquora ventis,
E terrâ alterius magnum spectare periclum.
Non quia vexari quenquam est jucunda voluptas;
Sed quibus ipse malis careas, quia cernere suave est.
LUCRETIUS.

"The pleasure here described by the poet, and of which he has mentioned so striking and apposite an instance, may perhaps at first seem of so singular and astonishing a nature, that some may be disposed to doubt of its existence. But that it does exist, in the case here referred to, and in many others of a similar kind, is an undoubted fact; and it may not appear an useless or disagreeable entertainment, to trace its source in the human breast, together with the final cause for which it was implanted there by our benevolent Creator.

"Shall I, it may be said, feel complacency in beholding a scene in which many of my fellow creatures are agonizing with terror, whilst I can neither diminish their danger, nor, by my sympathy, divide their anguish? At the sight of another's wo, does not my bosom naturally feel pain? Do I not share in his sensations? And is not this strong and exquisite sensibility intended by my Maker to urge me on to active and immediate assistance? These sensations are indeed attended with a noble pleasure, when I can, by friendly attention, or by benevolent communication, soothe the sorrows of the poor mourner, snatch him from impending danger, or supply his pressing wants. But in general, where my sympathy is of no avail to the wretched sufferer, I fly from the spectacle of his misery, unable or unwilling to endure a pain which is not allayed by the sweet satisfaction of doing good."

It will be necessary, in answer to these objections, in the first place to prove the reality of the feeling, the cause of which, in the human constitution, we here attempt to explore.

Mr Addison, in his beautiful papers on the Pleasures of the Imagination, has observed, "that objects or scenes, which, when real, give disgust or pain, in description often become beautiful and agreeable. Thus, even a dunghill may, by the charms of poetic imagery, excite pleasure and entertainment. Scenes of this nature, dignified by apt and striking description, we regard with something of the same feelings with which we look upon a dead monster.

———————*Informe cadaver*
Protrahitur: nequeunt expleri corda tuendo
Terribiles oculos, vultum, villosaque setis
Pectora semiferi, atque extinctos faucibus ignes. VIRGIL.

"This (he observes) is more particularly the case, where the description raises a ferment in the mind and works with violence upon the passions. One would wonder (adds he) how it comes to pass, that passions, which are very unpleasant at all other times, are very agreeable when excited by proper description; such as terror, dejection, grief, &c. This pleasure arises from the reflection we make upon ourselves, whilst reading it, that we are not in danger from them. When we read of wounds, death, &c. our pleasure does not rise so properly from the grief which these melancholy descriptions give us, as from the secret comparison we make of ourselves with those who suffer. We should not feel the same kind of pleasure, if we actually saw a person lying under the tortures that we meet with in a description."

And yet, upon the principle assigned by this amiable writer, we might feel the same, or even higher pleasure, from the actual view of distress, than from any description; because the comparison of ourselves with the sufferer would be more vivid, and consequently the feeling more intense. We would only observe, that the cause which he assigns for this pleasure is the very same with that assigned by Lucretius in our motto. Mr Addison applies it to the description; the poet, to the actual contemplation of affecting scenes. In both the pleasure is supposed to originate in selfishness. But wherever the social passions are deeply interested, as they are here supposed to be, from the pathetic description, or the still more pathetic survey, of the sufferings of another, the sympathetic feelings will of themselves, at once, and previously to all reflection, become a source of agreeeble and tender emotions. They will thus dignify and enhance the satisfaction, if any such be felt, arising merely from the consideration of our own personal security. And the more entirely we enter into the scene, by losing all ideas of its being either past or fabulous, the more perfectly we forget ourselves, and are absorbed in the feeling,—the more exquisite is the sensation.

But as our subsequent speculations will chiefly turn upon the pleasure derived from real scenes of calamity, and not from those which are imaginary, it may be expected that we produce instances in proof that such pleasure is felt by persons very different in their taste and mental cultivation.

We shall not mention the horrid joy with which the savage feasts his eye upon the agonies and contortions of his expiring prisoner—expiring in all the pains which artificial cruelty can inflict! Nor will we recur to the almost equally savage sons of ancient Rome, when the majesty of the Roman people could rush, with eagerness and transport, to behold hundreds of gladiators contending in fatal conflict, and probably more than half the number extended, weltering in blood and writhing in agony, upon the plain. Nor will we mention the Spanish bull-feasts; nor the fervent acclamations of an English mob around their fellow creatures, when engaged in furious battle, in which it is possible that some of the combatants may receive a mortal blow, and be hurried in this awful state to the bar of his Judge. Let us survey the multitudes which, in every part of the kingdom, always attend an execution. It may perhaps be said, that in all places the vulgar have little of the sensibility and tenderness of more polished bosoms. But, in the last mentioned instance, an execution, there is no exultation in the sufferings of the poor criminal. He is regarded by every eye with the most melting compassion. The whole assembly sympathizes with him in his unhappy situation. An awful stillness prevails at the dreadful moment. Many are wrung with unutterable sensations; and prayer and silence declare, more loudly than any language could, the interest they feel in his distress. Should a reprieve come to rescue him from death, how great is the general triumph and congratulation! And probably in this multitude you will find not the mere vulgar herd alone, but the man of superior knowledge and of more refined sensibility;

Distress. sensibility: who, led by some strong principle, which we wish to explain, feels a pleasure greater than all the pain, great and exquisite as one should imagine it to be, from such a spectacle.

The man who condemns many of the scenes we have already mentioned as barbarous and shocking, would probably run with the greatest eagerness to some high cliff, overhanging the ocean, to see it swelled into a tempest, though a poor vessel, or even a fleet of vessels, were to appear as one part of the dreadful scenery, now lifted to the heavens on the foaming surge, now plunged deep into the fathomless abyss, and now dashed upon the rocks, where they are in a moment shivered into fragments, and, with all their mariners, entombed in the wave. Or, to vary the question a little; Who would not be forward to stand safe, on the top of some mountain or tower, adjoining to a field of battle, in which two armies meet in desperate conflict, though probably thousands may soon lie before him prostrate on the ground, and the whole field present the most horrid scenes of carnage and desolation?

That in all these cases pleasure predominates in the compounded feeling, is plain from hence, because you continue to survey the scene; whereas when pain became the stronger sensation, you would certainly retire.

Cultivation may indeed have produced some minuter differences in the taste and feelings of different minds. Those whose sensibilities have not been refined by education or science, may feel the pleasure in a more gross and brutal form. But do not the most polished natures feel a similar, a kindred pleasure, in the deep-wrought distresses of the well-imagined scene? Here the endeavour is, to introduce whatever is dreadful or pathetic, whatever can harrow up the feelings or extort the tear. And the deeper and more tragical the scene becomes, the more it agitates the several passions of terror, grief, or pity—The more intensely it delights, even the most polished minds. They seem to enjoy the various and vivid emotions of contending passions. They love to have the tear trembling in the eye, and to feel the whole soul wrapt in thrilling sensations. For that moment they seem to forget the fiction; and afterwards commend that exhibition most, in which they most entirely lost sight of the author, and of their own situation, and were alive to all the unutterable vibrations of strong or melting sensibility.

Taking it then for granted, that in the contemplation of many scenes of distress, both imaginary and real, a gratification is felt, let us endeavour to account for it, by mentioning some of those principles, woven into the web of human nature, by its benevolent Creator, on which that gratification depends.

Dr Akenside, with his accustomed strength and brilliancy of colouring, describes and accounts for it in the following manner.

——————" Behold the ways
Of heaven's eternal destiny to man!
For ever just, benevolent, and wise!
That Virtue's awful steps, howe'er pursued
By vexing fortune, and intrusive pain.
Should never be divided from her chaste,
Her fair attendant, Pleasure. Need I urge
Thy tardy thought, through all the various round
Of this existence, that thy softening soul
At length may learn, what energy the hand
Of Virtue mingles in the bitter tide
Of passion, swelling with distress and pain,
To mitigate the sharp, with gracious drops
Of cordial Pleasure. Ask the faithful youth,
Why the cold urn of her, whom long he loved,
So often fills his arm? So often draws
His lonely footsteps, at the silent hour,
To pay the mournful tribute of his tears?
O! he will tell thee, that the wealth of worlds
Should ne'er seduce his bosom to forego
That sacred hour, when stealing from the noise
Of care and envy, sweet remembrance sooths,
With Virtue's kindest looks, his aching breast,
And turns his tears to rapture. Ask the croud,
Which flies impatient from the village-walk
To climb the neighbouring cliffs, when far below
The cruel winds have hurled upon the coast
Some helpless bark: whilst sacred Pity melts
The general eye, or Terror's icy hand
Smites their distorted limbs, or horrent hair,
While every mother closer to her breast
Catches her child; and, pointing where the waves
Foam through the shattered vessel, shrieks aloud,
As one poor wretch, that spreads his piteous arms
For succour, swallowed by the roaring surge,
As now another, dashed against the rock,
Drops lifeless down. O deemest thou indeed
No kind endearment here, by nature given,
To mutual terror, and compassion's tears?
No sweetly melting softness, which attracts
O'er all that edge of pain, the social powers,
To this their proper action, and their end?"

The poet pursues the sentiment in the same animated imagery, describing the strong, but pleasurable, sensations which the soul feels, in reading the sufferings of heroes who nobly died in the cause of liberty and their country:

——————" When the pious band
Of youths, who fought for freedom, and their sires,
Lie side by side in gore."

Or, in the strong movements of indignation and revenge against the tyrant, who invades that liberty, and enslaves their country.

——————" When the patriot's tear
Starts from thine eye, and thy extended arm
In fancy hurls the thunderbolt of Jove,
To fire the impious wreath on Philip's brow,
Or dash Octavius from his trophied car;
Say—Does thy secret soul repine to taste
The big distress? Or, would'st thou then exchange
Those heart-ennobling sorrows for the lot
Of him, who sits amid the gaudy herd
Of mute barbarians, bending to his nod,
And bears aloft his gold-invested front,
And says within himself, " I am a king,
And wherefore should the clamorous voice of wo
Intrude upon mine ear?"

The sentiment of this charming and moral poet is, that sympathetic feelings are virtuous, and therefore pleasant. And from the whole, he deduces this important conclusion; that every virtuous emotion must be agreeable, and that this is the sanction and the reward of virtue. The thought is amiable; the conclusion noble: but still the solution appears to us to be imperfect.

We have already said, that the pleasure arising from the contemplation of distressful scenes is a compounded feeling, arising from several distinct sources in the human breast. The kind and degree of the sensation must depend upon the various blendings of the several ingredients which enter into the composition. The cause assigned by Mr Addison, the sense of our own security, may be supposed to have some share in the mass of feelings. That of Dr Akenside may be allowed to have

Distress. have a still larger proportion. Let us attempt to trace some of the rest.

There are few principles in human nature of more general and important influence than that of sympathy. A late ingenious writer, led by the fashionable idea of simplifying all the springs of human nature into one source, has, in his beautiful Theory of Moral Sentiments, endeavoured to analyse a very large number of the feelings of the heart into sympathetic vibration. Though it appears to us most probable, that the human mind, like the human body, possesses various and distinct springs of action and of happiness, yet he has shown, in an amazing diversity of instances, the operation and importance of this principle of human nature. Let us apply it to our present subject.

We naturally sympathise with the passions of others. But if the passions they appear to feel be not those of mere distress alone; if, midst the scenes of calamity, they display fortitude, generosity, and forgiveness; if, "rising superior to the cloud of ills which covers them," they nobly stand firm, collected, and patient; here a still higher source of pleasure opens upon us, from complacence, admiration, and that unutterable sympathy which the heart feels with virtuous and heroic minds. By the operation of this principle, we place ourselves in their situation; we feel, as it were, some share of that conscious integrity and peace which they must enjoy. Hence, as before observed, the pleasure will vary, both as to its nature and degree, according to the scene and characters before us. The shock of contending armies in the field,—the ocean wrought to tempest, and covered with the wreck of shattered vessels,—and a worthy family silently, yet nobly, bearing up against a multitude of surrounding sorrows, will excite very different emotions, because the component parts of the pleasurable sensation consist of very different materials. They all excite admiration; but admiration, how diversified, both as to its degree and its cause! These several ingredients may doubtless be so blended together, that the pleasure shall make but a very small part of the mixed sensation. The more agreeable tints may bear little proportion to the terrifying red or the gloomy black.

In many of the instances which have been mentioned, the pleasure must arise chiefly, if not solely, from the circumstances or accompanyments of the scene. The sublime feelings excited by the view of an agitated ocean, relieve and soften those occasioned by the shipwreck. And the awe excited by the presence of thousands of men, acting as with one soul, and displaying magnanimity and firmness in the most solemn trial, tempers those sensations of horror and of pain which would arise from the field of battle.

The gratification we are attempting to account for depends also, in a very considerable degree, upon a principle of human nature, implanted in it for the wisest ends; the exercise which it gives to the mind, by rousing it to energy and feeling. Nothing is so insupportable, as that languor and ennui, for the full expression of which our language does not afford a term. How agreeable it is, to have the soul called forth to exertion and sensibility, let the gamester witness, who, unable to endure the lassitude and sameness of unanimated luxury, runs with eagerness to the place where probably await him all the irritation and agony of tumultous passions.

Again; it is a law of our nature, that opposite passions, when felt in succession, and, above all, when felt at the same moment, heighten and increase each other. Ease succeeding pain, certainty after suspense, friendship after aversion, are unspeakably stronger than if they had not been thus contrasted. In this conflict of feelings, the mind rises from passive to active energy. It is roused to intense sensation; and it enjoys that peculiar, exquisite, and complex feeling, in which, as in many articles of our table, the acid and the sweet, the pleasurable and painful, pungencies are so happily mixed together, as to render the united sensation amazingly more strong and delightful.

We have not yet mentioned the principle of curiosity, that busy and active power, which appears so early, continues almost unimpaired so long, and to which, for the wisest ends, is annexed so great a sense of enjoyment. To this principle, rather than to a love of cruelty, would we ascribe that pleasure which children sometimes seem to feel from torturing flies and lesser animals. They have not yet formed an idea of the pain they inflict. It is, indeed, of unspeakable consequence, that this practice be checked as soon and as effectually as possible, because it is so important, that they learn to connect the ideas of pleasure and pain with the motions and actions of the animal creation. And to this principle may we also refer no small share of that pleasure in the contemplation of distressful scenes, the springs of which, in the human heart, we are now endeavouring to open.

To curiosity, then—to sympathy—to mental exertion—to the idea of our own security—and to the strong feelings occasioned by viewing the actions and passions of mankind in interesting situations, do we ascribe that gratification which the mind feels from the survey of many scenes of sorrow. We have called it a *pleasure*; but it will approach towards, or recede from, pleasure, according to the nature and proportion of the ingredients of which the sensation is composed. In some cases, pain will predominate. In others, there will be exquisite enjoyment.

The final cause of this constitution of the human mind is probably, that by means of this strong sensation, the soul may be preserved in continual and vigorous motion—that its feelings may be kept lively and tender—that it may learn to practise the virtues it admires—and to assist those to whom its sympathy can reach—and that it may thus be led, by these social exercises of the heart, to soften with compassion—to expand with benevolence—and generously to assist in every case, in which assistance can be given. An end this sufficient,

———" To assert eternal Providence,
And justify the ways of God to man."

Distress, in law, the seizing or distraining any thing for rent in arrear, or other duty unperformed.

The effect of this distress is to compel the party either to replevy the things distrained, and contest the taking, in an action of trespass against the distrainer; or rather to oblige him to compound and pay the debt or duty for which he was so distrained.

There are likewise compulsory distresses in actions, to to cause a person appear in court; of which kind there is a distress personal of one's moveable goods, and the profits of his lands, for contempt in not appearing after summons: there is likewise distress real, of a person's immoveable goods. In these cases none shall be distrained to answer for any thing touching their freeholds, but by the king's writ.

Distress may be either finite or infinite. Finite distress is that which is limited by law, in regard to the number of times it shall be made, in order to bring the party to a trial of the action. Infinite distress is that which is without any limitation, being made till the person appears: it is farther applied to jurors that do not appear; as, upon a certificate of assise, the process is *venire facias, habeas corpora,* and distress infinite.

It is also divided into grand distress and ordinary distress; of these the former extends to all the goods and chattels that the party has within the county. A person, of common right, may distrain for rents and all manner of services; and where a rent is reserved on a gift in tail, lease for life, or years, &c. though there be no clause of distress in the grant or lease, so as that he has the reversion: but on a feoffment made in fee, a distress may not be taken, unless it be expresly reserved in the deed.

DISTRIBUTION, in a general sense, the act of dividing a thing into several parts, in order to the disposing each in its proper place.

DISTRIBUTION, in architecture, the dividing and disposing the several parts and pieces which compose a building, as the plan directs. See ARCHITECTURE.

DISTRIBUTION, in rhetoric, a kind of description, whereby an orderly division and enumeration is made of the principal qualities of the subject. David supplies us with an example of this kind, when, in the heat of his indignation against sinners, he gives a description of their iniquity: "Their throat is an open sepulchre; they flatter with their tongues; the poison of asps is under their lips; their mouth is full of cursing and lies; and their feet are swift to shed blood."

DISRTIBUTION, in printing, the taking a form asunder, separating the letters, and disposing them in the cases again, each in its proper cell. See PRINTING.

DISTRICT, in geography, a part of a province, distinguished by peculiar magistrates, or certain privileges; in which sense it is synonymous with hundred. See HUNDRED.

DISTRINGAS, in English law, a writ commanding the sheriff, or other officer, that he distrain a person for debt to the king, &c. or for his appearance at a certain day.

DISTRINGAS Juratores, a writ directed to the sheriff, whereby he is commanded to distrain upon a jury to appear, and to return issues on their lands, &c. for non-appearance. This writ of distringas juratores issues for the sheriff to have their bodies in court, &c. at the return of the writ.

DITCH, a common fence or inclosure in marshes, or other wet land where there are no hedges. They allow these ditches six feet wide against highways that are broad; and against commons, five feet. But the common ditches about inclosures, dug at the bottom of the bank on which the quick is raised, are three feet wide at the top, one at the bottom, and two feet deep. By this means each side has a slope, which is of great advantage; for where this is neglected, and the ditches dug perpendicular, the sides are always washing down, besides, in a narrow bottomed ditch, if cattle get down into it, they cannot stand to turn themselves to crop the quick: but where the ditch is four feet wide, it should be two and a half deep; and where it is five wide, it should be three deep; and so in proportion.

DITCH-Water is often used as an object for the microscope, and seldom fails to afford a great variety of animalcules. This water very often appears of a yellowish, greenish, or reddish colour; and this is wholly owing to the multitudes of animals of those colours which inhabit it. These animals are usually of the shrimp kind: and Swammerdam, who very accurately examined them, has called them, from the figure of their horns, *pulex aquaticus arborescens.* They copulate in May or June; and are often so numerous at that season, that the whole body of the water they are found in, is seen to be of a red, green, or yellowish colour, according to the colours of their bodies. The green thin scum also, so frequently seen on the surface of standing waters in summer, is no other than a multitude of small animalcules of this or some of the other kinds. Dunghill water is not less full of animals than that of ditches; and is often found so thronged with animalcules, that it seems altogether alive: it is then so very much crowded with these creatures, that it must be diluted with clear water before they can be distinctly viewed. There are usually in this fluid a sort of eels, which are extremely active; and besides these and many other of the common inhabitants of fluids, there is one species found in this which seems peculiar to it: the middle part of them is dark and beset with hairs, but the ends are transparent; their tails are tapering, with a long sprig at the extremity, and their motion is slow and waddling. See ANIMALCULE.

DITCH, in fortification, called also *foss* and *moat,* a trench dug round the rampart or wall of a fortified place, between the scarp and counterscarp. See FORTIFICATION.

DITHYRAMBUS, in ancient poetry, a hymn in honour of Bacchus, full of transport and poetical rage.

This poetry owes its birth to Greece, and to the transports of wine; and yet art is not quite exploded, but delicately applied to guide and restrain the dithyrambic impetuosity, which is indulged only in pleasing flights. Horace and Aristotle tell us, that the ancients gave the name of dithyrambus to those verses wherein none of the common rules or measures were observed. As we have now no remains of the dithyrambus of the ancients, we cannot say exectly what their measure was.

DITONE, in music, an interval comprehending two tones. The proportion of the sounds that form the ditone is 4 : 5, and that of the semiditone is 5 : 6.

DITRIHEDRIA, in mineralogy, a genus of spars with twice three sides, or six planes; being formed of two trigonal pyramids joined to base base, without any intermediate column. See SPAR.

The species of ditrihedria are distinguished by the different figures of these pyramids.

DITTANDER, in botany. See LEPIDIUM.

DITTANY, in botany. See DICTAMNUS.

DITTO, in books of accounts, usually written D°, signifies the aforementioned. The word is corrupted from

from the Italian *detto*, "the said:" as in our law-phrase, "the said premisses," meaning the same as were aforementioned.

DIVAL, in heraldry, the herb nightshade, used by such as blazon by flowers and herbs, instead of colours and metals, for sable or black.

DIVALIA, in antiquity, a feast held among the ancient Romans, on the 21st day of December, in honour of the goddess Angerona; whence it is also called *Angeronalia*.—On the day of this feast, the pontifices performed sacrifice in the temple of Voluptia, or the goddess of joy and pleasure; who, some say, was the same with Angerona, and supposed to drive away all the sorrows and chagrins of life.

DIVAN, a council-chamber or court of justice among the eastern nations, particularly the Turks.—The word is Arabic, and signifies the same with SOFA in the Turkish dialect.

There are two sorts of divans; that of the grand signior, called *the council of state*, which consists of seven of the principal officers of the empire; and that of the grand vizir, composed of six other vizirs or counsellors of state, the chancellor, and secretaries of state, for the distribution of justice.

The word is also used for a hall in the private houses of the orientals. The custom of China does not allow the receiving of visits in the inner parts of the house, but only at the entry, in a divan contrived on purpose for ceremonies.

Travellers relate wonders of the silence and expedition of the divans of the East.

DIVAN Beghi, the superintendant of justice in Persia, whose place is the last of the six ministers of the second rank, who are all under the athemadauler or first minister. To this tribunal of the divan-beghi he appeals from sentences passed by the governors. He has a fixed stipend of 50,000 crowns for administering justice. All the serjeants, ushers, &c. of the court are in his service. He takes cognisance of the criminal causes of the chams, governors, and other great lords of Persia, when accused of any fault. There are divan-beghis not only at court and in the capital, but also in the provinces and other cities of the empire. The alcoran is the sole rule of his administration of justice, which also he interprets at pleasure. He takes no cognisance of civil causes: but all differences arising between the officers of the king's household and between foreign ministers are determined by him.

DIVANDUROW, the name of seven islands which lie a league north of the Maldives, and 24 from the coast of Malabar, almost opposite to Cananor.

DIVER, in ornithology. See COLYMBUS.

DIVERGENT, or DIVERGING, LINES, in geometry, are those which constantly recede from each other.

DIVERGENT Rays, in optics, are those which, going from a point of the visible object, are dispersed, and continually depart one from another, in proportion as they are removed from the object: in which sense it is opposed to convergent. See OPTICS.

DIVERSIFYING, in rhetoric, is of infinite service to the orator; it is an accomplishment essential to his character, and may fitly be called the subject of all his tropes and figures. Vossius lays down six ways of diversifying a subject. 1. By enlarging on what was briefly mentioned before. 2. By a concise enumeration of what had been insisted on at length. 3. By adding something new to what is repeated. 4. By repeating only the principal heads of what had been said. 5. By transposing the words and periods. 6. By imitating them.

DIVERSION, in military affairs, is when an enemy is attacked in one place where they are weak and unprovided, in order to draw off their forces from another place where they have made or intend to make an irruption. Thus the Romans had no other way in their power of driving Hannibal out of Italy, but by making a diversion in attacking Carthage.

DIVESTING, properly signifies undressing, or stripping off one's garment; in contradistinction from investing.

In law, it is used for the act of surrendering or relinquishing one's effects. By a contract of donation or sale, the donor or seller is said to be disseised and divested of their property in such a commodity, and the donee or purchaser becomes invested therewith. See INVESTITURE.

A demise is a general divestiture which the fathers and mothers make of all their effects in favour of their children.

DIVIDEND, in arithmetic, the number proposed to be divided into equal parts. See ARITHMETIC, n° 14.

DIVIDEND of Stocks, is a share or proportion of the interest of stocks erected on public funds, as the south-sea, &c. divided among and paid to the adventurers half-yearly.

DIVINATION, the knowledge of things obscure or future, which cannot be attained by any natural means.

It was a received opinion among the heathens, that the gods were wont to converse familiarly with some men, whom they endowed with extraordinary powers, and admitted to the knowledge of their councils and designs. Plato, Aristotle, Plutarch, Cicero, and others, divide divination into two sorts or species, *viz.* natural and artificial.

The former was so called, because not attained by any rules or precepts of art, but infused or inspired into the diviner, without his taking any further care about it than to purify and prepare himself for the reception of the divine afflatus. Of this kind were all those who delivered oracles, and foretold future events by inspiration, without observing external signs or accidents.

The second species of divination was called *artificial*, because it was not obtained by immediate inspiration, but proceeded upon certain experiments and observations arbitarily instituted, and mostly superstitious. Of this sort there were various kinds, as by sacrifices, intrails, flame, cakes, flour, wine, water, birds, lots, verses, omens, &c.

In holy scripture we find mention made of nine different kinds of divination. The first performed by the inspection of planets, stars, and clouds: it is supposed to be the practisers of this whom Moses calls מעונן *meonen*, of אנן *anan*, "cloud," Deuter. ch. xviii. v. 10. 2. Those whom the prophet calls in the same place מנחש *menachesch*, which the vulgate and generality of interpreters render *augur*. 3. Those who in the same place are called מכשף *mecaschepk*, which the septuagint

and

Divination. and vulgate tranſlate " a man given to ill practices." 4. Such authors whom Moſes in the ſame chapter, ver. 11. calls חובר *hhober*. 5. Thoſe who conſult the ſpirits called *Python*; or, as Moſes expreſſes it in the ſame book, אוב אשל " thoſe who aſk queſtions of Python." 6. Witches or magicians, whom Moſes calls ידעני *judeoni*. 7. Thoſe who conſult the dead, *necromancers*. 8. The prophet Hoſea, chap. iv. ver. 12. mentions ſuch as conſult ſtaves, שאל מקלי; which kind of divination may be called *rhabdomancy*. 9. The laſt kind of divination mentioned in ſcripture is *hepatoſcopy* or the conſideration of the liver.

Divination of all kinds was neceſſarily made an occult ſcience, which naturally remained in the hands of the prieſts and prieſteſſes, the magi, the ſoothſayers, the augurs, the viſionaries, the prieſts of the oracles, the falſe prophets, and other like profeſſors, till the time of the coming of Jeſus Chriſt. The light of the goſpel, it is true, has diſſipated much of this darkneſs; but it is more difficult, than is commonly conceived, to eradicate from the human mind a deep-rooted ſuperſtition, even though the truth be ſet in the ſtrongeſt light, eſpecially when the error has been believed almoſt from the origin of the world: ſo we ſtill find exiſting among us the remains of this pagan ſuperſtition, in the following chimeras, which enthuſiaſtic and deſigning men have formed into arts and ſciences: though it muſt be owned, to the honour of the 18th century, that the pure doctrines of Chriſtianity, and the ſpirit of philoſophy, which become every day more diffuſed, equally concur in baniſhing theſe viſionary opinions. The vogue for theſe pretended ſciences and arts, moreover, is paſt, and they can no longer be named without exciting ridicule in all ſenſible people. By relating them here, therefore, and drawing them from their obſcurity, we only mean to ſhow their futility, and to mark thoſe rocks againſt which the human mind, without the aſſiſtance of a pilot, might eaſily run.

For the attaining of theſe ſupernatural qualifications, there are ſtill exiſting in the world the remains of,

1. *Aſtrology*: a conjectural ſcience which teaches to judge of the effects and influences of the ſtars; and to predict future events by the ſituation of the planets and their different aſpects. It is divided into *natural aſtrology*, or *meteorology*: which is confined to the foretelling of natural effects, as the winds, rain, hail, and ſnow, froſts and tempeſts. In this conſiſts one branch of the art of almanack-makers; and by merely confronting theſe predictions in the kalendar, with the weather each day produces, every man of ſenſe will ſee what regard is to be paid to this part of aſtrology. The other part, which is called *judicial aſtrology*, is ſtill far more illuſive and raſh than the former: and having been at firſt the wonderful art of viſionaries, it afterwards became that of impoſtors; a very common fate with all thoſe chimerical ſciences, of which we ſhall here ſpeak. This art pretends to teach the method of predicting all ſorts of events that ſhall happen upon the earth, as well ſuch as relate to the public as to private perſons; and that by the ſame inſpection of the ſtars and planets and their different conſtellations. The *cabala* ſignifies, in like manner, the knowledge of things that are above the moon, as the celeſtial bodies and their influences; and in this ſenſe it is the ſame with judicial aſtrology, or makes a part of it. Divination.

2. *Horoſcopy*, which may alſo be conſidered as a part of aſtrology, is the art by which they draw a figure, or celeſtial ſcheme, containing the 12 houſes, wherein they mark the diſpoſition of the heavens at a certain moment; for example, that at which a man is born, in order to foretel his fortune, or the incidents of his life. In a word, it is the diſpoſition of the ſtars and planets at the moment of any perſon's birth. But as there cannot be any probable or poſſible relation between the conſtellations and the human race, all the principles they lay down, and the prophecies they draw from them, are chimerical, falſe, abſurd, and a criminal impoſition on mankind.

3. The art of *augury* conſiſted, among the ancient Romans, in obſerving the flight, the ſinging, and eating of birds, eſpecially ſuch as were held ſacred. See AUGURY.

4. The equally deceitful art of *haruſpicy* conſiſted, on the contrary, in the inſpection of the bowels of animals, but principally of victims; and from thence predicting grand incidents relative to the republic, and the good or bad events of its enterpriſes.

6. *Aeromancy* was the art of divining by the air. This vain ſcience has alſo come to us from the Pagans; but is rejected by reaſon as well as Chriſtianity, as falſe and abſurd.

6. *Pyromancy* is a divination made by the inſpection of a flame, either by obſerving to which ſide it turns, or by throwing into it ſome combuſtible matter, or a bladder filled with wine, or any thing elſe from which they imagined they were able to predict.

7. *Hydromancy* is the ſuppoſed art of divining by water. The Perſians, according to Varro, invented it; Pythagoras and Numa Pompilius made uſe of it; and we ſtill admire the like wonderful prognoſticators.

8. *Geomancy* was a divination made by obſerving of cracks or clefts in the earth. It was alſo performed by points made on paper, or any other ſubſtance, at a venture; and they judged of future events from the figures that reſulted from thence. This was certainly very ridiculous; but it is nothing leſs ſo to pretend to predict future events by the inſpection of the grounds of a diſh of tea or coffee, or by cards, and many other like matters.—Thus have deſigning men made uſe of the four elements to deceive their credulous brethren.

9. *Chiromancy* is the art which teaches to know, by inſpecting the hand, not only the inclinations of a man, but his future deſtiny alſo. The fools or impoſtors who practiſe this art pretend, that the different parts or the lines of the hand have a relation to the internal parts of the body, as ſome to the heart, others to the liver, ſpleen, &c. On this falſe ſuppoſition, and on many others equally extravagant, the principles of chiromancy are founded: and on which, however, ſeveral authors, as Robert Flud an Engliſhman, Artemidorus, M. de la Chambre, John of Indagina, and many others, have written large treatiſes.

10. *Phyſiognomy*, or *phyſiognomancy*, is a ſcience that pretends to teach the nature, the temperament, the underſtanding, and the inclinations of men, by the inſpection

ſpection of their countenances, and is therefore very little leſs frivolous than chiromancy; though Ariſtotle, and a number of learned men after him, have written expreſs treatiſes concerning it.

DIVINE, ſomething relating to God. The word is alſo uſed, figuratively, for any thing that is excellent, extraordinary, and that ſeems to go beyond the power of nature and the capacity of mankind. In which ſenſe, the compaſs, teleſcope, clocks, &c. are ſaid to be *divine inventions:* Plato is called the *divine author*, the *divine Plato;* and the ſame appellation is given to Seneca: Hippocrates is called, "the divine old man," *divinus ſenex*, &c.

DIVING, the art or act of deſcending under water to conſiderable depths, and abiding there a competent time.

The uſes of diving are very conſiderable, particularly in the fiſhing for pearls, corals, ſpunges, &c. See *Pearl-Fiſhing*, &c.

There have been various methods propoſed, and machines contrived, to render the buſineſs of diving more ſafe and eaſy. The great point is to furniſh the diver with freſh air; without which, he muſt either make a ſhort ſtay or periſh.

Thoſe who dive for ſpunges in the Mediterranean, help themſelves by carrying down ſpunges dipt in oil in their mouths. But conſidering the ſmall quantity of air that can be contained in the pores of a ſpunge, and how much that little will be contracted by the preſſure of the incumbent water, ſuch a ſupply cannot long ſubſiſt the diver. For it is found by experiment, that a gallon of air included in a bladder, and by a pipe reciprocally inſpired and exſpired by the lungs, becomes unfit for reſpiration in little more than one minute of time. For though its elaſticity be but little altered in paſſing the lungs, yet it loſes its vivifying ſpirit and is rendered effete.

In effect, a naked diver, Dr Halley aſſures us, without a ſpunge, cannot remain above a couple of minutes incloſed in water, nor much longer with one, without ſuffocating; nor, without long practice, near ſo long; ordinary perſons beginning to ſtifle in about half a minute. Beſides, if the depth be conſiderable, the preſſure of the water in the veſſels makes the eyes blood-ſhotten, and frequently occaſions a ſpitting of blood.

Hence, where there has been occaſion to continue long at the bottom, ſome have contrived double flexible pipes, to circulate air down into a cavity, incloſing the diver as with armour, both to furniſh air and to bear off the preſſure of the water, and give leave to his breaſt to dilate upon inſpiration; the freſh air being forced down one of the pipes with bellows, and returning by the other of them, not unlike to an artery and vein.

But this method is impracticable when the depth ſurpaſſes three fathoms; the water embracing the bare limbs ſo cloſely as to obſtruct the circulation of the blood in them; and withal preſſing ſo ſtrongly on all the junctures where the armour is made tight with leather, that, if there be the leaſt defect in any of them, the water ruſhes in, and inſtantly fills the whole engine, to the great danger of the diver's life.

It is certain, however, that people, by being accuſtomed to the water from their infancy, will at length be enabled, not only to ſtay much longer under water than the time abovementioned, but put on a kind of amphibious nature, ſo that they ſeem to have the uſe of all their faculties as well when their bodies are immerſed in water as when they are on dry land. Moſt ſavage nations are remarkable for this. According to the accounts of the late voyagers, the inhabitants of the South-ſea iſlands are ſuch expert divers, that when a nail or any piece of iron was thrown overboard, they would inſtantly jump into the ſea after it, and never failed to recover it, notwithſtanding the quick deſcent of the metal. Even among civilized nations, many perſons have been found capable of continuing an incredible length of time below water. The moſt remarkable inſtance of this kind is the famous Sicilian diver Nicolo Peſce. The authenticity of the account, indeed, depends entirely on the authority of F. Kircher. He aſſures us, that he had it from the archives of the kings of Sicily: but, notwithſtanding this aſſertion, the whole hath ſo much of the marvellous in it, that we believe there are few who will not look upon it to have been exaggerated. "In the times of Frederic king of Sicily (ſays Kircher), there lived a celebrated diver, whoſe name was *Nicholas*, and who, from his amazing ſkill in ſwimming, and perſeverance under water, was ſurnamed the *fiſh*. This man had from his infancy been uſed to the ſea; and earned his ſcanty ſubſiſtence by diving for corals and oyſters, which he ſold to the villagers on ſhore. His long aquantaince with the ſea, at laſt, brought it to be almoſt his natural element. He was frequently known to ſpend five days in the midſt of the waves, without any other proviſions than the fiſh which he caught there and ate raw. He often ſwam over from Sicily into Calabria, a tempeſtuous and dangerous paſſage, carrying letters from the king. He was frequently known to ſwim among the gulphs of the Lipari iſlands, no way apprehenſive of danger.

"Some mariners out at ſea, one day obſerved ſomething at ſome diſtance from them, which they regarded as a ſea-monſter; but upon its approach it was known to be Nicholas, whom they took into their ſhip. When they aſked him whither he was going in ſo ſtormy and rough a ſea, and at ſuch a diſtance from land, he ſhowed them a packet of letters, which he was carrying to one of the towns of Italy, exactly done up in a leather bag, in ſuch a manner as that they could not be wetted by the ſea. He kept them thus company for ſome time in their voyage, converſing, and aſking queſtions; and after eating an hearty meal with them, he took his leave, and, jumping into the ſea, purſued his voyage alone.

"In order to aid theſe powers of enduring in the deep, nature ſeemed to have aſſiſted him in a very extraordinary manner: for the ſpaces between the fingers and toes were webbed, as in a gooſe; and his cheſt became ſo very capacious, that he could take in, at one inſpiration, as much breath as would ſerve him for a whole day.

"The account of ſo extraordinary a perſon did not fail to reach the king himſelf; who commanded Nicholas to be brought before him. It was no eaſy matter to find Nicholas, who generally ſpent his time in the ſolitudes of the deep; but, at laſt, after much ſearching, he was found, and brought before his maje-

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ſty. The curioſity of this monarch had been long excited by the accounts he had heard of the bottom of the gulph of Charybdis; he now therefore conceived, that it would be a proper opportunity to have more certain information. He therefore commanded our poor diver to examine the bottom of this dreadful whirlpool; and as an incitement to his obedience, he ordered a golden cup to be flung into it. Nicholas was not inſenſible of the danger to which he was expoſed; dangers beſt known only to himſelf; and therefore he preſumed to remonſtrate: but the hopes of the reward, the deſire of pleaſing the king, and the pleaſure of ſhowing his ſkill, at laſt prevailed. He inſtantly jumped into the gulph, and was as inſtantly ſwallowed up in its boſom. He continued for three quarters of an hour below; during which time the king and his attendants remained on ſhore, anxious for his fate; but he at laſt appeared, holding the cup in triumph in one hand, and making his way good among the waves with the other. It may be ſuppoſed he was received with applauſe when he came on ſhore: the cup was made the reward of his adventure; the king ordered him to be taken proper care of; and, as he was ſomewhat fatigued and debilitated by his labour, after an hearty meal he was put to bed, and permitted to refreſh himſelf by ſleeping.

"When his ſpirits were thus reſtored, he was again brought to ſatisfy the king's curioſity with a narrative of the wonders he had ſeen; and his account was to the following effect. He would never, he ſaid, have obeyed the king's commands, had he been appriſed of half the dangers that were before him. There were four things, he ſaid, which rendered the gulph dreadful, not only to men, but to fiſhes themſelves. 1. The force of the water burſting up from the bottom, which required great ſtrength to reſiſt. 2. The abruptneſs of the rocks that on every ſide threatened deſtruction. 3. The force of the whirlpool daſhing againſt thoſe rocks. And, 4. The number and magnitude of the polypous fiſh, ſome of which appeared as large as a man; and which, every where ſticking againſt the rocks, projected their fibrous arms to entangle him. Being aſked how he was able ſo readily to find the cup that had been thrown in, he replied, that it happened to be flung by the waves into the cavity of a rock againſt which he himſelf was urged in his deſcent. This account, however, did not ſatisfy the king's curioſity. Being requeſted to venture once more into the gulph for further diſcoveries, he at firſt refuſed: but the king, deſirous of having the moſt exact information poſſible of all things to be found in the gulph, repeated his ſolicitations; and, to give them ſtill greater weight, produced a larger cup than the former, and added alſo a purſe of gold. Upon theſe conſiderations the unfortunate diver once again plunged into the whirlpool, and was never heard of more."

To obviate the inconveniences of diving to thoſe who have not the extraordinary powers of the diver abovementioned, different inſtruments have been contrived. The chief of theſe is the diving bell; which is moſt conveniently made in form of a truncated cone, the ſmaller baſe being cloſed, and the larger open. It is to be poiſed with lead; and ſo ſuſpended, that the veſſel may ſink full of air, with its open baſis downward, and as near as may be in a ſituation parallel to the horizon, ſo as to cloſe with the ſurface of the water all at once.

Under this covercle the diver ſitting, ſinks down with the included air to the depth deſired; and if the cavity of the veſſel can contain a tun of water, a ſingle man may remain a full hour, without much inconvenience, at five or ſix fathoms deep. But the lower you go, ſtill the included air contracts itſelf according to the weight of the water which compreſſes it: ſo that at 33 feet deep the bell becomes half full of water, the preſſure of the incumbent water being then equal to that of the atmoſphere; and at all other depths the ſpace occupied by the compreſſed air in the upper part of the bell will be to the under part of its capacity filled with water, as 33 feet to the ſurface of the water in the bell below the common ſurface thereof. And this condenſed air being taken in with the breath ſoon inſinuates itſelf into all the cavities of the body, and has no ill effect, provided the bell be permitted to deſcend ſo ſlowly as to allow time for that purpoſe. One inconvenience that attends it, is found in the ears, within which there are cavities which open only outwards, and that by pores ſo ſmall as not to give admiſſion even to the air itſelf, unleſs they be dilated and diſtended by a conſiderable force. Hence, on the firſt deſcent of the bell, a preſſure begins to be felt on each ear; which, by degrees, grows painful, till the force overcoming the obſtacle, what conſtringes theſe pores yields to the preſſure, and letting ſome condenſed air ſlip in, preſently eaſe enſues. The bell deſcending lower, the pain is renewed, and again eaſed in the ſame manner.

But the greateſt inconvenience of this engine is, that the water entering it, contracts the bulk of air into ſo ſmall a compaſs, that it ſoon heats and becomes unfit for reſpiration: ſo that there is a neceſſity for its being drawn up to recruit it; beſides the uncomfortable abiding of the diver almoſt covered with water.

To obviate the difficulties of the diving bell, Dr Halley, to whom we owe the preceding account, contrived ſome further apparatus, whereby not only to recruit and refreſh the air from time to time, but alſo to keep the water wholly out of it at any depth. The manner in which this was effected, he relates in the following words.

"The bell I made uſe of was of wood, containing about 60 cubic feet in its concavity; and was of the form of a truncate cone, whoſe diameter at the top was three feet, and at the bottom five. This I coated with lead ſo heavy that it would ſink empty; and I diſtributed the weight ſo about its bottom, that it would go down in a perpendicular direction, and no other. In the top I fixed a ſtrong but clear glaſs, as a window, to let in the light from above; and likewiſe a cock to let out the hot air that had been breathed: and below, about a yard under the bell, I placed a ſtage which hung by three ropes, each of which was charged with about one hundred weight to keep it ſteady. This machine I ſuſpended from the maſt of a ſhip by a ſprit, which was ſufficiently ſecured by ſtays to the maſthead, and was directed by braces to carry it overboard clear of the ſhip's ſide, and to bring it again within board as occaſion required.

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"To supply air to this bell when under water, I caused a couple of barrels of about 36 gallons each to be cased with lead, so as to sink empty; each of them having a bung-hole in its lowest parts to let in the water, as the air in them condensed on their descent; and to let it out again when they were drawn up full from below. And to a hole in the uppermost part of these barrels, I fixed a leathern trunk or hose well liquored with bees-wax and oil, and long enough to fall below the bung-hole, being kept down by a weight appended: so that the air in the upper part of the barrels could not escape, unless the lower ends of these hose were first lifted up.

"The air barrels being thus prepared, I fitted them with tackle proper to make them rise and fall alternately, after the manner of two buckets in a well; which was done with so much ease, that two men, with less than half their strength, could perform all the labour required: and in their descent they were directed by lines fastened to the under edge of the bell, the which passed through rings on both sides the leathern hose in each barrel; so that, sliding down by these lines, they came readily to the hand of a man who stood on the stage on purpose to receive them, and to take up the ends of the hose into the bell. Through these hose, as soon as their ends came above the surface of the water in the barrels, all the air that was included in the upper parts of them was blown with great force into the bell; whilst the water entered at the bung-holes below, and filled them: and as soon as the air of one barrel had been thus received, upon a signal given, that was drawn up, and at the same time the other descended; and, by an alternate succession, furnished air so quick, and in so great plenty, that I myself have been one of five who have been together at the bottom in nine or ten fathom water, for above an hour and an half at a time, without any sort of ill consequence: and I might have continued there as long as I pleased, for any thing that appeared to the contrary. Besides, the whole cavity of the bell was kept entirely free from water, so that I sat on a bench which was diametrically placed near the bottom, wholly dressed, with all my clothes on. I only observed, that it was necessary to be let down gradually at first, as about 12 feet at a time; and then to stop and drive out the air that entered, by receiving three or four barrels of fresh air before I descended further. But being arrived at the depth designed, I then let out as much of the hot air that had been breathed, as each barrel would replenish with cool, by means of the cock at the top of the bell; through whose aperture, though very small, the air would rush with so much violence, as to make the surface of the sea boil, and to cover it with a white foam, notwithstanding the weight of the water over us.

"Thus I found that I could do any thing that required to be done just under us; and that, by taking off the stage, I could, for a space as wide as the circuit of the bell, lay the bottom of the sea so far dry, as not to be over shoes thereon. And, by the glass window, so much light was transmitted, that when the sea was clear, and especially when the sun shone, I could see perfectly well to write or read; much more to fasten or lay hold on any thing under us that was to be taken up. And, by the return of the air-barrels, I often sent up orders written with an iron pen, on small plates of lead, directing how to move us from place to place as occasion required. At other times, when the water was troubled and thick, it would be as dark as night below; but in such cases I have been able to keep a candle burning in the bell as long as I pleased, notwithstanding the great expence of air necessary to maintain flame.—By an additional contrivance, I have found it not impracticable for a diver to go out of an engine to a good distance from it, the air being conveyed to him with a continued stream, by small flexible pipes; which pipes may serve as a clue, to direct him back again when he would return to the bell."

Plate CLXIII. fig. 1. shows Dr Halley's diving bell, with the divers at work. DBLKRIMP represents the body of the bell. D, the glass which serves as a window. B, the cock for letting out the air which has been breathed. LM, the seats. C, one of the air-barrels. P, H, two of the divers. F, another diver at a distance from the bell, and breathing through the flexible tube K.—This diver is supposed to have a head-piece of lead, made to fit quite close about his shoulders: this head-piece was capable of containing as much air as would supply him for a minute or two. When he had occasion for more air, he turned a cock at F, by which means a communication was opened with the air in the bell, and thus he could receive a new supply at pleasure.

Since the invention of this diving machine, there has been one contrived by Mr Triewald, F. R. S. and military architect to the king of Sweden, which, for a single person, is in some respects thought to be more eligible than Dr Halley's, and is constructed as follows. AB is the bell, which is sunk by lead weights DD hung to its bottom. Fig. 2. This bell is of copper, and tinned all over in the inside, which is illuminated by three strong convex lenses, G, G, G, with copper lids H, H, H, to defend them. The iron ring or plate E serves the diver to stand on when he is at work; and is suspended at such a distance from the bottom of the bell by the chains F, F, F, that when the diver stands upright, his head is just above the water in the bell, where the air is much better than higher up, because it is colder, and consequently more fit for respiration. But as the diver must always be within the bell, and his head of course in the upper part, the inventor has contrived, that even there, when he has breathed the hot air as well as he can, he may, by means of a spiral copper tube *bc*, placed close to the inside of the bell, draw the cooler and fresher air from the lowermost parts: for which purpose, a flexible leather tube, about two feet long, is fixed to the upper end of the copper tube at *b*; and to the other end of this tube is fixed an ivory mouth-pipe, by which the diver draws in the air.

The greatest improvement, however, which the diving bell ever received, or probably can receive, was from the late Mr Spalding of Edinburgh. A section of his improved diving-bell is represented in fig. 3. Fig. 3. This construction is designed to remedy some inconveniences of Dr Halley's, which are very evident, and of very dangerous tendency. These are, 1. By Dr Halley's construction, the sinking or raising of the bell depends entirely

tirely on the people who are at the surface of the water; and as the bell even when in the water has a very considerable weight, the raising it not only requires a great deal of labour, but there is a possibility of the rope breaking by which it is raised, and thus every person in the bell would inevitably perish. 2. As there are, in many places of the sea, rocks which lie at a considerable depth, the figure of which cannot possibly be perceived from above, there is danger that some of their ragged prominences may catch hold of one of the edges of the bell in its descent, and thus overset it before any signal can be given to those above, which would infallibly be attended with the destruction of the people in the bell: and as it must always be unknown, before trial, what kind of a bottom the sea has in any place, it is plain, that without some contrivance to obviate this last danger, the descent in Dr Halley's diving bell is not at all eligible.

How these inconveniences are remedied by Mr Spalding's new construction will be easily understood from the following description.—ABCD represents a section of the bell, which is made of wood: *e, e*, are iron hooks, by means of which it is suspended by ropes QBF *e*, and QAER*e*, and QS, as expressed in the figure: *c, c*, are iron hooks, to which are appended lead weights, that keep the mouth of the bell always parallel to the surface of the water, whether the machine taken altogether is lighter or heavier than an equal bulk of water. By these weights alone, however, the bell would not sink: another is therefore added, represented at L; and which can be raised or lowered at pleasure, by means of a rope passing over the pulley *a*, and fastened to one of the sides of the bell at M. As the bell descends, this weight, called by Mr Spalding the *balance weight*, hangs down a considerable way below the mouth of the bell. In case the edge of the bell is catched by an obstacle, the balance-weight is immediately lowered down so that it may rest upon the bottom. By this means the bell is lightened so that all danger of oversetting is removed; for being lighter, without the balance-weight, than an equal bulk of water, it is evident that the bell will rise, as far as the length of the rope affixed to the balance-weight will allow it. This weight, therefore, will serve as a kind of anchor to keep the bell at any particular depth which the divers may think necessary; or by pulling it quite up, the descent may be continued to the very bottom.

By another very ingenious contrivance, Mr Spalding rendered it possible for the divers to raise the bell, with all the weights appended to it, even to the surface, or to stop at any particular depth, as they think proper; and thus they could still be safe, even though the rope designed for pulling up the bell was broke. For this purpose the bell is divided into two cavities, both of which are made as tight as possible. Just above the second bottom EF, are small slits in the sides of the bell; through which the water, entering as the bell descends, displaces the air originally contained in this cavity, which flies out at the upper orifice of the cock GH. When this is done, the divers turn the handle G, which stops the cock; so that if any more air was to get into the cavity AEFB, it could not longer be discharged through the orifice H as before. When this cavity is full of water, the bell sinks; but when a considerable quantity of air is admitted, it rises. If therefore the divers have a mind to raise themselves, they turn the small cock *g*, by which a communication is made between the upper and under cavities of the bell. The consequence of this is, that a quantity of air immediately enters the upper cavity, forces out a quantity of the water contained in it, and thus renders the bell lighter by the whole weight of the water which is displaced. Thus, if a certain quantity of air is admitted into the upper cavity, the bell will descend very slowly; if a greater quantity, it will neither ascend or descend, but remain stationary; and if a larger quantity of air is still admitted, it will arise to the top. It is to be observed, however, that the air which is thus let out into the upper cavity must be immediately replaced from the air-barrel; and the air is to be let out very slowly, or the bell will rise to the top with so great velocity that the divers will be in danger of being shaken out of their seats. But, by following these directions, every possible accident may be prevented, and people may descend to great depths without the least apprehension of danger. The bell also becomes so easily manageable in the water, that it may be conducted from one place to another by a small boat with the greatest ease, and with perfect safety to those who are in it.

Instead of wooden seats used by Dr Halley, Mr Spalding made use of ropes suspended by hooks *bbb*; and on these ropes the divers may sit without any inconvenience. I and K are two windows made of thick strong glass, for admitting light to the divers. N represents an air-cask with its tackle, and OCP the flexible pipe through which the air is admitted to the bell. In the ascent and descent of this cask the pipe is kept down by a small weight appended, as in Dr Halley's machine. R is a small cock by which the hot air is discharged as often as it becomes troublesome. Fig. 4. is a representation of the whole diving apparatus, which it is hoped will be readily understood without any further explanation. Two air-barrels are represented in this figure; but Mr Spalding was of opinion, that one capable of containing 30 gallons is sufficient for an ordinary machine.

We are told of another method put in practice by a gentleman of Devonshire. He has contrived a large case of strong leather, perfectly water-proof, which may hold about half a hogshead of air. This is so contrived, that, when he shuts himself up in this case, he may walk at the bottom of the sea, and go into any part of a wrecked vessel, and deliver out the goods. This method, we are told, he has practised for many years, and has thus acquired a great fortune. It would be a considerable improvement on this machine to condense the air in it as much as possible before the diver descended; as he would thus be furnished with an atmosphere endued with elasticity sufficient to resist the weight of the water, which otherwise would squeeze his case into much less room than it originally took up. The condensed air also would serve for respiration a much longer time than that which is in its ordinary state.

Diving-Bladder, a machine invented by Borelli, and by him preferred, though without any good reason, to the diving-bell. It is a globular vessel of brass or copper, about two feet in diameter, which contains the

Fig. 1 *Haly's* DIVING *Bell*

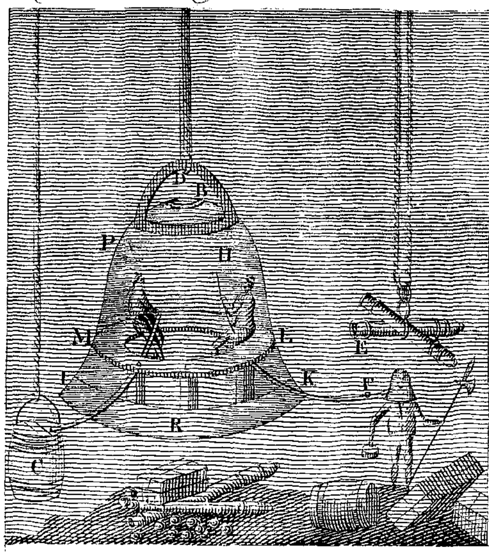


Fig. 2 *Triewalds*

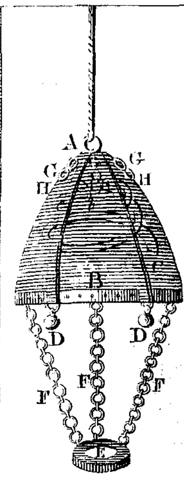


Fig. 3 *Spaldings*

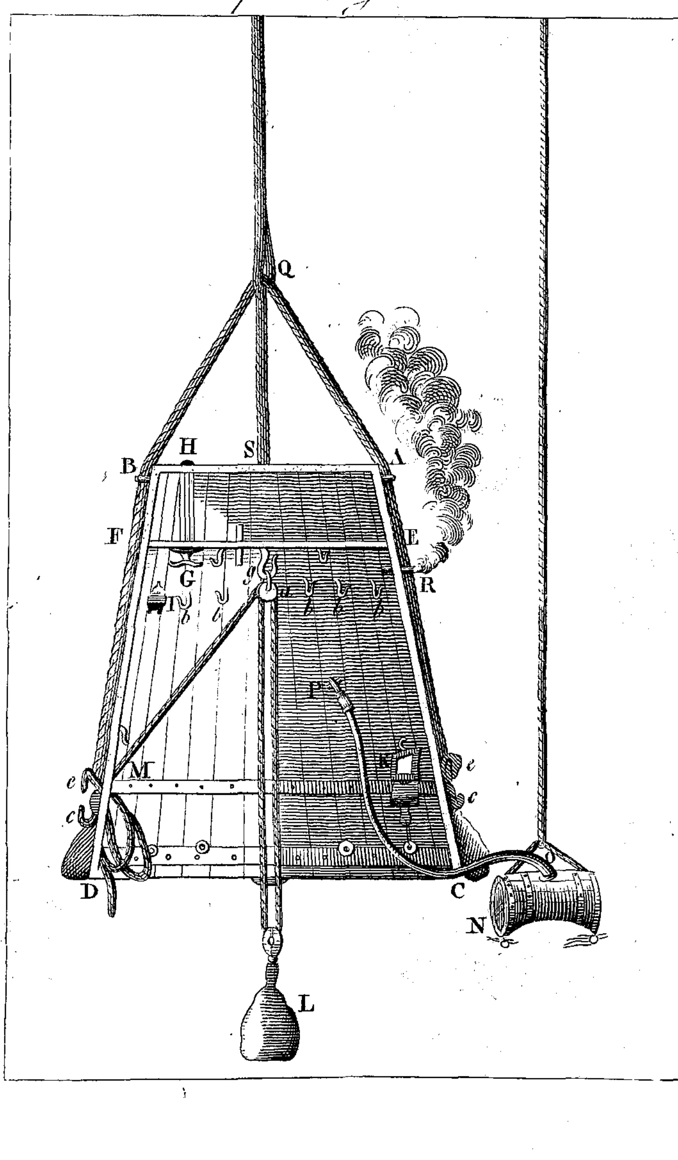
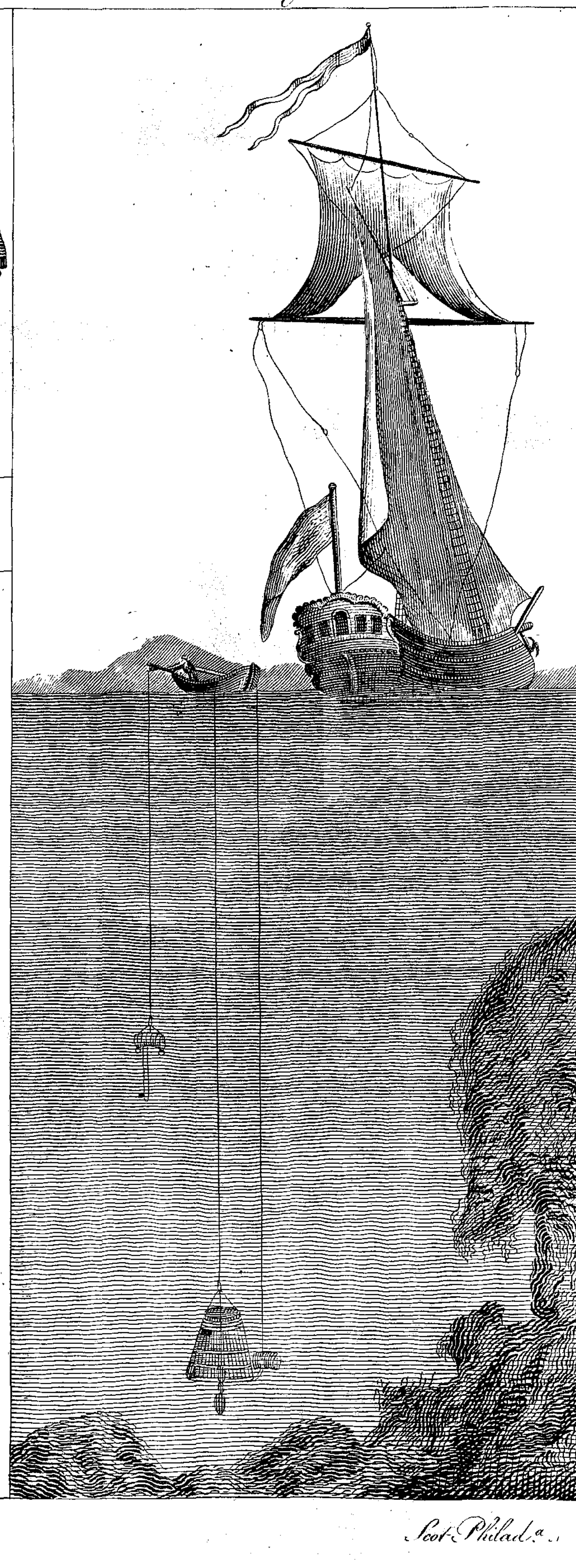


Fig. 4



Scot Philad.a

the diver's head. It is fixed to a goat's-skin habit exactly fitted to his person. Within the vessel are pipes; by means of which a circulation of air is contrived; and the person carries an air-pump by his side, by which he can make himself heavier or lighter as fishes do, by contracting or dilating their air bladder. By this means he thought all the objections to which other diving machines are liable were entirely obviated, and particularly that of want of air; the air which had been breathed, being, as he imagined, deprived of its noxious qualities by circulating through the pipes. These advantages, however, it is evident, are only imaginary. The diver's limbs, being defended from the pressure of the water only by a goat's-skin, would infallibly be crushed if he descended to any considerable depth; and from the discoveries now made by Dr Priestley and others, it is abundantly evident, that air, which is once rendered foul by breathing, cannot in any degree be restored by circulation through pipes. Concerning the use of copper machines in general, Mr Spalding favoured us with the following curious observation, namely, That when a person has breathed in them a few minutes, he feels in his mouth a very disagreeable brassy taste, which continues all the time he remains in the vessel; so that, on this account, copper seems by no means an eligible material. This taste most probably arises from the action of the alkalescent effluvia of the body upon the copper; for volatile alkali is a strong dissolvent of this metal: but how these effluvia volatilise the copper in such a manner as to make the taste of it sensible in the mouth, it is not easy to say.

DIVINITY, properly signifies the nature, quality, and essence of God.

DIVINITY, is also used in the same sense with theology.

DIVISIBILITY, that property by which the particles of matter in all bodies are capable of a separation or disunion from each other.

The Peripatetics and Cartesians hold divisibility to be an affection of all matter. The Epicureans, again, allow it to agree to every physical continuum; but they deny that this affection agrees to all bodies, for the primary corpuscles or atoms they mantain to be perfectly insecable and indivisible.

As it is evident that body is extended, so it is no less evident that it is divisible: for since no two particles of matter can exist in the same place, it follows, that they are really distinct from each other; which is all that is meant by being divisible. In this sense the least conceivable particle must still be divisible, since it will consist of parts which will be really distinct. To illustrate this by a familiar instance. Let the least imaginary piece of matter be conceived lying on a smooth plain surface, it is evident the surface will not touch it every where: those parts therefore which it does not touch may be supposed separable from the others, and so on as far as we please; and this is all that is meant when we say matter is infinitely divisible.

Palte CLXII. The infinite divisibility of mathematical quantity is demonstrated thus geometrically. Suppose the line AC perpendicular to BF; and another, as GH, at a small distance from it, also perpendicular to the same line: with the centres CCC, &c. describe circles cutting the line GH in the points *eee*, &c. Now the greater the radius AC is, the less is the part *e*H. But the radius may be augmented in infinitum; so long, therefore, the part *e*H may be divided into still less portions; consequently it may be divided in infinitum.

All that is supposed in strict geometry (says Mr Maclaurin) concerning the divisibility of magnitude, amounts to no more than that a given magnitude may be conceived to be divided into a number of parts equal to any given or proposed number. It is true, that the number of parts into which a given magnitude may be conceived to be divided, is not to be fixed or limited, because no given number is so great but a greater may be conceived and assigned; but there is not, therefore, any necessity of supposing the number of parts actually infinite; and if some have drawn very abstruse consequences from such a supposition, yet geometry ought not to be loaded with them.

How far matter may actually be divided, may in some measure be conceived from hence, that a piece of wire gilt with so small a quantity as eight grains of gold, may be drawn out to a length of 13,000 feet, the whole surface of it still remaining covered with gold. We have also a surprising instance of the minuteness of some parts of matter from the nature of light and vision. Let a candle be lighted, and placed in an open plain, it will then be visible two miles round; and consequently was it placed two miles above the surface of the earth, it would fill with luminous particles a sphere whose diameter was four miles, and that before it had lost any sensible part of its weight. A quantity of vitriol being dissolved, and mixed with 9000 times as much water, will tinge the whole; consequently will be divided into as many parts as there are visible portions of matter in that quantity of water. There are perfumes, which, without a sensible diminution of their quantity, shall fill a very large space with their odoriferous particles; which must therefore be of an inconceivable smallness, since there will be a sufficient number in every part of that space sensibly to affect the organ of smelling. Dr Keill demonstrates, that any particle of matter, how small soever, and any finite space, how large soever, being given, it is possible for that small particle of matter to be diffused through all that space, and to fill it in such a manner, as that there shall be no pore in it whose diameter shall exceed any given line.

The chief objections against the divisibility of matter in infinitum are, That an infinite cannot be contained by a finite: and that it follows from a divisibility in infinitum, either that all bodies are equal, or one infinite is greater than another. But the answer to these is easy; for the properties of a determined quantity are not to be attributed to an infinite considered in a general sense; and who has ever proved that their could not be an infinite number of infinitely small parts in a finite quantity, or that all infinites are equal? The contrary is demonstrated by mathematicians in innumerable instances. See the article INFINITE, and *'S Gravesande Elem. Matem.* l. i. c. 4.

DIVISION, in general, is the separating a thing into two or more parts.

Mechanical DIVISION, signifies that separation which is occasioned in the parts of a body by help of mechanical instruments.—The mechanical division of bodies does

does indeed separate them into smaller, homogeneous, similar parts; but this separation cannot extend to the primary integrant molecules of any body; and consequently is incapable of breaking what is properly called their *aggregation*: also, no union is formed betwixt the divided and dividing bodies, in which respect division essentially differs from dissolution.

Division is not properly a chemical operation. It is only employed preparatorily to facilitate other operations, and particularly solution. For this purpose it is very useful, as it increases the quantity of surface, and consequently the points of contact of any body.—Different methods are used to divide bodies according to their nature. Those which are tenacious and elastic, as horns and gums, require to be cut, rasped, or filed. Metals, because of their ductility, require the same treatment: but as they are also fusible, they may be quickly and conveniently reduced into grains small enough for most operations, by pouring them, when melted, into water. All brittle bodies may be reduced conveniently into fine parts by being bruised in a mortar with a pestle. Very hard bodies, such as glass, crystals, stones, particularly those of the vitrifiable kind, before they are pounded, ought to be plunged when red-hot into water, by which they are split and cracked, and rendered more easily pulverable. Bodies of this kind may also be bruised or ground by means of a hard and flat stone, upon which the matter is to be put, and bruised by another hard stone so small as to be held and moved upon the larger stone with the hand. The larger stone is called a *porphyry*, from its being generally of that kind of stone; and the operation is called *porphyrisation*. Instead of porphyrisation, a mill may be used, composed of a hard grit millstone, moving round upon another stone of the same kind, which must be fixed: in the upper stone is a groove or channel, through which the matter to be ground passes. By this method a substance may be more quickly reduced to a fine powder than by porphyrisation. But these mills can be only employed for considerable quantities of matter.

These methods of mechanically dividing bodies are attended with some practical inconveniences: the most considerable of which is, that some parts of the dividing instruments are always struck off, and mixed with the matter to be divided. This may greatly affect the operations. For instance, instruments of iron and copper furnish metallic colouring particles, and copper is very prejudicial to health. Porphyry is coloured by a reddish brown matter, which injures the colour of crystal glasses, enamels, and procelains made with matters ground upon this stone. These matters therefore must be cleansed after their porphyrisation, or else no instruments capable of injuring the intended operations ought to be employed. Thus, for the preparation of all medicines to be taken internally, no copper instruments, as mortars, pestles, &c. ought to be used; those made of iron are preferable; and instead of porphyries, mortars, grinding-stones and millstones made of hard and white stones ought to be employed for substances which are to enter into the composition of enamels, crystal glass, and porcelain, the whiteness of which is a most necessary quality.

Division, in algebra. See Algebra, p. 402.

Division, in arithmetic. See Arithmetic, n° 11.

Division of an Army, in the military art, the several brigades and squadrons into which it is cantoned.

Division of a Battalion, are the several platoons into which it is divided in marching or firing, each of which is commanded by an officer.

Division, in sea affairs, a select number of ships in a fleet or squadron of men of war, distinguished by a particular flag or pendant, and usually commanded by a general officer. A squadron is commonly ranged into three divisions, the commanding officer of which is always stationed in the centre.

When a fleet consists of 60 sail of the line, that is, of ships having at least 60 cannon each, the admiral divides it into three squadrons, each of which has its divisions and commanding officers. Each squadron has its proper colours, according to the rank of the admiral who commands it, and every division its proper mast. Thus the white flag denotes the first division of France; the white and blue the second; and the third is characterised by the blue. In Britian, the first admiral, or the admiral of the fleet, displays the union-flag at the main-top-mast head; next follows the white flag with St George's cross; and afterwards the blue. The private ships carry pendants of the same colour with their respective squadrons at the mast of their particular divisions; so that the last ship in the division of the blue squadron carries a blue pendant at her mizen-top-mast head.

DIVISOR, in arithmetic. See Arithmetic, n° 11.

DIUM (anc. geog.), a town of Chalcidice in Macedonia, near mount Athos. Also a promontory of Crete, on the north side of the island.—A third *Dium* a promontory of Eubœa; or a town of that name in Eubœa, near the promontory Cenæum, on the north-west side of the island, called also *Dia*.—A fourth *Dium* in Pieria of Macedonia, on the west side of the Sinus Thermaicus. Strabo and Livy place it on the borders of Pieria to the south, at the foot of mount Olympus towards Thessaly. That it was a splendid city appears from Polybius; who relates, that its gymnasium and walls were overthrown by the Ætolians. From which overthrow, however, it again recovered, Alexander adding new splendor to it, by the brass statues cast by Lysippus, and erected there in memory of the slain at the Granicus: an ornament which was continued down to the time of the Romans; who made it a colony, called *Diensis*—A fifth *Dium* beyond Jordan, near Pella in the Piræa.

DIVODURUM (anc. geog.), a town of the Mediomatrici in Gallia Belgica; situated on the Moselle, in the spot where now Metz stands: now a city of Lorrain. E. Long. 6. 0 Lat. 49. 16.

DIVORCE, a breach or dissolution of the bond of marraige. See Marriage; and Law, N° clx. 23.

Divorce is of two kinds: the one, *a vinculo matrimonii*, which alone is properly *divorce*; the other, *a mensa & thoro*, "a separation from bed and board."

The woman divorced *a vinculo matrimonii* receives all again that she brought with her: the other has a suitable separate maintenance allowed her out of her husband's effects. The first only happens thro' some essential impediment, as consanguinity or affinity within the degrees forbidden, Divorce. forbidden, pre-contract, impotency, adultery, &c. of which impediments the canon law allows 14, comprehended in these verses;

> *Error, conditio, votum, cognatio, crimen,*
> *Cultus, disparitas, vis, ordo, ligamen, honestas,*
> *Si sis affinis, si forte coire nequibis,*
> *Si parochi & duplicis desit præsentia testis,*
> *Raptave sit mulier, nec parti reddita tuta.*

Divorce in Britain is a spiritual judgment, and therefore is passed in the spiritual court. Under the old law, the woman divorced was to have of her husband a writing, as St Jerom and Josephus testify, to this effect: *I promise, that hereafter I will lay no claim to thee;* which was called a *bill of divorce.*

Divorce was allowed of in great latitude both among the pagans and Jews. At Rome, barrenness, age, disease, madness, and banishment, were the ordinary causes of divorce. Spurius Carvilius, between 500 and 600 years after the building of Rome, under the consulship of M. Attilius, and P. Valerius, was the first who put away his wife because she was barren: though Plutarch, in his Roman Questions, maintains, that Domitian was the first who permitted divorce. Justinian afterwards added impotence, a vow of chastity, and the profession of a monastic life, as valid reasons of divorce.

The Roman lawyers distinguish between *repudium* and *divortium*; making the former to be the breaking of a contract or espousal, and the latter separation after matrimony. Romulus enacted a severe law, which suffered not a wife to leave her husband, but gave the man the liberty of turning off his wife, either upon poisoning her children, counterfeiting his private keys, or for the crime of adultery; but if the husband on any other occasion put her away, he ordered one moiety of his estate for the wife, and the other to the goddess Ceres: besides an atonement to the gods of the earth. However, in later times, the women as well as the men might sue a divorce. The common way of divorcing was by sending a bill to the woman, containing the reasons of separation, and the tender of all her goods which she brought with her: and this was called *repudium mittere;* or else it was performed in her presence, and before seven witnesses, and accompanied with the formalities of tearing the writings, refunding the portion, taking away the keys, and turning the woman out of doors.

The Grecian laws concerning divorces were different: The Cretans allowed divorce to any man that was afraid of having too many children. The Spartans seldom divorced their wives; and it was extremely scandalous for a woman to depart from her husband. The Athenians allowed divorce on very small grounds, by a bill, containing the reason of the divorce, and approved, if the party appealed, by the chief magistrate; and women also were allowed to leave their husbands on just occasions. Persons divorcing their wives were obliged to return their portions; otherwise, the Athenian laws obliged them to pay nine oboli a month for alimony. The terms expressing the separation of men and women from each other were different; the men were said *αποπεμπειν* or *απολυειν, to dismiss their wives;* but wives, *απολειπειν, to leave their husbands.*

" The law of Moses (Mr Paley observes), for reasons of local expediency, permitted the Jewish husband to put away his wife; but whether for every cause, or for what cause, appears to have been controverted amongst the interpreters of those times. Christ, the precepts of whose religion were calculated for more general use and observation, revokes this permission, as given to the Jews 'for their hardness of hearts,' and promulges a law which was thenceforward to confine divorces to the single cause of adultery in the wife: 'Whosoever shall put away his wife, except it be for fornication, and shall marry another, committeth adultery; and whoso marrieth her which is put away, doth commit adultery.' Matt. xix. 9.

Paley's Moral and Political Philosophy, p. 273.

'Inferior causes may justify the separation of husband and wife, although they will not authorise such a dissolution of the marriage contract as would leave either at liberty to marry again: for it is that liberty in which the danger and mischief of divorces principally consist. The law of Britain, in conformity to our Saviour's injunction, confines the dissolution of the marriage contract to the single case of adultery in the wife; and a divorce even in that case can only be brought about by the operation of an act of parliament, founded upon a previous sentence in the spiritual court, and a verdict against the adulterer at common law: which proceedings taken together compose as complete an investigation of the complaint as a cause can receive. It has lately been proposed to the legislature to annex a clause to these acts, restraining the offending party from marrying with the companion of her crime, who by the course of proceeding is always known and convicted: for there is reason to fear, that adulterous connections are often formed with the prospect of bringing them to this conclusion; at least, when the seducer has once captivated the affection of a married woman, he may avail himself of this tempting argument to subdue her scruples, and complete his victory; and the legislature, as the business is managed at present, assists by its interposition the criminal design of the offenders, and confers a privilege where it ought to inflict a punishment. The proposal deserved an experiment; but something more penal, it is apprehended would be found necessary to check the progress of this alarming depravity. Whether a law might not be framed, directing *the fortune of the adulteress to descend as in case of her natural death;* reserving, however a certain proportion of the produce of it, by way of annuity, for her subsistence (such annuity in no case to exceed a certain sum); and also so far suspending the estate in the hands of the heir, as to preserve the inheritance to any children she might bear to a second marriage, in case there was none to succeed in the place of their mother by the first: whether such a law would not render female virtue in higher life less vincible, as well as the seducers of that virtue less urgent in their suit, I would recommend to the deliberation of those who are willing to attempt the reformation of this important but most incorrigible class of the community. A passion for splendor, for expensive amusements and distinctions, is commonly found in that description of women who would become the subjects of such a law, not less inordinate than their other appetites. A severity of the kind proposed applies immediately to that passion. And there is no room for any complaint of injustice, since the provisions

sions above stated, with others which might be contrived, confine the punishment, so far as it is possible, to the person of the offender; suffering the estate to remain to the heir, or with the family of the ancestor from whom it came, or to attend the appointments of his will.

"Sentences of the ecclesiastical courts which release the parties *a vinculo matrimonii*, by reason of impuberty, frigidity, consanguinity within the prohibited degrees, prior marriage, or want of the requisite consent of parents or guardians, are not dissolutions of the marriage contract, but judicial declarations that there never was any marriage; such impediment subsisting at the time as rendered the celebration of the marriage rite a mere nullity. And the rite itself contains an exception of these impediments. The man and woman to be married are charged, "if they know any impediment why they may not be lawfully joined together, to confess it;" and assured, "that so many as are coupled together, otherwise than God's word doth allow, are not joined together by God, neither is their matrimony lawful;" all which is intended by way of solemn notice to the parties, that the vow they are about to make will bind their consciences and authorise their cohabitation only upon the supposition that no legal impediment exist."

DIURETICS (from δια *by*, and ουρον *urine*), medicines which provoke a discharge by urine.

Such is water drank plentifully: white wine drank in a morning; alkali salts of all kinds; sea-salt, sal-gemmæ, nitre, borax, alum, tartar, sal ammoniac, whey, sour milk, lemon-juice, &c. Aqueous liquors are generally diuretic especially if mixed with salt, and drank cold. Fermented liquors are the least diuretic of all; and the less so, as they are the fatter. Sharp thin sour wines, rhenish, &c. as also acid spirits of vinegar, salt, sulphur, alum, vitriol, &c. asparagus, bitter almonds, smallage eryngium, eupatorium, sassafras, &c. are all diuretics.

DIURNAL, in astronomy, something relating to day; in opposition to *nocturnal*, which regards the night.

DIVUS, DIVA, in antiquity, appellations given to men and women who had been deified, or placed in the number of gods. See DEIFICATION, &c.

Hence it is, that on medals struck for the consecration of an emperor or empress, they give them the title of *divus* or *diva*: for example, DIVUS JULIUS. DIVO ANTONINO PIO. DIVO PIO. DIVO CLAUDIO. DIVA FAUSTINA AUG. &c.

DIZZINESS, in medicine. See VERTIGO.

DO, in music, a note of the Italian scale, corresponding to *ut* of the common gamut. See MUSIC.

DOBSON (William), an eminent English portrait and history painter, born at London in 1610. He served an apprenticeship with one Peck, a stationer and picture-dealer; and owed his improvement to the copying some pictures of Titian and Van Dyck, whose manner he always retained. He had farther obligations to the latter of these artists; for it is said, that a picture of his painting being exposed at a shop on Snow-hill, Van Dyck passing by was struck with it exceedingly; and enquiring after the author, found him at work in a poor garret. Van Dyck had the generosity to equip him in a manner suitable to his merit. He presented him to king Charles I. who took him under his protection, kept him with him at Oxford all the time his majesty continued in that city, and not only sat to him several times for his picture, but caused the prince of Wales, prince Rupert, and most of the lords of his court, to do so too. Mr. Dobson, however being somewhat loose and irregular in his way of life, was far from improving the many opportunities he had of making his fortune; and died very poor in 1647, at his house in St Martin's Lane.

DOBUNI, or BODUNI: an ancient people of Britain, who possessed the territory which now forms the counties of Oxford and Gloucester. Both the names of this British nation seem to have been derived from the low situation of a great part of the country which they inhabited: for both *Duvn* and *Bodun* signify "profound" or "low," in the ancient language of Gaul and Britain. The Dobuni are not mentioned among the British nations who resisted the Romans under Julius Cæsar, which was probably owing to the distance of their country from the scene of action; and before the next invasion under Claudius, they had been so much oppressed by their ambitious neighbours the Cattivellauni, that they submitted with pleasure to the Romans, in order to be delivered from that oppression. Cogidunus, who was at that time (as his name imports) prince of the Dobuni, recommended himself so effectually to the favour of the emperor Claudius, by his ready submission, and other means, that he was not only continued in the government of his own territories, but had some other states put under his authority. This prince lived so long, and remained so steady a friend and ally to the Romans, that his subjects, being habituated to their obedience in his time, never revolted, nor stood in need of many forts or forces to keep them in subjection. This is certainly the reason that we meet with so few Roman towns and stations in the country anciently inhabited by the Dobuni. The Durocornovium of Antoninus, and the Corinium of Ptolemy, are believed by antiquaries to have been the same place, the capital of the Dobuni, and situated at Cirencester, in Goucestershire, where there are many marks of a Roman station. Clevum or Glevum, in the thirteenth iter of Antoninus, stood where the city of Gloucester now stands; and Abone, in the fourteenth iter, was probably situated at Avinton on the Severn. The country of the Dobuni was comprehended in the Roman province Britannia Prima.

DOCETÆ (from δοκειν *to appear*) in ecclesiastical history, the followers of Julius Cassianus, one of the Valentinian sect, towards the close of the second century, who revived a notion that had been adopted by a branch of the Gnostics, against whom St John, Ignatius, and Polycarp, had asserted the truth of the incarnation. They believed and taught, as their name imports, that the actions and sufferings of Jesus Christ were not in reality, but only in appearance.

DOCIMASIA, in Greek antiquity, a probation of the magistrates and persons employed in public business at Athens. It was performed publicly in the forum, where they were obliged to give account of themselves and their past life before certain judges. Among several questions proposed to them, we find the following: Whether they had been dutiful to their parents,

rents,

rents, had served in the wars, and had a competent estate?

DOCIMASTIC ART, a name given to the art of essaying by operations in small, the nature and quantity of metallic or other matters which may be obtained from mineral or other compound bodies. See REFINING and METALLURGY.

DOCIMENUM MARMOR, a name given by the ancients to a species of marble of a bright and clear white, much used in large and sumptuous buildings, such as temples and the like. It had its name from *Docimenos*, a city of Phrygia, afterwards called *Synaia*; near which it was dug, and from whence it was sent to Rome. It was accounted little inferior to the Parian in colour, but not capable of so elegant a polish; whence it was less used by the statuaries, or in other smaller works. The emperor Adrian is said to have used this marble in building the temple of Jupiter: and many others of the great works of the Romans are of it.

DOCK, in botany. See RUMEX.

DOCK, in the manege, is used for a large case of leather, as long as the dock of a horse's tail, which serves it for a cover. The French call the dock *troussequeue*. It is made fast by straps to the crupper, and has leathern thongs that pass between his thighs, and along his flanks to the saddle-straps, in order to keep the tail tight, and to hinder it from whisking about.

DOCK, in maritime affairs, a sort of broad and deep trench, formed on the side of a harbour, or on the banks of a river; and commodiously fitted either to build ships or receive them to be repaired and *breamed* therein. These sorts of docks have generally strong flood-gates to prevent the flux of the tide from entering the dock while the ship is under repair.—There are likewise docks of another kind, called *wet docks*, where a ship can only be cleaned during the recess of the tide, or in the interval between the time when the tide left her dry a-ground and the period when it again reaches her by the return of the flood. Docks of the latter kind are not furnished with the usual flood-gates.

DOCK-Yards, certain magazines containing all sorts of naval stores and timber for ship-building. In England, the royal dock-yards are at Chatham, Portsmouth, Plymouth, Deptford, Woolwich, and Sheerness. His majesty's ships and vessels of war are generally moored at these ports during the time of peace; and such as want repairing are taken into the docks, examined, and refitted for service.

The principal dock-yards are governed by a commissioner, resident at the port: who superintends all the musters of the officers, artificers, and labourers, employed in the dock-yard and ordinary. He also controls their payment therein; examines the accounts; contracts, and draws bills on the navy-office to supply the deficiency of stores; and, finally, regulates whatever belongs to the dock-yard, maintaining due order in the respective offices.

These yards are generally supplied from the northern crowns with hemp, pitch, tar, rosin, canvas, oak-plank, and several other species. With regard to the masts, particularly those of the largest size, they are usually imported from New-England.

DOCTOR, a person who has passed all the degrees of a faculty, and is impowered to teach or practise the same: thus we say, doctor in divinity, doctor in physic, doctor of laws.

The establishment of the *doctorate*, such as now in use among us, is ordinarily attributed to Irnerius, who himself drew up the formulary. The first ceremony of this kind was performed at Bologna, in the person of Bulgarus, who began to profess the Roman law, and on that occasion was solemnly promoted to the *doctorate, i. e.* installed *juris utriusque doctor*. But the custom was soon transferred from the faculty of law to that of theology; the first instance whereof was given in the university of Paris, where Peter Lombard and Gilbert de la Portree, the two chief divines of those days, were created doctors in theology, *sacræ theologiæ doctores*.

Spelman takes the title of doctor not to have commenced till after the publication of Lombard's sentences, about the year 1140; and affirms, that such as explained that work to their scholars were the first that had the appellation of doctors. Others go much higher, and hold Bede to have been the first doctor at Cambridge, and John de Beverley at Oxford, which latter died in the year 721. But Spelman will not allow doctor to have been the name of any title or degree in England till the reign of king John, about the year 1207.

To pass doctor in divinity at Oxford, it is necessary the candidate have been four years bachelor of divinity. For doctor of laws, he must have been seven years in the university to commence bachelor of law; five years after which he may be admitted doctor of laws. Otherwise, in three years after taking the degree of master of arts, he may take the degree of bachelor in law; and in four years more, that of LL. D. which same method and time are likewise required to pass the degree of doctor in physic.

At Cambridge, to take the degree of doctor in divinity, it is required the candidate have been seven years bachelor of divinity. Though in several of the colleges the taking of the bachelor of divinity's degree is dispensed with, and they may go out *per saltum*. To commence doctor in laws, the candidate must have been five years bachelor of law, or seven years master of arts. To pass doctor in physic, he must have been bachelor in physic five years, or seven years master of arts. A doctor of the civil law, in England, may exercise ecclesiastical jurisdiction, though a layman, stat. 37 Hen. VIII. cap. 17. sect. 4.

DOCTOR of the Law, a title of honour among the Jews. The investiture, if we may so say, of this order was performed by putting a key and table-book in their hands; which is what some authors imagine our Saviour had in view, Luke xi. 52. when, speaking of the doctors of the law, he says, "Wo unto you doctors of the law, for ye have taken away the key of knowledge: ye entered not in yourselves, and them that were entering ye hindered."

DOCTOR of the Church, a title given to certain of the fathers whose doctrines and opinions have been the most generally followed and authorised. We usually reckon four doctors of the Greek church, and three of the Latin. The first are St Athanasius, St Basil, St Gregory Nazianzen, and St Chrysostom. The latter are

St Jerom, St Augustine, and Gregory the Great. In the Roman breviary there is a particular office for the doctors. It only differs from that of the confessors, by the anthem of the Magnificat, and the lessons.

DOCTOR, is also an appellation adjoined to several specific epithets, expressing the merit of some of the schoolmen: thus, Alexander Hales is called the irrefragable doctor; Thomas Aquinas, the angelic doctor; St Bonaventure, the seraphic doctor; John Duns Scotus, the subtile doctor; Raimond Lully, the illuminated doctor; Roger Bacon, the admirable doctor, &c.

DOCTOR, Διδασκαλος, in the Greek church, is a particular officer, appointed to interpret part of the scriptures. He who interprets the Gospels, is called *doctor of the Gospels*; he who interprets St Paul's Epistles, *doctor of the Apostle*: he who interprets the Psalms, *doctor of the Psalter*.

DOCTORS-Commons. See *COLLEGE of Civilians*.

DOCUMENT, in law, some written monument produced in proof of any thing asserted.

DODARTIA, in botany: A genus of the angiospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 40th order, *Personatæ*. The calyx is quinquedentated; the under lip of the corolla twice as long as the upper; the capsule bilocular and globose.

DODD (Dr William), an unfortunate English divine, eldest son of the Rev. William Dodd, many years vicar of Bourne in Lincolnshire, was born May 29. 1729. He was sent, at the age of 16, to the university of Cambridge; and admitted, in the year 1745, a sizar of Clare-Hall. In 1749-50 he took the degree of B. A. with great honour, being upon that occasion in the list of wranglers. Leaving the university, he imprudently married a Miss Mary Perkins in 1751, was ordained a deacon the same year, priest in 1753, and soon became a celebrated and popular preacher. His first preferment was the lectureship of West-Ham. In 1754 he was also chosen lecturer of St Olave's, Hart-Street; and in 1757 took the degree of M. A. at Cambridge. On the foundation of the Magdalen Hospital in 1758, he was a strenuous supporter of that charity, and soon after became preacher at the chapel of it. By the patronage of Bishop Squire, he in 1763 obtained a prebend of Brecon, and by the interest of some city-friends procured himself to be appointed one of the king's chaplains; soon after which, he had the education of the present earl of Chesterfield committed to his care. In 1766 he went to Cambridge and took the degree of LL. D. At this period, the estimation in which he was held by the world was sufficient to give him expectations of preferment, and hopes of riches and honours; and these he might probably have acquired, had he possessed a common portion of prudence and discretion. But, impatient of his situation, and eager for advancement, he rashly fell upon means which in the end were the occasion of his ruin. On the living of St George, Hanover-Square, becoming vacant, he wrote an anonymous letter to the chancellor's lady, offering 3000 guineas if by her assistance he was promoted to it. This being traced to him, complaint was immediately made to the king, and Dr Dodd was dismissed with disgrace from his office of chaplain. From this period he lived neglected, if not despised; and his extravagance still continuing, he became involved in difficulties, which tempted him to forge a bond from his late pupil lord Chesterfield, Feb. 4. 1777, for L.4200, which he actually received: but being detected, he was tried at the Old Bailey, found guilty, and received sentence of death; and, in spite of every application for mercy, was executed at Tyburn, June 27. 1777. Dr Dodd was a voluminous writer, and possessed considerable abilities, with little judgment and much vanity. An accurate list of his various writings is prefixed to his "Thoughts in Prison," ed. 1781.

Nichol's Anecdotes of Boyer.

DODDER, in botany. See CUSCUTA.

DODDRIDGE (Philip), D. D. an eminent Presbyterian minister, was the son of Daniel Doddridge an oil-man in London, where he was born on the 26th of June 1702; and having completed the study of the classics in several schools, was, in 1719, placed under the tuition of the reverend Mr John Jennings, who kept an academy at Kilworth in Leicestershire. He was first settled as a minister at Kilworth, where he preached to a small congregation in an obscure village: but, on Mr Jennings's death, succeeded to the care of his academy; and soon after was chosen minister of a large congregation of Dissenters at Northampton, to which he removed his academy, and where the number of his pupils increased. He instructed his pupils with the freedom and tenderness of a father; and never expected nor desired that they should blindly follow his sentiments, but encouraged them to judge for themselves. He checked any appearance of bigotry and uncharitableness, and endeavoured to cure them by showing what might be said in defence of those principles they disliked. He died at Lisbon, whither he went for the recovery of his health; and his remains were interred in the burying-ground belonging to the British factory there, and a handsome monument was erected to his memory in the meeting-house at Northampton, at the expence of the congregation, on which is an epitaph written by Gilbert West, Esq. He wrote, 1. Free Thoughts on the most probable means of reviving the Dissenting Interest. 2. The Life of Colonel James Gardiner. 3. Sermons on the Education of Children. 4. The Rise and Progress of Religion in the Soul. 5. The Family Expositor, in 6 vols 4to, &c. And since the author's death, a volume of his Hymns have been published, and his Theological Lectures. Several of his works have been translated into Dutch, German, and French.

DODECAGON, in geometry, a regular polygon consisting of twelve equal sides and angles.

DODECAHEDRON, in geometry, one of the platonic bodies, or regular solids, contained under twelve equal and regular pentagons.

DODECANDRIA (from δωδεκα *twelve*, and ανηρ *a man*;) the name of the eleventh class in Linnæus's sexual system, consisting of plants with hermaphrodite flowers, that, according to the title, have twelve stamina or male organs. This class, however, is not limited with respect to the number of stamina. Many genera have sixteen, eighteen, and even nineteen stamina; the essential character seems to be, that, in the class in question, the stamina, however numerous, are inserted into the receptacle: whereas in the next class, icosandria, which is as little determined in point of number as the present, they are attached to the inside of the calyx or flower-cup.

The orders in this class, which are six, are founded upon the number of the styles, or female organs. Asarabacca, mangostan, storax, purple loose-strife, wild Syrian rue, and purslane, have only one style: agrimony and heliocarpus have two; burning thorny plant and bastard rocket, three; *glinus*, five; *illicium*, eight; and house-leek, twelve.

DODECAS, in botany: A genus of the trigynia order, belonging to the dodecandria class of plants. The calyx is half quadrifid, having the corolla above; the corolla quinquefid; the capsule unilocular, conjoined with the calyx.

DODECATHEON, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 21st order, *Preciæ*. The corolla is verticillated and reflexed: the stamina placed in the tube; the capsule unilocular and oblong.

DODO, in ornithology. See DIDUS.

DODONA, a town of Thesprotia in Epirus, or (according to others) in Thessaly. There was in its neighbourhood a celebrated oracle of Jupiter. The town and temple of the god were first built by Deucalion, after the universal deluge. It was supposed to be the most ancient oracle of all Greece; and according to the traditions of the Egyptians mentioned by Herodotus, it was founded by a dove. Two black doves, as he relates, took their flight from the city of Thebes in Egypt; one of which flew to the temple of Jupiter Ammon, and the other of Dodona, where with an human voice they acquainted the inhabitants of the country that Jupiter had consecrated the ground, which in future would give oracles. The extensive grove which surrounded Jupiter's temple was endowed with the gift of prophecy; and oracles were frequently delivered by the sacred oaks and the doves which inhabited the place. This fabulous tradition of the oracular power of the doves is explained by Herodotus, who observes that some Phenicians carried away two priestesses from Egypt, one of which went to fix her residence at Dodona, where the oracle was established. It may farther be observed, that the fable might have been founded upon the double meaning of the word πελειαι, which signifies *doves* in most parts of Greece, while in the dialect of the Epirots it implies *old women*. In ancient times the oracles were delivered by the murmuring of a neighbouring fountain; but the custom was afterwards changed. Large kettles were suspended in the air near a brazen statue, which held a lash in its hand. When the wind blew strong, the statue was agitated and struck against one of the kettles, which communicated the motion to all the rest, and raised that clattering and discordant din, which continued for a while, and from which the artifice of the priests drew the predictions. Some suppose that the noise was occasioned by the shaking of the leaves and boughs of an old oak, which the superstition of the people frequently consulted, and from which they pretended to receive oracles. It may be observed with more probability, that the oracles were delivered by the priests, who, by artfully concealing themselves behind the oaks, gave occasion to the superstitious multitude to believe that the trees were endowed with the power of prophecy. As the ship Argo was built with some of the oaks of the forest of Dodona, there were some beams which gave oracles to the Argonauts, and warned them against the approach of calamity. Within the forest of Dodona there was a stream and a fountain of cool water which had the power of lighting a torch as soon as it touched it. This fountain was totally dry at noon day, and was restored to its full course at midnight, from which time till the following noon it began to decrease, and at the usual hour was again deprived of its waters. The oracles of Dodona were generally delivered by women.

DODONÆA, in botany: A genus of the monogynia order, belonging to the octandria class of plants. The calyx is tetraphyllous; there is no corolla; the capsule trilocular and inflated; the seeds twofold.

DODONIAN, *Dodonæus*, in antiquity, an epithet given to Juptier, because he was worshipped in a temple built in the forest of Dodona, where was the most famous, and (it is said) the most ancient, oracle of all Greece. See DODONA.

DODONIDES, the priestesses who gave oracles in the temple of Jupiter in Dodona. According to some traditions the temple was originally inhabited by seven daughters of Atlas, who nursed Bacchus. Their names were Ambrosia, Eudora, Pasithoe, Pytho, Plexaure, Coronis, Tythe or Tyche. In the later ages the oracles were always delivered by three old women; which custom was first established when Jupiter enjoyed the company of Dione, whom he permitted to receive divine honour in his temple at Dodona. The Bœotians were the only people of Greece who received their oracles at Dodona from men, for reasons which Strabo, l. 9. fully explains.

DODRANS, in antiquity, three-fourths of the as. See the article As.

DODSLEY (Robert), a late eminent bookseller, and ingenious writer, born at Mansfield in Nottinghamshire, in the year 1703. He was not indebted to education for his literary fame, being originally a livery servant; but his natural genius, and early passion for reading, soon elevated him to a superior station. He wrote an elegant little satirical farce called *The Toy-shop*, which was acted with applause in 1735, and which recommended him to the patronage of Mr Pope. The following year he produced the *King and Miller of Mansfield*. The profits of these two farces enabled him to commence bookseller, and his own merit procured him eminence in that profession. He wrote some other dramatic pieces, and published a collection of his works in one vol. 8vo, under the modest title of *Trifles*; which was followed by *Public Virtue*, a poem in 4to. Beside what he wrote himself, the public were obliged to him for exerting his judgment in the way of his business; he having collected several volumes of well chosen *Miscellaneous Poems* and *Fugitive Pieces*, whose brevity would else have endangered their being totally lost to posterity. He died in 1764.

DODWELL (Henry), a very learned controversial writer, born at Dublin, but of English extraction, in 1641. He wrote an incredible number of tracts: but his services were so little acknowledged, that bishop Burnet and others accuse him of doing more hurt than good

Dreſburg, Dog. good to the cauſe of Chriſtianity, by his indiſcreet love of paradoxes and novelties, and thus expoſing himſelf to the ſcoffs of unbelievers. His pamphlet on the immortality of the ſoul gave riſe to the well known controverſy between Mr Collins and Dr Clark on that ſubject. He died in 1711.

DOESBURG, a town of the united provinces, in the county of Zutphen and province of Guelderland. It is ſmall, but well peopled, and very ſtrong both by art and nature, having the river Yſſel on one ſide, and a moraſs on the other, and is only to be approached by a narrow neck of land. E. Long. 5. 55. N. Lat. 52. 3.

DOG, in zoology: An animal remarkable for its natural docility, fidelity, and affection for its maſter; which qualities mankind are careful to improve for their own advantage. Theſe uſeful creatures guard our houſes, gardens, and cattle, with ſpirit and vigilance. By their help we are enabled to take not only beaſts, but birds; and to purſue game both over land and through the waters. In ſome northern countries, they ſerve to draw ſleds, and are alſo employed to carry burdens. In ſeveral parts of Africa, China, and by the Weſt Indian negroes, dogs are eaten, and accounted excellent food. Nay, we have the teſtimony of Mr Forſter, that dogs fleſh, in taſte, exactly reſembles mutton.* They were alſo uſed as food by the Romans, and long before them by the Greeks, as we learn from ſeveral treatiſes of Hippocrates. In the preſent times, their ſkins, dreſſed with the hair on, are uſed in muffs, made into a kind of buſkins for perſons in the gout, and for other purpoſes. Prepared in another way, they are uſed for ladies gloves, and the linings of maſks, being thought to make the ſkin peculiarly white and ſmooth. The French import many of theſe ſkins from Scotland, under a ſmall duty. Here, when tanned, they ſerve for upper leathers for neat pumps. Dogs ſkins dreſſed are exported under a ſmall and imported under a high, duty. The French import from Denmark large quantities of dogs hair, both white and black. The laſt is eſteemed the beſt, and is worked up in the black liſt of a particular kind of woollen cloth; but is not uſed, as many have ſuppoſed, in making of hats, being entirely unfit for this purpoſe.

* See *America*, nº 90.

With regard to the qualities of dogs, thoſe bred in the iſland of Britain are juſtly reckoned ſuperior to the dogs bred in any other country. The ſwiftneſs of the gre-hound is amazing: as are alſo the ſteadineſs and perſeverance of other hounds and beagles; the boldneſs of terriers in unearthing foxes, &c.; the ſagacity of pointers and ſetting dogs, who are taught a language by ſigns as intelligible to ſportſmen as ſpeech; and the invincible ſpirit of a bull-dog, which can be quelled only by death.—All the nations in Europe not only do juſtice to the ſuperior qualities of the Britiſh dogs, but adopt the terms and names, and thankfully receive the creatures as preſents.—It is remarkable, however, that almoſt every kind of Britiſh dogs degenerates in foreign countries; nor is it poſſible to prevent this degeneracy by any art whatever.

For the natural hiſtory of the dog, ſee CANIS.

Chooſing of Dogs. In order to chooſe a dog and bitch for good whelps, take care that the bitch come of a generous kind, be well proportioned, having large ribs and flanks; and likewiſe that the dog be of a good breed and young, for a young dog and an old bitch breed excellent whelps.

Sportſman's Dict. The beſt time for hounds nitches, or bratchets, to be lined in, are the months of January, February, and March. The bitch ſhould be uſed to a kennel, that ſhe may like it after her whelping, and ſhe ought to be kept warm. Let the whelps be weaned after two months old; and though it be ſome difficulty to chooſe a whelp under the dam that will prove the beſt of the litter, yet ſome approve that which is laſt, and account him to be the beſt. Others remove the whelps from the kennel, and lay them ſeverally and apart one from the other; then they watch which of them the bitch firſt takes and carries into her kennel again, and that they ſuppoſe to be the beſt. Others again imagine that which weighs leaſt when it ſucks to be the beſt: this is certain, that the lighter whelp will prove the ſwifter. As ſoon as the bitch has littered, it is proper to chooſe them you intend to preſerve, and drown the reſt: keep the black, brown, or of one colour; for the ſpotted are not much to be eſteemed, though of hounds the ſpotted are to be valued.

Hounds for chaſe are to be choſen by their colours. The white, with black ears, and a black ſpot at the ſetting on of the tail, are the moſt principal to compoſe a kennel of, and of good ſcent and condition. The black hound, or the black tanned, or the all liver-coloured, or all white: the true talbots are the beſt for the ſtronger line; the grizzled, whether mixed or unmixed, ſo they be ſhag-haired, are the beſt verminers, and a couple of theſe are proper for a kennel.—In ſhort take theſe marks of a good hound: That his head be of a middle proportion, rather long than round: his noſtrils wide, his ears large, his back bowed; his fillet great, his hunches large, thighs well truſſed, ham ſtrait, tail big near the reins, the reſt ſlender; the leg big, the ſole of the foot dry, and in the form of that of a fox, with large claws.

Keeping Dogs in Health.—As pointers and ſpaniels, when good of their kind and well broken, are very valuable to the ſportſman, it is worth while to take ſome care to preſerve them in health. This very much depends on their diet and lodging: frequent cleaning their kennels, and giving them freſh ſtraw to lie on, is very neceſſary; or, in ſummer-time, deal-ſhavings, or ſand, inſtead of ſtraw, will check the breeding of fleas. If you rub your dog with chalk, and bruſh and comb him once or twice a-week, he will thrive much the better; the chalk will clear his ſkin from all greaſineſs, and he will be the leſs liable to be mangy. A dog is of a very hot nature; he ſhould therefore never be without clean water by him, that he may drink when he is thirſty. In regard to their food, carrion is by no means proper for them: it muſt hurt their ſenſe of ſmelling, on which the excellence of theſe dogs greatly depends. Barley-meal, the droſs of wheat flour, or both mixed together, with broth or ſkimmed milk, is very proper food. For change, a ſmall quantity of greaves from which the tallow is preſſed by the chandlers, mixed with flour, or ſheep's feet well baked or boiled, are a very good diet; and when you indulge them with fleſh, it ſhould always be boiled. In the ſeaſon of hunting your dogs, it is proper to feed them in the evening before, and give them nothing in the morning you intend to take them out

Dog. Sportsman's Dict.

out except a little milk. If you stop for your own refreshment in the day, you should also refresh your dogs with a little bread and milk. It has been already observed that dogs are of a hot constitution; the greatest relief to them in the summer is twitch-grass, or dog-grass, which is the same thing. You should therefore plant some of it in a place where you can turn them into every morning: they will feed freely on it to be cured of the sickness they are subject to, and cured of any extraordinary heat of blood: but unless the grass be of this sort, it will have no effect.

Diseases of Dogs.—1. *Bites and Stings.* If dogs are bitten by any venomous creatures, as snakes, adders, &c. squeeze out the blood, and wash the place with salt and urine; then lay a plaster to it made of calamint, pounded in a mortar, with turpentine and yellow wax, till it come to a salve. If you give your dog some of the juice of calamint to drink in milk, it will be good; or an ounce of treacle dissolved in some sweet wine.

2. *Mange.* Dogs are subject to the mange from being fed too high, and allowed no exercise or an opportunity of refreshing themselves with dog-grass; or by being starved at home, which will cause them to eat the vilest stuff abroad, such as carrion, or even human excrement; or by want of water, and sometimes by not being kept clean in their kennel, or by foundering and melting in their grease. Either of these will heat the blood to a great degree, which will have a tendency to make them mangy. The cure may be effected by giving stone-brimstone powdered fine, either in milk or mixed up with butter, and rubbing them well every day for a week with an ointment made of some of the brimstone and pork-lard, to which add a small quantity of oil of turpentine.—Or, boil four ounces of quicksilver in two quarts of water to half the quantity; bathe them every day with this water, and let them have some of it to lick till the cure is perfected. Or, a small quantity of trooper's ointment rubbed on the parts on its first appearance will cure it. It will also free lousy puppies from their lice. Or, take two ounces of euphorbium: flour of sulphur, Flanders oil of bays, and soft soap, each four ounces. Anoint and rub your dog with it every other day; give him warm milk, and no water. The cure will be performed in about a week. The following receipt is also said to be efficacious. Take two handfuls of wild cresses, and as much elecampane, and also of the leaves and roots of roerb and sorrel, and two pounds of the roots of fodrels: boil all these well together in lee and vinegar; strain the decoction, and put into it two pounds of grey soap, and when it is melted, rub the dog with it four or five days successively, and it will cure him.

3. *Poison.* If you suspect your dog to be poisoned with nux vomica (the poison usually employed by the warreners, which causes convulsive fits and soon kills), the most effectual remedy, if immediately applied, is to give him a good deal of common salt; to administer which, you may open his mouth, and put a stick across to prevent the shutting it, whilst you cram his throat full of salt, at the same time holding his mouth upwards; and it will dissolve so that a sufficient quantity will be swallowed to purge and vomit him. When his stomach is sufficiently cleared by a free passage obtained by stool, give him some warm broth frequently, to prevent his expiring from faintness; and he will recover.

4. *Worms.* Dogs are very frequently troubled with worms; but more particularly while they are young. Any thing bitter is so nauseous to these worms, that they are very often voided by taking two or three purges of aloes; or (which is the same thing) Scots pills, four or five being a dose for a large dog: this is to be repeated two or three times in a week. If this do not succeed, you may give him an ounce of powder of tin mixed up with butter, in three doses; which seldom fails to cure. Or of the herb savin, dried and rubbed to powder, give about as much as will lie on a shilling for a dose; which will entirely destroy worms and their seed.

6 *Sore Feet.* A pointer ought not to be hunted oftener than two or three days in a week; and unless you take care of his feet, and give him good lodging as well as proper food, he will not be able to perform that through the season. You should therefore, after a hard day's hunting, wash his feet with warm water and salt; and when dry, wash them with warm broth, or beer and butter, which will heal their soreness, and prevent a settled stiffness from fixing.

7. *Strains, Blows, or small Wounds.* If your dog has received any little wounds by forcing through hedges, or gets any lameness from a blow or strain; bathe the wound or grieved part with salt and cold vinegar (for warming it only evaporates the fine spirit); and when dry, if a wound, you may pour in it a little friar's balsam, which will perform the cure sooner than any method hitherto experienced.

8. *Coughs and Colds.* Dogs are very subject to a cough, with an extraordinary choaking, which is thought to arise generally from a cold or some inward disorder; and probably it is often occasioned by their eating of fish-bones. To guard against it, order your servants to throw all such fish-bones where the dog can't get at them. But if the disorder be from a cold, let bleeding be repeated in small quantities, if necessary; but if it be what is called the *distemper* in dogs, and they appear to be very low in spirits, the bleeding is better omitted. Let meat-broth, or milk-broth warmed, be the principal part of his diet, using at the same time the following medicine. Take flour of sulphur, cold drawn linseed oil, and salt-petre, of each an ounce; divide it into four doses, giving him one dose every other day, and let him have plenty of clean straw to lie on; or one spoonful of honey daily.

Dog-Madness. Of this there are no less than seven sorts common among dogs. The chief causes are, high-feeding, want of exercise, fulness of blood, and costiveness. As for the two first, you must observe when you hunt them, that they should be better fed than when they rest; and let them be neither too fat nor too lean; but, of the two, rather fat than lean; by which means they will not only be preserved from madness but also from the mange and scab: which diseases they will be subject to for want of air, water, or exercise; but if you have but the knowledge to keep them in an even temper, they may live long, and continue sound. As for water, they should be left to their own pleasure; but for exercise and diet, it must be ordered according to discretion, observing a medium.

um. Give them once a week, especially in the heat of the year, five or six spoonfuls of salad-oil, which will cleanse them: at other times, the quantity of a hazel-nut of mithridate is an excellent thing to prevent diseases. It is also very good to bleed them under the tongue, and behind the ears.

The symptoms of madness are many and easily discerned. When any dog separates himself contrary to his former use, becomes melancholy or droops his head, forbears eating, and as he runs snatches at every thing; if he often looks upwards, and his stern at his setting on be a little erect, and the rest hanging down; if his eyes be red, his breath strong, his voice hoarse, and he drivels and foams at the mouth; you may be assured he has this distemper.

The seven sorts of madness are as follow; of which the two first are incurable. 1. The hot burning madness. 2. The running madness. The animals labouring under these are peculiarly dangerous; for all things they bite and draw blood from will have the same distemper; and they generally seize on all they meet with, but chiefly on dogs: their pain is so great it soon kills them.—The five curable madnesses are,

3. *Sleeping madness*, so called from the dog's great drowsiness, and almost continual sleeping. This is caused by the little worms that breed in the mouth of the stomach, from corrupt humours, vapours, and fumes which ascend to the head: for cure of which, take six ounces of the juice of wormwood, two ounces of the powder of hartshorn burnt, and two drams of agaric; mix all these together in a little white-wine, and give it the dog to drink in a drenching horn.

4. *Dumb madness*, lies also in the blood, and causes the dog not to feed, but to hold his mouth always wide open, frequently putting his feet to his mouth, as if he had a bone in his throat: to cure this, take the juice of black hellebore, the juice of *spatula putrida*, and of rue, of each four ounces; strain them well, and put thereto two drams of unprepared scammony; and being mixed well together, put it down the dog's throat with a drenching horn, keeping his head up for some time, lest he cast it out again; then bleed him in the mouth, by cutting two or three veins in his gums.

It is said, that about eight drams of the juice of an herb called *hartshorn*, or *dog's tooth*, being given to the dog, cures all sorts of madness.

5. *Lank madness*, is so called by reason of the dog's leanness and pining away. For cure give them a purge as before directed, and also bleed them: but some say there is no cure for it.

6. *Rheumatic* or *slavering madness*, occasions the dog's head to swell, his eyes to look yellow, and he will be always slavering and driveling at the mouth. To cure which, take four ounces of the powder of the roots of polipody of the oak, six ounces of the juice of fennel-roots, with the like quantity of the roots of misletoe, and four ounces of the juice of ivy: boil all these together in white-wine, and give it to the dog as hot as he can take it, in a drenching horn.

7. *Falling madness*, is so termed because it lies in the dog's head, and makes him reel as he goes, and to fall down. For the cure, take four ounces of the juice of briony, and the same quantity of the juice of peony, with four drams of stavesacre pulverised; mix these together, and give it the dog in a drenching horn; also let him blood in the ears, and in the two veins that come down his shoulders; and indeed bleeding is necessary for all sorts of madness in dogs.

When a dog happens to be bit by a mad one, there is nothing better than their licking the place with their own tongues, if they can reach it; if not, then let it be washed with butter and vinegar, made luke-warm, and let it afterwards be anointed with Venice-turpentine; but, above all, take the juice of the stalks of strong tobacco boiled in water, and bathe the place therewith: also wash him in sea-water, or water artificially made salt: give him likewise a little mithridate inwardly in two or three spoonfuls of sack; and so keep him apart; and if you find him after some time still to droop, the best way is to hang him.

Some have asserted their having cured several creatures that have been bit by mad dogs, with only giving them the middle yellow bark of buckthorn; which must be boiled in ale for a horse or cow, and in milk for a dog; but that it must be boiled till it is as bitter as you can take it.

As to the preventive of worming dogs, see Worming.

Dog-Days. See Canicula.

Dog-Fish, in ichthyology. See Squalus.

Dogs-Bane. See Apocynum.

Dog-Wood Tree. See Piscidia.

DOGE, the chief magistrate in the republics of Venice and Genoa.

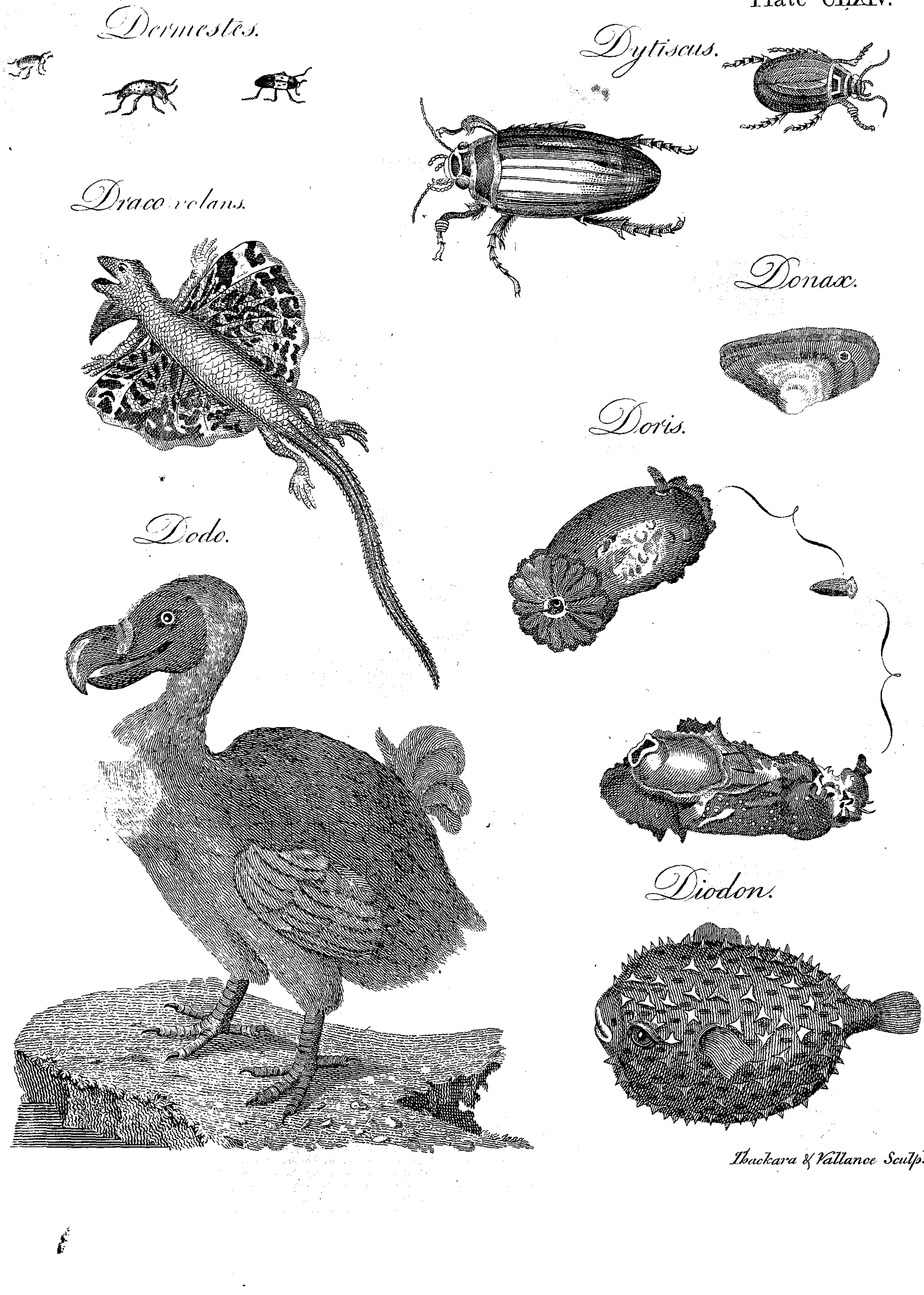
The word properly signifies *duke*, being formed from the Latin *dux:* as *dogate*, and *dogado*, from *ducatus*, "duchy."

The dogate, or office and dignity of doge, is elective; at Venice, the doge is elected for life; at Genoa, only for two years; he is addressed under the title of *Serenity*, which among the Venetians is superior to that of highness.

The doge is the chief of the council, and the mouth of the republic; yet the Venetians do not go into mourning at his death, as not being their sovereign, but only their first minister. In effect, the doge of Venice is no more than the phantom or shadow of the majesty of a prince; all the authority being reserved to the republic. He only lends his name to the senate; the power is diffused throughout the whole body, though the answers be all made in the name of the doge. If he gives any answers on his own account, they must be very cautiously expressed, and in general terms, otherwise he is sure to meet with a reprimand. So that it is absolutely necessary he be of an easy and pliable disposition.

Anciently the doges were sovereigns; but things are much altered; and at present, all the prerogatives reserved to the quality of doge, are these which follow: he gives audience to ambassadors; but does not give them any answer from himself, in matters of any importance; only he is allowed to answer according to his own pleasure, to the compliments they make to the signory; such answers being of no consequence. The doge, as being first magistrate, is head of all the councils; and the credentials which the senate furnishes its ministers in foreign courts, are written in his name;

Plate CLXIV.



Thackara & Vallance Sculp.t

name and yet he does not sign them; but a secretary of state signs them, and seals them with the arms of the republic. The ambassadors direct their dispatches to the doge; and yet he may not open them but in presence of the counsellors. The money is struck in the doge's name, but not with his stamp or arms. All the magistrates rise, and salute the doge when he comes into council; and the doge rises to none but foreign ambassadors.

The doge nominates to all the benefices in the church of St Mark; he is protector of the monastery delle Virgine; and bestows certain petty offices of ushers of the household, called *commanders of the Palace*. His family is not under the jurisdiction of the master of the ceremonies; and his children may have staff-officers, and gondoliers in livery.

His grandeur, at the same time, is tempered with a variety of circumstances, which render it burdensome. He may not go out of Venice without leave of the council; and if he does go out, he is liable to receive affronts, without being intitled to demand satisfaction; and, if any disorder should happen where he was, it belongs not to him, but to the podesta, as being invested with the public authority, to compose it.

The children and brothers of the doge are excluded from all the chief offices of state. They may not receive any benefice from the court of Rome; but are allowed to accept of the cardinalate, as being no benefice, nor including any jurisdiction. The doge may not divest himself of his dignity, for his ease; and after his death, his conduct is examined by three inquisitors and five correctors, who sift it with great severity.

DOGGER, a Dutch fishing vessel navigated in the German Ocean. It is generally employed in the herring fishery; being equipped with two masts, *viz.* a main-mast and a mizen-mast, and somewhat resembling a ketch. See the Plates at the article SHIP.

DOGGERS, in the English alum works, a name given by the workmen to a sort of stone found in the same mines with the true alum rock, and containing some alum, though not near so much as the right kind. The county of York, which abounds greatly with the true alum rock, affords also a very considerable quantity of these doggers; and in some places they approach so much to the nature of the true rock, that they are wrought to advantage.

DOGMA, a principle, maxim, tenet, or settled opinion, particularly with regard to matters of faith and philosophy.

DOGMATICAL, something belonging to a doctrine or opinion. A dogmatical philosopher is one who asserts things positively; in opposition to a sceptic, who doubts of every thing.

DOGMATISTS, a sect of ancient physicians, of which Hippocrates was the first author. They are also called *logici*, "logicians," from their using the rules of logic in subjects of their profession. They laid down definitions and divisions; reducing diseases to certain genera, and those genera to species, and furnishing remedies for them all; supposing principles, drawing conclusions, and applying those principles and conclusions to particular diseases under consideration: in which sense, the dogmatists stand contradistinguished from empirics and methodists. They reject all medicinal virtues that they think not reducible to manifest qualities: but Galen hath long ago observed of such men, that they must either deny plain matter of fact, or assign but very poor reasons and causes of many effects they pretend to explain.

DOLCE (Carlo, or Carlino), a celebrated history and portrait painter, was born at Florence in 1616, and was the disciple of Vignali. This great master was particularly fond of representing pious subjects, though he sometimes painted portraits; and his works are easily distinguished by the peculiar delicacy with which he perfected all his compositions, by a pleasing tint of colour, and by a judicious management of the chiaro scuro. His performance was remarkably slow; and it is reported that his brain was fatally affected by seeing Luca Jordana dispatch more business in four or five hours than he could have done in as many months. He died in 1686.

DOLE, in the Saxon and British tongue, signified a part or portion, most commonly of a meadow, where several persons have shares. It also still signifies a distribution or dealing of alms, or a liberal gift made by a great man to the people.

DOLE, in Scots law, signifies a malevolent intention. It is essential in every crime, that it be committed intentionally, or by an act of the will: hence the rule, *Crimen dolo contrahitur*.

DOLICHOS, in botany: A genus of the decandria order, belonging to the diadelphia class of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The basis of the vexillum has two callous knobs, oblong, parallel, and compressing the alæ below. There are 25 species; the most remarkable of which are the following.

1. The lablab, with a winding stalk, is a native of warm climates, where it is frequently cultivated for the table. Mr Hasselquist informs us, that it is cultivated in the Egyptian gardens, but is not a native of that country. The Egyptians make pleasant arbours with it in their houses and gardens, by supporting the stem and leading it where they think proper. They not only support it with sticks and wood, but tie it with cords; by which means the leaves form an excellent covering, and an agreeable shade.

2. The soja is a native of Japan, where it is termed *daidsu*; and, from its excellence, *mame*; that is, "the legumen or pod," by way of eminence. It grows with an erect, slender, and hairy stalk, to the height of about four feet. The leaves are like those of the garden kidney bean*. The flowers are of a bluish white, and produced from the bosom of the leaves, and succeeded by bristly hanging pods resembling those of the yellow lupine, which commonly contain two, sometimes three, large white seeds. There is a variety of this kind, with a small black fruit, which is used in medicine. Kempfer affirms, that the seeds of this when pounded and taken inwardly give relief in the asthma. This legumen is doubly useful in the Japanese kitchens. It serves for the preparation of a substance named *miso*, that is used as butter; and likewise a pickle celebrated among them under the name of *sooju* or *soy*. To make the first, they take a measure of mame, or the beans produced by the plant: after boiling them for a considerable time in water, and to a proper degree of softness, they

* See *Phaseolus*.

they beat or bray them into a softish pulse; incorporating with it, by means of repeated braying, a large quantity of common salt, four measures in summer, in winter three. The less salt that is added, the substance is more palatable; but what it gains in point of taste, it loses in durability. They then add to this mixture a certain preparation of rice, to which they give the name of *koos;* and having formed the whole into a compost, remove it into a wooden vessel which had lately contained their common ale or beverage named *sacki*. In about two months it is fit for use. The koos gives it a grateful taste; and the preparing of it, like the polenta of the Germans, requires the skilful hand of an experienced master. For this reason there are certain people who make it their sole business to prepare the koos, and who sell it ready made for the purpose of making miso: a substance which cannot fail to be greatly valued in those countries where butter from the milk of animals is unknown. To make sooju or soy, they take equal quantities of the same beans boiled to a certain degree of softness; of muggi, that is corn, whether barley or wheat, roughly ground; and of common salt. Having properly mixed the beans with the pounded corn, they cover up the mixture, and keep it for a day and a night in a warm place, in order to ferment; then putting the mass into a pot, they cover it with the salt, pouring over the whole two measures and a half of water. This compound substance they carefully stir at least once a-day, if twice or thrice the better, for two or three months: at the end of which time, they filtrate and express the mass, preserving the liquor in wooden vessels. The older it is, the better and the clearer; and if made of wheat instead of barley, greatly blacker. The first liquor being removed, they again pour water upon the remaining mass; which, after stirring for some days, as before, they express a second time, and thus obtain an inferior sort of soy.

3. The pruriens, or cow-itch, is also a native of warm climates. It hath a fibrous root, and an herbaceous climbing stalk, which is naked, dividing into a great number of branches; and rises to a great height when properly supported. The leaves are alternate and trilobate, rising from the stem and branches about 12 inches distant from each other. The footstalk is cylindrical, from 6 to 14 inches long. From the axilla of the leaf descends a pendulous solitary spike, from 6 to 14 inches long, covered with long blood-coloured papilionaceous flowers, rising by threes in a double alternate manner from small fleshy protuberances, each of which is a short pedunculus of three flowers. These are succeeded by leguminous, coriaceous pods, four or five inches long, crooked like an Italic *f*; densely covered with sharp hairs, which penetrate the skin, and cause great itching. This will grow in any soil in those countries where it is a native: but is generally eradicated from all cultivated grounds; because the hairs from the pods fly with the winds, and torment every animal they happen to touch. If it was not for this mischievous quality, the beauty of its flowers would intitle it to a place in the best gardens. It flowers in the cool months, from September to March, according to the situation.—The spiculæ, or sharp-hairs, of this plant, have been long used in South America in cases of worms; and have of late been frequently employed in Britain. The spiculæ of one pod mixed with syrup or molasses, and taken in the morning fasting, is a dose for an adult. The worms are said to appear with the second or third dose; and by means of a purge in some cases the stools are said to have consisted almost entirely of worms; and in cases of lumbrici, it is said to produce a safe and effectual cure. Those who have used it most, particularly Dr Bancroft and Dr Cochrane, affirm that they have never seen any inconvenience resulting from the internal use of it, notwithstanding the great uneasiness it occasions on the slightest touch to any part of the surface.

DOLLAR, or DOLLER, a silver coin, nearly of the value of the Spanish piece of eight or French crown.

Dollars are coined in different parts of Germany and Holland; and have their diminutions, as semi-dollars, quarter dollars, &c. See *MONEY-Table*.

They are not all of the same fineness nor weight. The Dutch dollars are the most frequent in the Levant. They are called *astaini*, from the impression of a lion thereon.

DOLPHIN, in ichthyology. See DELPHINUS.

DOLPHIN, of the Mast, a peculiar kind of wreath, formed of plaited cordage, to be fastened occasionally round the masts, as a support to the puddening, whose use is to sustain the weight of the fore and main yards in case the rigging or chains by which those yards are suspended should be shot away in the time of battle; a circumstance which might render their sails useless at a season when their assistance is extremely necessary. See the article PUDDENING.

DOM, or DON, a title of honour, invented and chiefly used by the Spaniards, signifying *sir* or *lord*.

This title, it seems, was first given to Pelayo, in the beginning of the eighth century. In Portugal no person can assume the title of *don* without the permission of the king, since it is looked upon as a mark of honour and nobility. In France it is sometimes used among the religious. It is an abridgment of *domnus*, from *dominus*.

DOM and Som, in old charters, signifies full property and jurisdiction.

DOMAIN, the inheritance, estate, or possession of any one. See DEMESNE.

DOMAT (John), a celebrated French lawyer born in 1625, who observing the confused state of the laws, digested them in 4 vols 4to, under the title of The Civil Laws in their natural order: for which undertaking, Louis XIV. settled on him a pension of 2000 livres. Domat was intimate with the famous Pascal, who left him his private papers at his death: he himself died in 1696.

DOME, in architecture, a spherical roof, or a roof of a spherical form, raised over the middle of a building, as a church, hall, pavilion, vestibule, stair-case, &c. by way of crowning.

DOME, in chemistry, the upper part of furnaces, particularly portable ones. It has the figure of a hollow hemisphere or small dome. Its use is to form a space in the upper part of the furnace, the air of which is continually expelled by the fire: hence the current of air is considerably increased, which is obliged to enter by the ash-hole, and to pass through the fire to supply the place of the air driven from the dome. The form of this piece renders it proper to reflect or reverberate a part of the flame upon the matters which are in the furnace, which has occasioned this kind of furnace to be called a *reverberating* one. See FURNACE.

DOME, or *Doom*, signifies judgment, sentence, or decree. The homagers oath in the black book of Hereford in England ends thus: "So help me God at his holy *dome*, and by my trowthe."

DOMENICHINO, a famous Italian painter, born of a good family at Bologna in 1581. He was at first a disciple of Calvart the Fleming, but soon quitted his school for that of the Caraccis. He always applied himself to his work with much study and thoughtfulness; and never offered to touch his pencil but when he found a proper kind of enthusiasm upon him. His great skill in architecture also procured him the appointment of chief architect of the apostolical palace from Pope Gregory XV.; nor was he without a theoretical knowledge in music. He died in 1641.

DOMESDAY, or DOOMSDAY, BOOK, a most ancient record, made in the time of William I. surnamed the *Conqueror*, and containing a survey of all the lands of England. It consists of two volumes, a greater and a less. The first is a large folio, written on 382 double pages of vellum, in a small but plain character; each page having a double column. Some of the capital letters and principal passages are touched with red ink; and some have strokes of red ink run cross them, as if scratched out. This volume contains the description of 31 counties. The other volume is in quarto, written upon 450 double pages of vellum, but in a single column, and in a large but very fair character. It contains the counties of Essex, Norfolk, Suffolk, part of the county of Rutland included in that of Northampton, and part of Lancashire in the counties of York and Chester.

This work, according to the red book in the exchequer, was begun by order of William the Conqueror, with the advice of his parliament, in the year of our Lord 1080, and completed in the year 1086. The reason given for taking this survey, as assigned by several ancient records and historians, was, that every man should be satisfied with his own right, and not usurp with impunity what belonged to another. But, besides this, it is said by others, that now all those who possessed landed estates became vassals to the king, and paid him so much money by way of fee or homage in proportion to the lands they held. This appears very probable, as there was at that time extant a general survey of the whole kingdom, made by order of king Alfred.

For the execution of the survey recorded in domesday book, commissioners were sent into every county and shire; and juries summoned in each hundred, out of all orders of freemen, from barons down to the lowest farmers. These commissioners were to be informed by the inhabitants, upon oath, of the name of each manor, and that of its owner; also by whom it was held in the time of Edward the Confessor; the number of hides; the quantity of wood, of pasture, and of meadow-land; how many ploughs were in the demesne, and how many in the tenanted part of it; how many mills, how many fish-ponds or fisheries belonged to it; with the value of the whole together in the time of king Edward, as well as when granted by king William, and at the time of this survey; also whether it was capable of improvement, or of being advanced in its value: they were likewise directed to return the tenants of every degree, the quantity of lands then and formerly held by each of them, what was the number of villains or slaves, and also the number and kinds of their cattle and live stock. These inquisitions being first methodized in the county, were afterwards sent up to the king's exchequer.

This survey, at the time it was made, gave great offence to the people; and occasioned a jealousy that it was intended for some new imposition. But notwithstanding all the precaution taken by the conqueror to have this survey faithfully and impartially executed, it appears from indisputable authority, that a false return was given in by some of the commissioners; and that, as it is said, out of a pious motive. This was particularly the case with the abbey of Croyland in Lincolnshire, the possessions of which were greatly underrated both with regard to quantity and value. Perhaps more of these pious frauds were discovered, as it is said Ralph Flambard, minister to William Rufus, proposed the making a fresh and more vigorous inquisition; but this was never executed.

Notwithstanding this proof of its falsehood in some instances, which must throw a suspicion on all others, the authority of domesday-book was never permitted to be called in question; and always, when it hath been necessary to distinguish whether lands were held in ancient demesne, or in any other manner, recourse was had to domesday-book, and to that only, to determine the doubt. From this definitive authority, from which, as from the sentence pronounced at *domesday*, or the day of judgment, there could be no appeal, the name of the book is said to have been derived. But Stowe assigns another reason for this appellation; namely, that domesday-book is a corruption of *domus Dei book*; a title given it because heretofore deposited in the king's treasury, in a place of the church of Westminster or Winchester, called *domus Dei*. From the great care formerly taken for the preservation of this survey, we may learn the estimation in which its importance was held. The dialogue de Scaccariis says, "*Liber ille* (domesday) *sigilli regis comes est individuus in thesauro*." Until lately it has been kept under three different locks and keys; one in the custody of the treasurer, and the others in that of the two chamberlains of the exchequer. It is now deposited in the chapter-house at Westminster, where it may be consulted on paying to the proper officers a fee of 6 s. 8 d. for a search, and fourpence per line for a transcript.

Besides the two volumes abovementioned, there is also a third made by order of the same king; and which differs from the others in form more than matter. There is also a fourth called *domesday*, which is kept in the exchequer; which, though a very large volume, is only an abridgement of the others. In the remembrancer's office in the exchequer is kept a fifth book, likewise called *domesday*, which is the same with the fourth book already mentioned. King Alfred had a roll which he called *domesday*; and the domesday-book made by William the Conqueror referred to the time of Edward the Confessor, as that of king Alfred did to the time of Ethelred. The fourth book of domesday having many pictures and gilt letters in the begin-

Domestic. ning relating to the time of king Edward the Confessor, this had led some into a false opinion that domesday-book was composed in the reign of king Edward.

DOMESTIC, any man who acts under another, serving to compose his family; in which he lives, or is supposed to live, as a chaplain, secretary, &c. Sometimes domestic is applied to the wife and children; but very seldom to servants, such as footmen, lacquies, porters, &c.

Domestic, adj. is sometimes opposed to foreign. Thus "*domestic* occurrences" signify those events which happen in our own country, in contradistinction to those of which we receive intelligence from abroad.

In its more usual acceptation, the term implies something peculiar to *home* or *household*. Thus we speak of *domestic* happiness or pleasures: meaning the pleasures enjoyed in the bosom of one's family; in opposition to those found in the bustle of public life, or delusively sought in the haunts of dissipation.

The solace of domestic enjoyments has been coveted by the wisest and greatest of men. Senators and heroes have shut out the acclamation of an applauding world, to enjoy the prattling of their little ones, and to partake the endearments of family conversation. They knew that even their best friends, in the common intercourse of life, were in some degrees actuated by interested motives in displaying their affection; that many of their followers applauded them in hopes of reward; and that the giddy multitude, however zealous, were not always judicious in their approbation. But the attentions paid them at their fire-side, the smiles which exhilarated their own table, were the genuine result of undissembled love.

Knox's Essays, N° 40. To pursue the observations of an elegant essayist; "The nursery has often alleviated the fatigues of the bar and the senate house. Nothing contributes more to raise the gently pleasing emotions, than the view of infant innocence, enjoying the raptures of a game at play. All the sentiments of uncontrolled nature display themselves to the view, and furnish matter for agreeable reflection to the mind of the philosophical observer. To partake with children in their little pleasures, is by no means unmanly. It is one of the purest sources of mirth. It has an influence in amending the heart, which necessarily takes a tincture from the company that surrounds us. Innocence as well as guilt is communicated and increased by the contagion of example. And the great author of evangelical philosophy has taught us to emulate the simplicity of the infantine age. He seems indeed himself to have been delighted with young children, and found in them, what he in vain sought among those who judged themselves their superiors, unpolluted purity of heart.

"Among the great variety of pictures which the vivid imagination of Homer has displayed throughout the Iliad, there is not one more pleasing than the family-piece, which represents the parting interview between Hector and Andromache. It deeply interests the heart, while it delights the imagination. The hero ceases to be terrible, that he may become amiable. We admire him while he stands completely armed in the field of battle; but we love him more while he is taking off his helmet, that he may not frighten his little boy with its nodding plumes. We are refreshed with the tender scene of domestic love, while all around breathes rage and discord. We are pleased to see the arm, which is shortly to deal death and destruction among a host of foes, employed in caressing an infant son with the embraces of paternal love. A professed critic would attribute the pleasing effect entirely to contrast; but the heart has declared, previously to the inquiries of criticism, that it is chiefly derived from the satisfaction which we naturally take in beholding great characters engaged in tender and amiable employments.

"But after all that is said of the purity and the solidity of domestic pleasures, they unfortunately appear, to a great part of mankind, insipid, unmanly, and capable of satisfying none but the weak, the spiritless, the inexperienced, and the effeminate. The pretenders to wit and modern philosophy are often found to renounce the received opinions of prudential conduct; and, while they affect a superior liberality, to regulate their lives by the most selfish principles. Whatever appears to have little tendency to promote personal pleasure and advantage, they leave to be performed by those simple individuals, who are dull enough, as they say, to pursue the journey of life by the straight road of common sense. It is true, they will allow, that the world must be replenished by a perpetual succession; and it is no less true, that an offspring, once introduced into the world, requires all the care of painful attention. But let the task be reserved for meaner spirits. If the passions can be gratified without the painful consequences of supporting a family, they eagerly seize the indulgence. But the toil of education they leave to those whom they deem fools enough to take a pleasure in it. There will always be a sufficient number, say they, whose folly will lead them, for the sake of a silly passion called virtuous love, to engage in a life of perpetual anxiety. The fool's paradise, they add with derision, will never be deserted.

"Presumptuous as are all such pretenders to newly-invented systems of life and conduct, it is not to be supposed they will think themselves superior to Cicero. Yet Cicero, with all his liberality of mind, felt the tenderness of conjugal and paternal attachment, and acknowledged that, at one time, he received no satisfaction in any company but that of his wife, his little daughter, and, to use his own epithet, his HONIED young Cicero. The great Sir Thomas More, whom nobody will suspect of narrowness of mind, who by a very singular treatise evinced that he was capable of thinking and of choosing for himself, has left it on record that he devoted a great share of his time, from the united motives of duty and delight, to the amusement of his children.

"It will be objected by those who pretend to have formed their ideas of life from actual observation, that domestic happiness, however pleasing in description, like many a poetic dream, is but an alluring picture, designed by a good heart, and painted in glowing colours by a lively fancy. The constant company, they urge, even of those we love, occasions an insipidity. Insipidity grows into disgust. Disgust, long continued, sours the temper. Peevishness is the natural consequence. The domestic circle becomes the scene of dispute. Mutual antipathy is ingenious in devising mutual torment. Sullen silence or malignant remarks fill up every hour, till the arrival of a stranger causes a temporary

porary restraint, and excites that good humour, which ought to be displayed among those whom the bonds of affection and blood have already united.

"Experience, indeed, proves that these remarks are sometimes verified. But that there is much domestic misery is no argument that there is no domestic happiness, or that the evil may not be removed. Natural stupidity, natural ill temper, acquired ill habits, want of education, illiberal manners, and a neglect of the common rules of discretion, will render every species of intercourse disagreeable. When those are united by connubial ties who were separated by natural and inherent diversity, no wonder if that degree of happiness which can only result from a proper union, is unknown. In the forced alliance, which the poet of Venusium mentions, of the serpent with the dove, of the tyger with the lamb, there can be no love. When we expatiate on the happiness of the domestic groupe, we presuppose that all who compose it are originally assimilated by affection, and are still kept in union by discreet friendship. Where this is not the case, the censure must fall on the discordant disposition of the parties, and not on the essential nature of family intercourse.

"To form, under the direction of prudence, and by the impulse of virtuous love, an early conjugal attachment, is one of the best securities of virtue, as well as the most probable means of happiness. The duties, which are powerfully called forth by the relations of husband and father, are of that tender kind which inspires goodness and humanity. He who beholds a woman whom he loves, and an helpless infant, looking up to him for support, will not easily be induced to indulge in unbecoming extravagance, or devote himself to indolence. He who has a rising family to introduce into a vicious world, will be cautious of setting a bad example, the contagion of which, when it proceeds from parental authority, must be irresistibly malignant. Thus many who, in their individual and unconnected state, would probably have spent a life not only useless to others, but profligate and careless in itself, have become valuable members of the community, and have arrived at a degree of moral improvement, to which they would not otherwise have attained.

"The contempt in which domestic pleasures have in modern times been held, is a mark of profligacy. It is also a proof of prevailing ignorance of a real enjoyment. It argues a defect in taste and judgment as well as in morals. For the general voice of the experienced has in all ages declared, that the truest happiness is to be found at home."

DOMICILE, in Scots law, is the dwelling-place where a person lives with an intention to remain.

DOMIFYING, in astrology, the dividing or distributing the heavens, into 12 houses, in order to erect a theme, or horoscope, by means of six great circles, called *circles of position*.

There are various ways of domifying; that of Regiomontanus, which is the most common, makes the circles of position pass through the intersections of the meridian and the horizon: others make them pass through the poles of the zodiac.

DOMINANT (from the Latin word *dominari* "to rule or govern"), among musicians, is used either as an adjective or substantive; but these different acceptations are far from being indiscriminate. In both senses it is explained by Rousseau as follows.

The *dominant* or sensible chord is that which is practised upon the dominant of the tone, and which introduces a perfect cadence. Every perfect major chord becomes a *dominant* chord, as soon as the seventh minor is added to it.

Dominant (subst.). Of the three notes essential to the tone, it is that which is a fifth from the tonick. The tonick and the *dominant* fix the tone; in it they are each of them the fundamental sound of a particular chord; whereas the mediant, which constitutes the mode, has no chord peculiar to itself, and only makes a part of the chord of the tonick.

Mr Rameau gives the name of *dominant* in general to every note which carries a chord of the seventh, and distinguishes that which carries the sensible chord by the name of a *tonick dominant*; but, on account of the length of the word, this addition to the name has not been adopted by artists: they continue simply to call that note a *dominant* which is a fifth from the tonick; and they do not call the other notes which carry a chord of the seventh *dominants*, but *fundamentals*; which is sufficient to render their meaning plain, and prevents confusion.

A *dominant*, in that species of church-music which is called *plain-chant*, is that note which is most frequently repeated or beaten, in whatever degree it may be from the tonick. In this species of music there are *dominants* and *tonicks*, but no mediant.

DOMINATION, or DOMINION, in theology, the fourth order of angels or blessed spirits in the hierarchy, reckoning from the seraphim. See ANGEL.

DOMINGO, or ST DOMINGO, the capital of the island of Hispaniola in the West Indies, is seated in that part belonging to the Spaniards on the south side of the island, and has a commodious harbour. The town is built in the Spanish manner, with a great square in the middle of it; about which are the cathedral and other public buildings. From this square run the principal streets, in a direct line, they being crossed by others at right angles, so that the form of the town is almost square. The country on the north and east side is pleasant and fruitful; and there is a large navigable river on the west, with the ocean on the south. It is the see of an archbishop, an ancient royal audience, and the seat of the governor. It has several fine churches and monasteries; and is so well fortified, that a fleet and army sent by Oliver Cromwell in 1654 could not take it. The inhabitants are Spaniards, Negroes, Mulattoes, Mestices, and Albatraces; of whom about a sixth part may be Spaniards. It had formerly about 2000 houses, but it is much declined of late years. The river on which it is seated is called *Ozama*. W. Long. 69. 30. N. Lat. 18. 25.

DOMINIC (de Gusman), founder of the Dominican order of monks, was born at Calaroga in old Castile, 1170. He preached with great fury against the Albigenses, when Pope Innocent III. made a croisade against that unhappy people; and was inquisitor in Languedoc, where he founded his order, and got it confirmed by the Lateran council in 1215. He died at Bologna in 1221, and was afterwards canonized. The dominican order has produced many illustrious men. See DOMINICANS.

DOMINICA, one of the Caribbee islands in the West Indies, about 39 miles long and 13 broad, situated between 61° and 62° W. Long. and between 15° and 16° of N. Lat. This island formerly belonged to the French, but was ceded to Britain by the treaty in 1763. It is very advantageous to the latter, as being situated between the French islands of Gaudaloupe and Martinico, so that it is equally alarming to both; and its safe and commodious roads enable the British privateers to intercept, without risk, the navigation of France in her colonies, whenever a war happens between the two nations.

This island was reduced, in the year 1778, by the French, under the marquis de Bouille, governor of Martinico. At that time the island, though very well fortified, had been unaccountably neglected by the British government, in such a manner as to be almost entirely destitute of a garrison. The French commander therefore, who made a descent with 2000 men, found only 100 regular forces and a few companies of militia to oppose him. All resistance therefore being vain, the only thing the garrison could do was to procure as favourable terms of capitulation as possible. These were granted with such readiness as did great honour to the character of this officer; the inhabitants experiencing no kind of change except that of transferring their obedience from Britain to France, being left unmolested in the enjoyment of all their rights both civil and religious. The capitulation was strictly observed by the Marquis; no plunder or irregularity being allowed, and a pecuniary gratification being distributed among the soldiers and volunteers who accompanied him in the expedition. An hundred and sixty-four pieces of excellent cannon, and twenty-four brass mortars, besides a large quantity of military stores, were found in the place; insomuch that the French themselves expressed their surprise at finding so few hands to make use of them. The Marquis, however, took care to supply this defect, by leaving a garrison of 1500 of the best men he had with him. It was restored to Britain at the conclusion of the peace in 1783.

La DOMINICA, one of the MARQUESAS Islands in the South-Sea.

DOMINICAL LETTER, popularly called *Sunday-Letter*, one of the seven letters A B C D E F G, used in almanacks, ephemerides, &c. to denote the Sundays throughout the year. See CHRONOLOGY, n° 32. The word is formed from *dominica* or *dominicus dies*, "Lord's-day, Sunday."

The dominical letters were introduced into the kalendar by the primitive Christians, in lieu of the NUNDINAL letters in the Roman kalendar.

DOMINICAL, in church-history. The council of Auxerre, held in 578, decrees, that women communicate with their dominical. Some authors contend, that this dominical was a linen cloth, wherein they received the species; as not being allowed to receive them in the bare hand. Others will have it a kind of veil, wherewith they covered the head. The most probable account is, that it was a sort of linen cloth or handkerchief wherein they received and preserved the eucharist in times of persecution, to be taken on occasion at home. This appears to have been the case by the practice of the first Christians, and by Tertullian's book *Ad Uxorem*.

DOMINICANS, an order of religious, called in some places *Jacobins*; and in others, *Predicants*, or *Preaching Friers*.

The Dominicans take their name from their founder Dominic de Guzman, a Spanish gentleman, born in 1170, at Calaroga in Old Castile. He was first canon and archdeacon of Osma; and afterwards preached with great zeal and vehemence against the Albigenses in Languedoc, where he laid the first foundation of his order. It was approved of in 1215, by Innocent III. and confirmed in 1216 by a bull of Honorius III. under the tile of *St Augustin*; to which Dominic added several austere precepts and observances, obliging the brethern to take a vow of absolute poverty, and to abandon entirely all their revenues and possessions; and also the title of *Preaching Friers*, because public instruction was the main end of their institution.

The first convent was founded at Tholouse by the bishop thereof and Simon de Monfort. Two years afterwards they had another at Paris, near the bishop's house; and some time after a third in the rue St Jacques, St James's street, whence the denomination of *Jacobins*.

Just before his death, Dominic sent Gilbert de Fresney, with twelve of the brethern, into England, where they founded their first monastery at Oxford in the year 1221, and soon after another at London. In the year 1276, the mayor and aldermen of the city of London gave them two whole streets by the river Thames, where they erected a very commodious convent, whence that place is still called *Black Friers*, from the name by which the Dominicans were called in England.

St Dominic, at first, only took the habit of the regular cannons; that is, a black cassock and rochet: but this he quitted in 1219, for that which they now wear, which it is pretended was shown by the blessed Virgin herself to the beautified Renaud d'Orleans.

This order is diffused throughout the whole known world. It has forty-five provinces under the general, who resides at Rome; and twelve particular congregations or reforms, governed by vicars general.

They reckon three popes of this order, above sixty cardinals, several patriarchs, a hundred and fifty archbishops, and about eight hundred bishops; besides masters of the sacred palace, whose office has been constantly discharged by a religious of this order, ever since St Dominic, who held it under Honorius III. in 1218.

Of all the monastic orders, none enjoyed a higher degree of power and authority than the Dominican friers, whose credit was great, and their influence universal. But the measures they used in order to maintain and extend their authority were so perfidious and cruel, that their influence began to decline towards the beginning of the sixteenth century. The tragic story of Jetzer, conducted at Bern in 1509, for determining an uninteresting dispute between them and the Franciscans, relating to the *immaculate conception*, will reflect indelible infamy on this order. See an account of it in Burnet's travels through France, Italy, Germany,

and

and Switzerland, p. 31. or Mosheim's Eccl. Hist. vol. iii. p. 294. 8vo. They were indeed perpetually employed in stigmatizing with the opprobrious name of heresy numbers of learned and pious men; in encroaching upon the rights and properties of others, to augment their possessions; and in laying the most iniquitous snares and stratagems for the destruction of their adversaries. They were the principal councellors, by whose instigation and advice Leo X. was determined to the public condemnation of Luther. The papal see never had more active and useful abettors than this order, and that of the Jesuits.

The dogmata of the Dominicans are usually opposite to those of the Franciscans.

There are also nuns or sisters of this order, called in some places *Preaching Sisters*. These are even more ancient than the friars; St Dominic having founded a society of religious maids at Prouilles some years before the institution of his order of men; viz. in 1206.

There is also a third order of Dominicans, both for men and women.

DOMINION, DOMINIUM, in the civil law, signifies the power to use or dispose of a thing as we please.

DOMINION, or *Domination*. See DOMINATION.

DOMINIS (Mark Anthony de), archbishop of Spalatro in Dalmatia at the close of the 15th and beginning of 16th centuries, was a man whose fickleness in religion proved his ruin. His preferment, instead of attaching him to the church of Rome, rendered him disaffected to it. Becoming acquainted with bishop Bedell, while chaplain to Sir Henry Wotton ambassador from James I. at Venice, he communicated his books *De Republica Ecclesiastica* to him; which were afterwards published at London, with Bedell's corrections. He came to England with Bedell; where he was received with great respect, and preached and wrote against the Romish religion. He is said to have had a principal hand in publishing father Paul's *History of the Council of Trent*, at London, which was inscribed to James in 1619. But on the promotion of Pope Gregory XIV. who had been his school-fellow and old acquaintance, he was deluded by Gondomar the Spanish ambassador into the hopes of procuring a cardinal's hat, by which he fancied he should prove an instrument of great reformation in the church. Accordingly he returned to Rome in 1622, recanted his errors, and was at first well received: but he afterwards wrote letters to England, repenting his recantation; which being intercepted, he was imprisoned by Pope Urban VIII. and died in 1625. He was also the author of the first philosophical explanation of the rainbow, which before his time was accounted a prodigy.

DOMINIUM EMINENS, in Scots law, that power which the state or sovereign has over private property, by which the proprietor may be compelled to sell it for an adequate price where public utility requires. See LAW, N° clxii. 1.

DOMINIUM Directum, in Scots law, the right which a superior retains in his lands, notwithstanding the feudal grant to his vassal. See LAW, N° clxvi. 1.

DOMINIUM Utile, in Scots law, the right which the vassal acquires in the lands by the feudal grant from his superior. See LAW, N° clxvi. 1.

DOMINUS, in ancient times, a title prefixed to a name, usually to denote the person either a knight or a clergyman. See *VICE-Dominus*.

The title was sometimes also given to a gentleman not dubbed; especially if he were lord of a manor. See DOM, GENTLEMAN, and SIRE.

In Holland, the title *dominus* is still retained, to distinguish a minister of the reformed church.

DOMITIAN, the Roman emperor, son to Vespasian, was the last of the 12 Cæsars. See *(History of)* ROME.

DON, or TANAIS, a river of Russia, which takes its rise from the small lake of St John, near Tula, in the government of Moscow, and passing through part of the province of Voronetz, a small portion of the Ukraina-Slobodskaia, and the whole province of Azof, divides itself near Tcherhask into three streams, and falls in these separate branches into the Sea of Azof. The river has so many windings, is in many parts so shallow, and abounds with such numerous shoals, as to be scarcely navigable, excepting in the spring, upon the melting of the snows; and its mouth is also so choacked up with sand, that only flat-bottomed vessels, excepting in the same season, can pass into the sea of Azof. The banks of the Don, and the rivulets which fall into it, are clothed with large tracts of forest, whose timber is floated down the stream to St Demetri and Rostof, where the frigates for the sea of Azof are chiefly constructed. The navigation of the Don, Mr Cox observes, may possibly hereafter be rendered highly valuable, by conveying to the Black Sea the iron of Siberia, the Chinese goods, and the Persian merchandize: which latter commodities, as well as the products of India, formerly found their way into Europe through this same channel.

DON is also the name of a river in Scotland, noticed under the article ABERDEEN; the Old Town being situated at its mouth. See ABERDEEN.

DONARIA, among the ancients, in its primary signification, was taken for the places where the oblations offered to the gods were kept; but afterwards was used to denote the offerings themselves; and sometimes, though improperly, the temples.

DONATIA, in botany: A genus of the trigynia order, belonging to the triandria class of plants. The calyx is a triphyllous perianthium, with short subulated leaves standing at a distance from one another. The corolla has from eight to ten petals of an oblong linear shape, twice as long as the calyx. The stamina are three subulated filaments the length of the calyx; the antheræ roundish, didymous, and two-lobed at the base.

DONATION, DONATIO, an act or contract whereby a man transfers to another either the property or the use of the whole or a part of his effects as a free gift.

A donation, to be valid and complete, supposes a capacity both in the donor and the donee; and requires consent, acceptance, and delivery; and by the French law registry also.

DONATION Mortis Causa, in law, a disposition of property made by a person in his last sickness, who apprehending

Donatists. hending his dissolution near, delivers, or causes to be delivered to another, the possession of any personal goods, to keep in case of his decease. If the donor dies, this gift needs not the consent of his executor; but it shall not prevail against creditors; and it is accompanied with this implied trust, that, if the donor lives, the property shall revert to himself, being only given in prospect of death, or *mortis causa*. This method of donation seems to have been conveyed to us from the civil lawyers, who borrowed it from the Greeks.

DONATISTS, ancient schismatics in Africa, so denominated from their leader Donatus.

They had their origin in the year 311, when, in the room of Mensurius, who died in that year on his return to Rome, Cæcilian was elected bishop of Carthage, and consecrated without the concurrence of the Numidian bishops, by those of Africa alone; whom the people refused to acknowledge, and to whom they opposed Majorinus; who, accordingly, was ordained by Donatus bishop of Casæ Nigræ. They were condemned, in a council held at Rome, two years after their separation; and afterwards in another at Arles, the year following; and again at Milan, before Constantine the Great, in 316, who deprived them of their churches, and sent their seditious bishops into banishment, and punished some of them with death. Their cause was espoused by another Donatus, called the *great*, the principal bishop of that sect, who, with numbers of his followers, was exiled by order of Constans. Many of them were punished with great severity. See CIRCUMCELLIONES. However, after the accession of Julian to the throne in 362, they were permitted to return, and restored to their former liberty. Gratian published several edicts against them; and in 377 deprived them of their churches, and prohibited all their assemblies. But notwithstanding the severities they suffered, it appears that they had a very considerable number of churches towards the close of this century; but at this time they began to decline, on account of a schism among themselves, occasioned by the election of two bishops, in the room of Parmenian, the successor of Donatus; one party elected Primian, and were called *Primianists*, and another Maximian, and were called *Maximianists*. Their decline was also precipitated by the zealous opposition of St Augustin, and by the violent measures which were pursued against them, by order of the emperor Honorius, at the solicitation of two councils held at Carthage; the one in 404, and the other in 411. Many of them were fined, their bishops were banished, and some put to death. This sect revived and multiplied under the protection of the Vandals, who invaded Africa in 427, and took possession of this province; but it sunk again under new severities, when their empire was overturned in 534. Nevertheless, they remained in a separate body till the close of this century, when Gregory, the Roman pontiff, used various methods for suppressing them; his zeal succeeded, and there are few traces to be found of the Donatists after this period. They were distinguished by other appellations; as *Circumcelliones*, *Montenses*, or *Mountaineers*, *Campites*, *Rupites*, &c. They held three councils, or conciliabules; that of Cirta in Numidia, and two at Carthage.

Donative. The errors of the Donatists, beside their schism, were, 1. That baptism conferred out of the church, that is, out of their sect, was null; and accordingly they rebaptised those who joined their party from other churches, and re-ordained their ministers. 2. That theirs was the only true, pure, and holy church; all the rest of the churches they held as prostitute and fallen.

Donatus seems likewise to have given into the doctrine of the Arians, with whom he was closely allied; and, accordingly, St Epiphanius, Theodoret, and some others, accused the Donatists of Arianism; and it is probable that the charge was well founded, because they were patronised by the Vandals, who were of these sentiments. But St Augustine, ep. 185, to count Bonniface, & Hær. 69. affirms, that the Donatists, in this point, kept clear of the errors of their leader.

DONATIVE, DONATIVUM, a present made by any person; called also *gratuity*.

The Romans made large donatives to their soldiers. Julia Pia, wife of the emperor Severus, is called on certain medals *mater castrorum*, because of the care she took of the soldiery, by interposing for the augmentation of their donatives, &c.

Donative was properly a gift made to the soldiery; as congiarium was that made to the people. Salmasius, on his notes to Lampridius, in his Life of Heliogabalus, mentioning a donative that emperor gave of three pieces of gold *per* head, observes, that this was the common and legitimate rate of a donative. Casaubon, in his notes on the Life of Pertinax by Capitolinus, observes, that Pertinax made a promise of 3000 denarii to each soldier; which amounts to upwards of 79 pounds sterling. The same author writes, that the legal donative was 20,000 denarii; and that it was not customary to give less, especially to the prætorian soldiers; that the centurions had double, and the tribunes, &c. more in proportion.

DONATIVE, in the canon law, a benefice given, and collated to a person, by the founder or patron; without either presentation, institution, or induction by the ordinary.

If chapels founded by laymen be not approved by the diocesan, and, as it is called, *spiritualized*, they are not accounted proper benefices, neither can they be conferred by the bishop, but remain to the pious disposition of the founders; so that the founders, and their heirs, may give such chapels without the bishop.

Gwin observes, that the king might of ancient time found a free chapel, and exempt it from the jurisdiction of the diocesan; so may he, by letters patent, give liberty to a common person to found such a chapel, and make it donative, not presentable; and the chaplain, or beneficiary, shall be deprivable by the founder or his heir, and not by the bishop. And this seems to be the original of donatives in England.

Donatives are within the statute against simony; and if they have cure of souls, within that against pluralities. If the patron of a donative doth not nominate a clerk, there can be no lapse thereof, unless it be specially provided for in the foundation; but the bishop may compel him to do it by spiritual censures. But if it be augmented by queen Anne's bounty, it will lapse like other presentative livings. 1. Geo. I. stat. 2.

2. cap. 10. The ordinary cannot visit a donative, and therefore it is free from procuration, and the incumbent is exempted from attendance at visitations.

All bishopricks in ancient time were donative by the king. Again, where the bishop has the gift of a benefice, it is properly called a *donative*, because he cannot present to himself.

DONATORY, in Scots law, that person to whom the king bestows his right to any forfeiture that has fallen to the crown.

DONATUS, a schismatic bishop of Carthage, founder of the sect of DONATISTS. His followers swore by him, and honoured him like a god. He died about 368.

DONATUS (Ælius), a famous grammarian, lived at Rome in 354. He was one of St Jerome's masters; and composed commentaries on Terence and Virgil, which are esteemed.

DONAWERT, a strong town of Germany, in the circle of Bavaria on the frontiers of Suabia. It has been taken and retaken several times in the wars of Germany; and was formerly an imperial city, but at present is subject to the duke of Bavaria. E. Long. 10. 32. N. Lat. 48. 32.

DONAX, a genus of insects belonging to the order of vermes testacea. It is an animal of the oyster kind; and the shell has two valves, with a very obtuse margin in the fore-part. There are 10 species, principally distinguished by the figure of their shells.*

* Plate CLXIV.

DONCASTER, a market-town of Yorkshire, 30 miles south of York. It was noted for knitting worsted stockings; that article of their trade is now on the decline. Doncaster gives the English title of Earl to the duke of Buccleugh in Scotland, which belonged to his ancestor the duke of Monmouth, but was omitted out of the forfeiture. W. Long. 1. 0. N. Lat. 53. 30.

DONNE (Dr John) an excellent poet and divine of the 17th century. His parents were of the Romish religion, and used their utmost efforts to keep him firm to it; but his early examination of the controversy between the church of Rome and the Protestants, at last determined him to choose the latter. He travelled into Italy and Spain; where he made many useful observations, and learned their languages to perfection. Soon after his return to England, Sir Thomas Egerton, keeper of the great seal, appointed him his secretary; in which post he continued five years. He marrying privately Anne the daughter of Sir George Moore then chancellor of the garter, and niece to the lord keeper's lady, was dismissed from his place, and thrown into prison. But he was reconciled to Sir George by the good offices of Sir Francis Wolley. In 1612, he accompanied Sir Robert Drury to Paris. During this time, many of the nobility solicited the king for some secular employment for him. But his majesty, who took pleasure in his conversation, had engaged him in writing his *Pseudo Martyr*, printed at London in 1610, and was so highly pleased with that work, that in 1614 he prevailed with him to enter into holy orders; appointed him one of his chaplains, and procured him the degree of Doctor of Divinity from the university of Oxford. In 1619, he attended the earl of Doncaster in his embassy into Germany. In 1621, he was made dean of St Paul's: and the vicarage of St Dunstan in the west, in London, soon after fell to him; the advowson of it having been given to him long before by Richard earl of Dorset. By these and other preferments, he was enabled to be charitable to the poor, kind to his friends, and to make good provision for his children. He wrote, besides the above, 1. Devotions upon emergent occasions. 2. The Ancient History of the Septuagint, translated from the Greek of Aristeus, quarto. 3. Three volumes of sermons, folio. 4. A considerable number of poems; and other works. He died in 1631; and was interred in St Paul's cathedral, where a monument was erected to his memory. His writings show him to be a man of incomparable wit and learning; but his greatest excellence was satire. He had a prodigious richness of fancy, but his thoughts were much debased by his versification. He was, however, highly celebrated by all the great men of that age.

DONOR, in law, the person who gives lands or tenements to another in tail, &c.; as he to whom such lands, &c. are given, is the *donee*.

DOOMSDAY BOOK. See DOMESDAY *Book*.

DOOR, in architecture. See ARCHITECTURE, n° 76.

DOR, the English name of the common black beetle. Some apply it also to the dusty beetle, that flies about hedges in the evening. See SCARABÆUS.

DORADO, in astronomy, a southern constellation, not visible in our latitude; it is also called *xiphias*. The stars of this constellation, in Sharp's Catalogue, are six.

DORCHESTER, the capital of Dorsetshire, situated on the river Froom, six miles north of Weymouth: W. Long. 2. 35. N. Lat. 50. 40. It gives the title of marquis to the noble family of Pierpoint, duke of Kingston; and sends two members to parliament.

DOREE, or JOHN DOREE, in ichthyology. See ZEUS.

DORIA (Andrew), a gallant Genoese sea-officer, born in 1466. He entered into the service of Francis I. of France; but preserved that spirit of independence so natural to a sailor and a republican. When the French attempted to render Savona, long the object of jealousy to Genoa, its rival in trade, Doria remonstrated against the measure in a high tone; which bold action, represented by the malice of his courtiers in the most odious light, irritated Francis to that degree, that he ordered his admiral Barbesieux to sail to Genoa, then in the hands of the French troops, to arrest Doria, and to seize his galleys. This rash order Doria got timely hints of; retired with all his galleys to a place of safety; and, while his resentment was thus raised, he closed with the offers of the emperor Charles V. returned his commission with the collar of St Michael to Francis, and hoisted the Imperial colours. To deliver his country, weary alike of the French and Imperial yoke, from the dominion of foreigners, was now Doria's highest ambition; and the favourable moment offered. Genoa was afflicted with the pestilence, the French garrison was greatly reduced and ill-paid, and the inhabitants were sufficiently disposed to second his views. He sailed to the harbour with 13 galleys, landed 500 men, and made himself master of the gates and the palace with very little resistance. The French governor with his feeble garrison retired to the citadel, but was quickly forced to capitulate; when the people ran together, and levelled the citadel with the ground. It was now in Doria's power to have rendered himſelf the ſovereign of his country; but, with a magnanimity of which there are few examples, he aſſembled the people in the court before the palace, diſclaimed all pre-eminence, and recommended to them to ſettle that form of government they choſe to eſtabliſh. The people animated by his ſpirit, forgot their factions, and fixed that form of government which has ſubſiſted ever ſince with little variation. This event happened in 1528. Doria lived to a great age, reſpected and beloved as a private citizen; and is ſtill celebrated in Genoa by the moſt honourable of all appellations, "The father of his country, and the reſtorer of its liberty."

DORIC, in general, any thing belonging to the Dorians, an ancient people of Greece, inhabiting near mount Parnaſſus. See DORIS.

DORIC, in architecture, is the ſecond of the five orders; being that between the Tuſcan and Ionic. It is uſually placed upon the Attic baſe, though originally it had no baſe. See ARCHITECTURE, n° 43.

At its firſt invention it was more ſimple than at preſent; and when in after-times they came to adorn and enrich it more, the appellation *Doric* was reſtrained to this richer manner, and the primitive ſimple manner they called by a new name, the Tuſcan order, which was chiefly uſed in temples; as the former, being more light and delicate, was for porticos and theatres. The tradition is, that Dorus, king of Achaia, having firſt built a temple of this order at Argos, which he dedicated to Juno, occaſioned it to be called *Doric;* though others derive its name, from its being invented or uſed by the Dorians.

The moderns, on account of its ſolidity, uſe it in large ſtrong buildings; as in the gates of cities and citadels, the outſides of churches, and other maſſy works, where delicacy of ornaments would be unſuitable. The gate of Burlington-houſe in Piccadily is of the Doric order.

The moſt conſiderable antient monuments of this order, are the theatre of Marcellus at Rome, wherein the capital, the height of the frize, and its projecture, are much ſmaller than in the modern architecture; and the Parthenion, or temple of Minerva at Athens, in which the ſhort and maſſy columns bear upon the pavement without a baſe; and the capital is a ſimple torus, with its cincture, and a ſquare, plain, and ſolid abacus.

Doric Cymatium. See CYMA.

Doric Dialect, one of the five dialects, or manners of ſpeaking, which obtained among the Greeks.

It was firſt uſed by the Lacedemonians, and particularly thoſe of Argos; thence it paſſed into Epirus, Libya, Sicily, the iſlands of Rhodes, and Crete. In this dialect, Archimedes and Theocritus wrote, who were both of Syracuſe; as likewiſe Pindar.

In ſtrictneſs, however, we ſhould rather define Doric, the manner of ſpeaking peculiar to the Dorians, after their receſs near Parnaſſus and Aſopus; and which afterwards came to obtain among the Lacedemonians, &c. Some even diſtinguiſh between the Lacedemonian and Doric; but in reality, they were the ſame; ſetting aſide a few particularities in the language of the Lacedemonians; as is ſhown by Rulandus, in his excellent treatiſe *De Lingua Græca ejuſque Dialectis*, lib. v.

Beſide the authors already mentioned to have written in the Doric dialect, we might add Archytas of Tarentum, Bion, Callinus, Simonides, Bacchylides, Cypſelas, Alcman, and Sophron.

Moſt of the medals of the cities of Græcia Magna, and Sicily, ſavour of the Doric dialect in their inſcription: witneſs, ΑΜΒΡΑΚΙΩΤΑΝ, ΑΠΟΛΛΩΝΙΑΤΑΝ, ΑΧΕΡΟΝΤΑΝ, ΑΧΥΡΙΤΑΝ, ΗΡΑΧΛΕΩΤΑΝ, ΤΡΑΧΙΝΙΩΝ, ΘΕΡΜΙΤΑΝ, ΚΑΥΛΟΝΙΑΤΑΝ, ΚΟΠΙΑΤΑΝ, ΤΑΥΡΟΜΕΝΙΤΑΝ, &c. Which ſhows the countries wherein the Doric dialect was uſed.

The general rules of this dialect are thus given by the Port-royaliſts.

D'ε Ητα d'ω grand, d'ε, do & d'ȣ l'α fait le Dore.
D'ει fait ητα; d'ȣ, ω; & d'ω αυ fait encore.
Oſte ι de l'infini: & pour le ſingulier
Se ſert au femenin du nombre plurier.

But they are much better explained in the fourth book of Rulandus; where he even notes the minuter differences of the dialects of Sicily, Crete, Tarentum, Rhodes Lacedæmon, Laconia, Macedonia, and Theſſaly.

The *α* abounds every where in the Doric; but this dialect bears ſo near a conformity with the Æolic, that many reckon them but one.

Doric Mode, in muſic, the firſt of the authentic modes of the ancients. Its character is to be ſevere, tempered with gravity and joy; and is proper upon religious occaſions, as alſo to be uſed in war. It begins *D, la, ſol, re.* Plato admires the muſic of the Doric mode, and judges it proper to preſerve good manners as being maſculine, and on this account allows it in his commonwealth. The ancients had likewiſe their ſubdoric or hypodoric mode, which was one of the plagal modes. Its character was to be very grave and ſolemn; it began with *re*, a fourth lower than the doric.

DORING, or DARING, among ſportſmen, a term uſed to expreſs a method of taking larks, by means of a clap-net and a looking-glaſs. For this ſport there muſt be provided four ſticks very ſtraight and light, about the bigneſs of a pike; two of theſe are to be four feet nine inches long, and all notched at the edges or the ends. At one end of each of theſe ſticks there is to be faſtened another of about a foot long on one ſide; and on the other ſide a ſmall wooden peg about three inches long. Then four or more ſticks are to be prepared, each of one foot length; and each of theſe muſt have a cord of nine feet long faſtened to it at the end. Every one ſhould have a buckle for the commodious faſtening on the reſpective ſticks when the net is to be ſpread.—A cord muſt alſo be provided, which muſt have two branches. The one muſt have nine feet and a half, and the other ten feet long, with a buckle at the end of each; the reſt, or body of the cord muſt be 24 yards long. All theſe cords, as well the long ones as thoſe about the ſticks, muſt be well twiſted and of the bigneſs of one's little finger. The next thing to be provided is a ſtaff of four feet long, pointed at one end, and with a ball of wood at the other, for the carrying theſe conveniences in a ſack or wallet.—There ſhould alſo be carried, on this occaſion, a ſpade to level the ground where there may be any little irregularities; and two small rods, each 18 inches long, and having a small rod fixed with a pack-thread at the larger end of the other. To these are to be tied some pack-thread loops, which are to fasten in the legs of some larks; and there are to be reels to these, that the birds may fly a little way up and down. When all this is done, the looking-glass is to be prepared in the following manner. Take a piece of wood about an inch and an half thick, and cut it in form of a bow; so that there may be about nine inches space between the two ends; and let it have its full thickness at the bottom that it may receive into it a false piece; in the five corners of which there are to be set in five pieces of looking-glass. These are so fixed, that they may dart their light upwards; and the whole machine is to be supported on a moveable pin, with the end of a long line fixed to it, and made in the manner of the children's play-thing of an apple and a plum-stone; so that the other end of the cord being carried through a hedge, the barely pulling it may set the whole machine of the glasses a-turning. This and the other contrivances are to be placed in the middle between the two nets. The larks fixed to the place, and termed *calls*, and the glittering of the looking-glasses as they twirl round in the sun, invite the other larks down; and the cord that communicates with the nets, and goes through the hedge, gives the person behind an opportunity of pulling up the nets, so as to meet over the whole, and take every thing that is between them. The places where this sort of sporting succeeds best are open fields remote from any trees and hedges except one by way shelter for the sportsman: and the wind should always be either in the front or back; for if it blows sideways, it prevents the playing of the net.

DORIS, a country of Greece, between Phocis, Thessaly, and Acarnania. It received its name from Dorus the son of Deucalion, who made a settlement there. It was called *Tetrapolis* from the four cities of Pindus or Dryopis Erineum, Cytinium, Borium, which it contained. To these four some add Lilæum and Carphia, and therefore call it *Hexapolis* The name of Doris has been common to many parts of Greece. The Dorians in the age of Deucalion inhabited Phthiotis, which they exchanged for Histiæotis, in the age of Dorus. From thence they were driven by the Cadmeans, and came to settle near the town of Pindus. From thence they passed into Dryopis, and afterwards into Peloponnesus. Hercules having re-established Ægimius king of Phthiotis or Doris, who had been driven from his country by the Lapithæ, the grateful king appointed Hyllus the son of his patron to be his successor, and the Heraclidæ marched from that part of the country to go to recover Peloponnesus. The Dorians sent many colonies into different places, which bore the same name as their native country. The most famous of these is in Asia Minor, of which Halicarnassus was once the capital. This part of Asia Minor was called *Hexapolis*, and afterwards *Pentapolis*.

Doris, a genus of insects, belonging to the order of vermes testacea. The body is oblong, flat beneath; creeping: mouth placed below: vent behind surrounded with a fringe: two feelers, retractile. There are several species.—The argo, or lemon doris, has an oval body, convex, marked with numerous punctures, of a lemon colour, the vent beset with elegant ramifications. It inhabits different parts of the British seas, called about Brighthelmstone the *sea-lemon*. See Plate CLXIV.

DORMANT, in heraldry, is used for the posture of a lion, or any other beast, lying along in a sleeping attitude with the head on the fore-paws; by which it is distinguished from the *couchant*, where though the beast is lying, yet he holds up his head.

DORMER, in architecture, signifies a window made in the roof of an house, or above the entablature, being raised upon the rafters.

DORMITORY, a gallery in convents or religious houses, divided into several cells, in which the religious sleep or lodge.

DORMOUSE, in zoology. See Mus and Sciurus.

DORONICUM, leopard's bane: A genus of the polygamia superflua order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Compositæ*. The receptacle is naked, the pappus simple; the scales of the calyx in a double row, longer than the disc. The seeds of the radius naked without any pappus. There are three species; of which the only one worthy of notice is the pardalianches, with obtuse heart-shaped leaves. It grows naturally in Hungary, and on the Helvetian mountains: But is frequently preserved in the English gardens. It hath thick fleshy roots, which divide into many knobs or knees, sending out strong fleshy fibres which penetrate deep in the ground; from these arise in the spring a cluster of heart-shaped leaves, which are hairy, and stand upon footstalks: between these arise the flower-stalks, which are channelled and hairy near three feet high, putting out one or two smaller stalks from the side. Each stalk is terminated by one large yellow flower. The plant multiplies very fast by its spreading roots; and the seeds, if permitted to scatter, will produce plants wherever they happen to fall; so that it very soon becomes a weed in the places where it is once established. It loves a moist soil and shady situation. The roots were formerly used in medicine as alexipharmics and purifiers of the blood, but their operation was so violent that they are now entirely laid aside.

DORSAL, an appellation given to whatever belongs to the back. See Dorsum.

DORSET (Thomas Sackville), Lord Buckhurst. See Sackville.

Dorset (Charles Sackville), Earl of. See Sackville.

DORSETSHIRE, a county of England, bounded on the south by the English channel, on the north by Somersetshire and Wiltshire, on the east by Hampshire, and on the west by Devonshire and some part of Somersetshire. It is between 40 and 50 miles long from east to west, and 34 broad from south to north, and contains 34 hundreds, 22 market-towns, and 248 parishes. This county enjoys a mild, pleasant, and wholesome air, and a deep, rich, and fertile soil, finely diversified. Towards the north it is level, under the high lands that divide it from Somersetshire, where there are fine arable grounds that will yield large crops of different kinds of grain. But on the south, from the borders of Hampshire by the sea-coast, for an extent of almost 20 miles in length, and in some places four or five in breadth, is an heathy common, which renders this country less populous than it otherwise would be. From east to west runs a ridge of hills called the *Downs*, abounding with sweet and short herbage, which nourishes a vast number of sheep equally esteemed for their flesh and fleece. The country is also very plentifully watered; and in all respects so well suited both for pleasure and profit, that it was distinguished by the Romans above all others. They had more stations and summer-camps in Dorsetshire than in any other country. That the Saxons had the same regard for it, is evident from the number of palaces they had in it, the stately minsters they built, and the express directions they gave that their bodies should be interred in those monuments of their piety. This county yields many and very valuable commodities. The quarries in Purbeck and Portland supply stones of different qualities, suited to various uses, and in prodigious quantities, together with some very rich and beautiful marble. The best tobacco-pipe clay in England is also found in this county. Madder, hemp, and flax, also thrive in many places, grain of all sorts, &c.

DORSIFEROUS PLANTS, among botanists, such as are of the capillary kind, without stalks, and which bear their seeds on the back-side of their leaves.

DORSTENIA, CONTRAYERVA: A genus of the monogynia order, belonging to the tetrandria class of plants: and in the natural method ranking under the 53d order, *Scabridæ*. The receptacle is common, monophyllous, and carnous; the seeds lying singly in the carnous substance. There are four species, all of them low herbaceous plants, growing in the warm countries of America. The root is used in medicine. It is full of knots; an inch or two in length, about half an inch thick; externally of a reddish brown colour, and pale within; long, tough, slender fibres shoot out from all sides of it, which are generally loaded with small round knots. The root has a peculiar kind of aromatic smell, and somewhat astringent, warm, bitterish taste, with a light and sweetish kind of acrimony when chewed. The fibres have little taste or smell; the tuberous part therefore should only be chosen.—Contrayerva is one of the mildest of those substances call *alexipharmics*: it is indisputably a good and useful diaphoretic. Its virtues are extracted both by water and rectified spirit, and do not arise by evaporation with either. The plants cannot be propagated in Britain without the greatest difficulty.

DORSUM, the BACK, in anatomy comprehends all the posterior part of the trunk of the body from the neck to the buttocks. See ANATOMY, n° 29, &c.

DORT, or DORDRECHT, a city of Holland, which holds the first rank in the assembly of the states. It is seated in a small island formed by the rivers Meuse, Merue, Rhine, and Linghe. The Meuse, on which it stands, gives it a good harbour, and separates it from the islands of Isselmonde and Ablas. It is divided from Beyerland by a canal. The harbour is very commodious for the merchandizes which come down the Rhine and the Meuse, which keep it in a flourishing condition. Its strength consists in being surrounded with water. Its walls are old, and defended by round towers. It is very rich, and well built with brick, and had formerly the exclusive right of coining money. It is at present the staple town for wines, particularly Rhenish. It was detached from the main land in 1421, on the 17th of November, by a flood occasioned by the breaking down of the dyke, which overwhelmed 70 villages, and about 100,000 persons. However, by time and the industry of the inhabitants, a great part of the land is recovered. It has two principal canals, namely the New and Old Haven, by which heavy-loaded vessels may enter into the city. Over the Old Haven is a large bridge well built with brick.

Dort was almost reduced to ashes in the year 1457; there being then consumed 2000 houses, with the halls, hospital, and church of Notre Dame: but they are now well provided with fire-engines and watchmen to prevent the like disaster. This city is famous for the meeting of the clergy called the *Synod of Dort*, in which the Calvinists obtained a sentence against the Arminians, who were called the *Remonstrants*. The dispute between the contending parties occasioned strange disorders, skirmishes, and murders, in most of the principal cities. Those ministers who would not subscribe to the decree of the synod were banished, of whom there were above 100. E. Long. 4. 36. N. Lat. 51. 39.

Synod of DORT, a national synod, summoned by authority of the States General, the provinces of Holland, Utrecht, and Overyssel excepted, and held at Dort in 1618. The most eminent divines of the United Provinces, and deputies from the churches of England, Scotland, Switzerland, Bremen, Hessia, and the Palatinate, assembled on this occasion in order to decide the controversy between the Gomarists or Calvinists and Arminians; the latter of whom were declared corrupters of the true religion. But the authority of this synod was far from being universally acknowledged either in Holland or in England. The provinces of Friesland, Zealand, Utrecht, Guelderland, and Groningen, could not be persuaded to adopt their decisions; and they were opposed by the authority of Archbishop Laud and King James I. in England. The reformed churches in France, though at first disposed to give a favourable reception to the decisions of this famous synod, in process of time espoused doctrines very different from those of the Gomarists; and the churches of Brandenburgh and Bremen would not suffer their doctors to be tied down to the opinions and tenets of the Dutch divines. The liberty of private judgment with respect to the doctrines of predestination and grace, which the spirit that prevailed among the divines of Dort seemed so much adapted to discourage and suppress, acquired new vigour in consequence of the arbitrary proceedings of this assembly.

DORTMUND, a rich, populous, and imperial city of Germany, in the circle of Westphalia. It is pretty large, but not well built. Formerly it was one of the Hanse towns. Its territory also was formerly a county, and had lords of its own; but since 1504, it hath been possessed entirely by the city.

DORYPHORI (from δορυ *spear*, and φερω *I bear*), an appellation given to the life-guard-men of the Roman emperors. They were held in such high estimation, as frequently to have the command of armies conferred on them.—It was usual also for chief commanders to have their doryphori or life-guard to attend them.

DOSE,

DOSE, in pharmacy, &c. the quantity of a medicine to be taken at one time. The word is formed from the Greek δοσις, which signifies *gift*, or a thing given; from διδωμι *do*, "I give."

DOSITHEANS, Dosithei, an ancient sect among the Samaritans in the first century of the Christian era.

Mention is made in Origen, Epiphanius, Jerom, and divers other Greek and Latin fathers, of one Dositheus, the chief of a faction among the Samaritans; but the learned are not at all agreed as to the time wherein he lived. St Jerom, in his dialogue against the Luciferians, places him before our Saviour; wherein he is followed by Drusius, who in his answer to Serrarius places him about the time of Sennacherib king of Assyria. But Scaliger will have him posterior to our Saviour's time: And in effect Origen intimates him to have been contemporary with the apostles; where he observes, that he endeavoured to persuade the Samaritans that he was the Messiah foretold by Moses.

He had many followers; and his sect was still subsisting at Alexandria in the time of the patriarch Eulogius, as appears from a decree of that patriarch published by Photius. In that decree, Eulogius accuses Dositheus of injuriously treating the ancient patriarchs and prophets, and attributing to himself the spirit of prophecy. He makes him contemporary with Simon Magus; and accuses him of corrupting the Pentateuch in divers places, and of composing several books directly contrary to the law of God.

Archbishop Usher takes Dositheus to be the author of all the changes made in the Samaritan Pentateuch, which he argues from the authority of Eulogius. But all we can justly gather from the testimony of Eulogius is, that Dositheus corrupted the Samaritan copies since used by that sect; but that corruption did not pass into all the copies of the Samaritan Pentateuch now in use among us, which vary but little from the Jewish Pentateuch: And in this sense we are to understand that passage in a Samaritan chronicle, where it is said that Dousis, *i. e.* Dositheus, altered several things in the law of Moses. The author of that chronicle, who was a Samaritan by religion, adds, that their high-priest sent several Samaritans to seize Dousis and his corrupted copy of the Pentateuch.

Epiphanius takes Dositheus to have been a Jew by birth, and to have abandoned the Jewish party for that of the Samaritans. He imagines him likewise to have been the author of the sect of the Sadducees: Which seems inconsistent with his being later than our Saviour; and yet the Jesuit Serrarius agrees to make Dositheus the master of Sadoc, from whom the Sadducees are derived.

Tertullian, making mention of the same Dositheus, observes, that he was the first who dared to reject the authority of the prophets by denying their inspiration. But he charges that as a crime peculiar to this sectary, which in reality is common to the whole sect, who have never allowed any but the five books of Moses for divine.

DOSSER, a sort of basket to be carried on the shoulders of men. It is used in carrying the overplus earth from one part of a fortification to another where it is wanted. There are likewise small carts and wheelbarrows for the same use.

DOSSIL, in surgery, is lint made into a cylindric form, or resembling the shape of dates or olive-stones. Dossils are sometimes secured by a thread tied round their middle.

DOTTEREL, in ornithology. See Charadrius.

DOU, or Douw, (Gerard). See Douw.

DOUAY, or Doway, a large and strong city of the French Netherlands, situated in E. Long. 3. 0. N. Lat. 50. 25. It is situated on the river Scarpe, in a very fertile and pleasant country. The town is large and populous, and exceedingly well fortified. You enter it by six gates, and the streets from each of these gates lead to the market-place. Here is a venerable old town-house, adorned with the statues of the earls of Flanders, in which the magistrates assemble, and are renewed every thirteen months. Here also are held several country courts for the dependencies of Douay, which contain about 30 villages. The parliament of Doway was at first only a supreme council, established at Tournay in 1668, and erected into a parliament in 1686. But Tournay being taken by the allies in 1709, the parliament was removed to Cambray; and upon the yielding of Tournay to the Austrians by the treaty of Utrecht, the parliament was removed to Douay, where it still continues. This city was erected into an university like that of Louvain by Philip II. because of its being in the middle of so many great cities, and Louvain at so great a distance, that the children on that side of the country were generally sent for their education into France. It contains 14 colleges, all governed and settled after the manner of those at Louvain; and the schools of philosophy, canon and civil law, and physic, are disposed also after the same manner, only the rector here is chosen annually. There is a considerable seminary here of English Roman Catholics, founded by Philip II. of Spain about the year 1569. There is also a great number of convents; and among the rest two English, one of Franciscan friars, the other of Benedictine monks. Douay was taken from the Spaniards by the French king in person in 1667, after a short resistance. That prince made it very strong, and built a fort about a cannon shot below it upon the Scarpe, with sluices, by which the adjacent country could be drowned. The allies laid siege to it in 1710, under the command of the Duke of Marlborough; and after a vigorous defence, the town and Fort Scarpe surrendered upon honourable terms. It was retaken by the French in 1712, after the suspension of arms between Great Britain and France.

DOUBLE; two of a sort, one corresponding to the other.

Double *Children, Double Cats, Double Pears, &c.* Instances of these are frequent in the *Philosoph. Transact.* and elsewhere. See Monster.

Sir John Floyer, in the same *Tansactions*, giving an account of a *double turkey*, furnishes some reflections on the productions of *double animals* in general. Two turkeys, he relates, were taken out of an egg of the common size, when the rest were well hatched, which grew together by the flesh of the breast-bone, but in all other parts were distinct. They seemed less than the ordinary size, as wanting bulk, nutriment, and room for their growth; which latter, too, was apparently the occasion of their cohesion. For, having two distinct cavities in their bodies, and two hearts, they must have arisen from two cicatriculas; and, consequently, Double. quently, the egg had two yolks; which is no uncommon accident. He mentions a dried *double chicken* in his poſſeſſion, which, though it had four legs, four wings, &c. had but one cavity in the body, one heart, and one head; and, conſequently, was produced from one cicatricula.

So, Pæreus mentions a *double infant*, with only one heart: in which caſe, the original or ſtamen of the infant was one, and the veſſels regular; only, the nerves and arteries towards the extremities dividing into more branches than ordinary, produced *double* parts.

The ſame is the caſe in the *double flowers* of plants, occaſioned by the richneſs of the ſoil. So it is in the eggs of quadrupeds, &c.

There are, therefore, two reaſons of duplicity in embryos: 1. The conjoining or connection of two perfect animals; and 2. An extraordinary diviſion and ramification of the original veſſels, nerves, arteries, &c.

Double *Employment*, in muſic, a name given by M. Rameau to the two different manners in which the chord of the ſub-dominant may be regarded and treated, viz. as the fundamental chord of the ſixth ſuperadded, or as the chord of the great ſixth, inverted from a fundamental chord of the ſeventh. In reality, the chords carry exactly the ſame notes, are figured in the ſame manner, are employed upon the ſame chord of the tone, in ſuch a manner, that frequently we cannot diſcern which of the two chords the author employs, but by the aſſiſtance of the ſubſequent chord, which reſolves it, and which is different in theſe different caſes.

To make this diſtinction, we muſt conſider the diatonic progreſs of the two notes which form the fifth and the ſixth, and which conſtituting between them the interval of a ſecond, muſt one or the other conſtitute the diſſonance of the chord. Now, this progreſs is determined by the motion of the baſs. Of theſe two notes, then, if the ſuperior be the diſſonance, it will riſe by one gradation into the ſubſequent chord, the lower note will keep its place, and the higher note will be a ſuperadded ſixth. If the lower be the diſſonance, it will deſcend into the ſubſequent chord, the higher will remain in its place, and the chord will be that of the great ſixth. See the two caſes of the *double employment* in Rouſſeau's Muſical Dictionary, Plate D, fig. 12.

With reſpect to the compoſer, the uſe which he may make of the double-employment, is to conſider the chord in its different points of view, that from thence he may know how to make his enterance to it, and his exit from it; ſo that having arrived, for inſtance, at the chord of the ſuperadded ſixth, he may reſolve it as a chord of the great ſixth, and reciprocally.

M. D'Alembert has ſhown, that one of the chief uſes of the double-employment is, that we be able to carry the diatonic ſucceſſion of the gamut even to an octave, without changing the mode, at leaſt whilſt we riſe; for in deſcending we muſt change it. Of this gamut and its fundamental baſs, an example will be found in Rouſſeau's muſical Dictionary, Plate D, fig. 13. It is evident, according to the ſyſtem of M. Rameau, that all the harmonic ſucceſſions which reſult from it, are in the ſame tone: for, in ſtrictneſs, no other chords are there employed but three, that of the tonic, that of the dominant, and that of the ſub-dominant; as this laſt, in the double-employment, conſtitutes the ſeventh from the ſecond note, which is employed upon the ſixth.

With reſpect to what M. D'Alembert adds in his Elements of Muſic, p. 80. and which he repeats in the Encyclopédia, article *Double-emploi*, viz. that the chord of the ſeventh *re fa la ut*, though we ſhould even regard it only as an inverſion of *fa la ut re*, cannot be followed by the chord *ut mi ſol ut*; "I cannot (ſays Roſſeau) be of his opinion in this point. Double.

"The proof which he gives for it is, that the diſſonance *ut* of the firſt chord cannot be reſolved in the ſecond; and this is true, ſince it remains in its place: but in this chord of the ſeventh *re fa la ut*, inverted from this chord of the ſuperadded ſixth *fa la ut re*, it is not the *ut*, but the *re*, which is the diſſonance; which, of conſequence, ought to be reſolved in aſcending upon *mi*, as it really does in the ſubſequent chord; ſo that this procedure in the baſs itſelf is forced, which, from *re*, cannot without an error return to *ut*, but ought to aſcend to *mi*, in order to reſolve the diſſonance.

"M. D'Alembert afterwards ſhows, that this chord *re fa la ut*, when preceded and followed by that of the tonic, cannot be authoriſed by the double-employment; and this is likewiſe very true; becauſe this chord, tho' figured with a 7, is not treated as a chord of the ſeventh, neither when we make our entrance to it, nor our exit from it; or at leaſt that it is not neceſſary to treat it as ſuch, but ſimply as an inverſion of the ſuperadded ſixth, of which the diſſonance is the baſs: in which caſe we ought by no means to forget, that this diſſonance is never prepared. Thus, though in ſuch a tranſition the double-employment is not in queſtion, though the chord of the ſeventh be no more than apparent, and impoſſible to be reſolved by the rules, this does not hinder the tranſition from being proper and regular, as I have juſt proved to theoriſts. I ſhall immediately prove to practical artiſts, by an inſtance of this tranſition; which certainly will not be condemned by any one of them, nor juſtified by any other fundamental baſs except my own. (See the Muſical Dictionary, Plate D, fig. 14.)

"I acknowledge, that this inverſion of the chord of the ſixth ſuperadded, which transfers the diſſonance to the baſs, has been cenſured by M. Rameau. This author, taking for a fundamental chord the chord of the ſeventh, which reſults from it, rather choſe to make the fundamental baſs deſcend diatonically, and reſolve one ſeventh by another, than to unfold this ſeventh by an inverſion. I had diſſipated this error, and many others, in ſome papers which long ago had paſſed into the hands of M. D'Alembert, when he was compoſing his elements of Muſic; ſo that it is not his ſentiment which I attack, but my own opinion which I defend."

For what remains, the double-employment cannot be uſed with too much reſerve, and the greateſt maſters are the moſt temperate in putting it in practice.

Double *Fichy*, or *Fiché*, in heraldry, the denomination of a croſs, when the extremity has two points; in contradiſtinction to fiché, where the extremity is ſharpened away to one point.

Double *Octave*, in muſic, an interval compoſed of fifteen notes in diatonic progreſſion; and which, for that reaſon, is called a *fifteenth*. "It is (ſays Rouſſeau) an interval compoſed of two octaves, called by the Greeks *diſdiapaſon*."

It deſerves, however, to be remarked, that in intervals leſs diſtant and compounded, as in the *third* the *fifth*, the

Doublet. the *ſimple octave*, &c. the loweſt and higheſt extremes are included in the number from whence the interval takes its name. But, in the *double octave*, when termed a fifteenth, the ſimple number of which it is compoſed gives the name. This is by no means analogical, and may occaſion ſome confuſion. We ſhould rather chooſe, therefore, to run any hazard which might occur from uniformly including all the terms of which the component intervals conſiſt, and call the *double* octave a ſixteenth, according to the general analogy. See INTERVAL.

DOUBLET, among lapidaries, implies a counterfeit ſtone compoſed of two pieces of cryſtal, and ſometimes glaſs ſoftened, together with proper colours between them; ſo that they make the ſame appearance to the eye as if the whole ſubſtance of the cryſtal had been tinged with theſe colours.

The impracticability of imparting tinges to the body of cryſtals, while in their proper and natural ſtate, and the ſoftneſs of glaſs, which renders ornaments made of it greatly inferior in wear to cryſtal, gave inducements to the introduction of colouring the ſurface of cryſtal wrought in a proper form, in ſuch a manner, that the ſurfaces of two pieces ſo coloured being laid together, the effect might appear the ſame as if the whole ſubſtance of the cryſtal had been coloured. The cryſtals, and ſometimes white tranſparent glaſs ſo treated, were called *doublets*; and at one time prevailed greatly in uſe on account of the advantages, with reſpect to wear, ſuch doublets had, when made of cryſtal, over glaſs, and the brightneſs of the colours which could with certainty be given to counterfeit ſtones this way, when coloured glaſs could not be procured, or at leaſt not without a much greater expence. Doublets have not indeed the property which the others have, of bearing to be ſet tranſparent, as is frequently required in drops of ear-rings and other ornaments: but when mounted in rings, or uſed in ſuch manner that the ſides of the pieces, where the joint is made, cannot be inſpected, they have, when formed of cryſtal, the title to a preference to the coloured glaſs; and the art of managing them is therefore, in ſome degree, of the ſame importance with that of preparing glaſs for the counterfeiting gems; and is therefore properly an appendage to it, as being entirely ſubſervient to the ſame intention. The manner of making doublets is as follows:

Let the cryſtal or glaſs be firſt cut by the lapidaries in the manner of a brilliant, except that, in this caſe, the figure muſt be compoſed from two ſeparate ſtones, or parts of ſtones, formed in the manner of the upper and under parts of a brilliant, if it was divided in an horizontal direction, a little lower than the middle. After the two plates of the intended ſtone are thus cut, and fitted ſo exactly that no diviſion can appear when they are laid together, the upper part muſt be poliſhed ready for ſetting; and then the colour muſt be put betwixt the two plates by this method, "Take of Venice or Cyprus turpentine two ſcruples; and add to it one ſcruple of the grains of maſtich choſen perfectly pure, free from foulneſs, and previouſly powdered. Melt them together in a ſmall ſilver or braſs ſpoon ladle, or other veſſel, and put to them gradually any of the coloured ſubſtances below mentioned, being firſt well powdered; ſtirring them together as the colour is put in, that they may be thoroughly commixed. Warm then the doublets to the ſame degree of heat as the melted mixture; and paint the upper ſurface of the lower part, and put the upper one inſtantly upon it, preſſing them to each other, but taking care that they may be conjoined in the moſt perfectly even manner. When the cement or paint is quite cold and ſet, the redundant part of it, which has been preſſed out of the joint of the two pieces, ſhould be gently ſcraped off the ſide, till there be no appearance of any colour on the outſide of the doublets: and they ſhould then be ſkilfully ſet; obſerving to carry the mounting over the joint, that the upper piece may be well ſecured from ſeparating from the under one."

Doublet, Doublets.

The colour of the ruby may be beſt imitated, by mixing a fourth part of carmine with ſome of the fineſt crimſon lake that can be procured.

The ſapphire may be counterfeited by very bright Pruſſian blue, mixed with a little of the abovementioned crimſon lake, to give it a caſt of the purple. The Pruſſian blue ſhould not be very deep-coloured, or but little of it ſhould be uſed: for otherwiſe, it will give a black ſhade that will be injurious to the luſtre of the doublets.

The emerald may be well counterfeited by diſtilled verdigreaſe, with a little powdered aloes. But the mixture ſhould not be ſtrongly heated, nor kept long over the fire after the verdigreaſe is added: for the colour is to be ſoon impaired by it.

The reſemblance of the garnet may be made by dragon's blood; which, if it cannot be procured of ſufficient brightneſs, may be helped by a very ſmall quantity of carmine.

The amethyſt may be imitated by the mixture of ſome Pruſſian blue with the crimſon lake; but the proportions can only be regulated by direction, as different parcels of the lake and Pruſſian blue vary extremely in the degree of ſtrength of the colour.

The yellow topazes may be counterfeited by mixing the powdered aloes with a little dragon's blood, or by good Spaniſh anotto: but the colour muſt be very ſparingly uſed, or the tinge will be too ſtrong for the appearance of that ſtone.

The chryſolite, hyacinth, vinegar garnet, eagle marine, and other, ſuch weaker or more diluted colours, may be formed in the ſame manner, by leſſening the proportions of the colours, or by compounding them together correſpondently to the hue of the ſtone to be imitated; to which end it is proper to have an original ſtone, or an exact imitation of one, at hand when the mixture is made, in order to the more certain adapting the colours to the effect deſired; and when theſe precautions are taken, and the operation well conducted, it is practicable to bring the doublets to ſo near a reſemblance of the true ſtones, that even the beſt judges cannot diſtinguiſh them, when well ſet, without a peculiar manner of inſpection.

There is, however, an eaſy method of diſtinguiſhing doublets, which is only to behold them betwixt the eye and light, in ſuch poſition, that the light may paſs through the upper part and corners of the ſtone; when it will eaſily be perceived that there is no colour in the body of the ſtone.

DOUBLETS, a game on dice within tables; the men, which are only 15, being placed thus: Upon the ſice, fice, cinque, and quatre points, there stand three men a-piece; and upon the trey, duce, and ace, only two. He that throws highest hath the benefit of throwing first, and what he throws he lays down, and so doth the other: what the one throws, and hath not, the other lays down for him, but on his own account; and thus they do till all the men are down, and then they bear. He that is down first, bears first; and will doubtless win the game, if the other throws not doublets to overtake him: which he is sure to do, since he advances or bears as many as the doublets make, viz. eight for two fours.

DOUBLING, in the military art, is the putting two ranks or files of soldiers into one. Thus, when the word of command is, *double your ranks*, the second, fourth, and sixth ranks march into the first, third, and fifth, so that the six ranks are reduced to three, and the intervals between the ranks become double what they were before.

Doubling, among hunters, who say that a hare doubles, when she keeps in plain fields, and winds about to deceive the hounds.

Doubling, in the manege, a term used of a horse, who is said to double his reins, when he leaps several times together, to throw his rider: thus we say, *the ramingue doubles his reins, and makes pontlevis*.

Doubling, in navigation, the act of sailing round, or passing beyond, a cape or promontory, so as that the cape or point of land separates the ship from her former situation, or lies between her and any distant observer.

Doubling-Upon, in naval tactics, the act of inclosing any part of a hostile fleet between two fires, or of cannonading it on both sides.

It is usually performed by the van or rear of that fleet which is superior in number, taking the advantage of the wind, or of its situation and circumstances, and tacking or veering round the van or rear of the enemy, who will thereby be exposed to great danger, and can scarcely avoid being thrown into a general confusion.

DOUBLON, or Dubloon, a Spanish and Portuguese coin, being the double of a Pistole.

DOUBTING, the act of with-holding our assent from any proposition, on suspicion that we are not thoroughly apprised of the merits thereof, or from not being able peremptorily to decide between the reasons for and against it.

Doubting is distinguished by the schoolmen into two kinds, *dubitatio sterilis*, and *dubitatio efficax*. The former is that where no determination ensues: in this manner the Sceptics and Academics doubt, who withhold their assent from every thing. See Sceptics, &c.

The latter is followed by judgment, which distinguishes truth from falsehood: such is the doubting of the Peripatetics and Cartesians. The last in particular are perpetually inculcating the deceitfulness of our senses, and tell us that we are to doubt of every one of their reports, till they have been examined and confirmed by reason. On the other hand, the Epicureans teach, that our senses always tell truth; and that, if you go ever so little from them, you come within the province of doubting. See Cartesians, Epicureans, &c.

Doubting, in rhetoric, a figure wherein the orator appears some time fluctuating, and undetermined what to do or say. Tacitus furnishes us with an instance of doubting, almost to a degree of distraction, in those words of Tiberius written to the senate; *Quid scribam, P. S. aut quomodo scribam, aut quid omnino non scribam hoc tempore, dii me deæque pejus perdant quam perire quotidie sentio, si scio.*

DOUCETS, or Doulcets, among sportsmen, denote the testes of a deer or stag.

DOUCINE, in architecture, a moulding concave above and convex below, serving commonly as a cymatium to a delicate corniche. It is likewise called gula.

DOVE, in ornithology. See Columba.

Dove-Tailing, in carpentry, is the manner of fastening boards together by letting one piece into another, in the form of the tail of a dove. The dove tail is the strongest of the assemblages or jointings; because the tenon, or piece of wood which is put into the other, goes widening to the extreme, so that it cannot be drawn out again, by reason the extreme or tip is bigger than the hole.

DOVER, a borough and port town of England, in the county of Kent, situated in E. Long. 0. 25. N. Lat. 51. 10. It sends two members to parliament, styled *barons of the Cinque-ports*, whereof Dover is the chief. Dover gave the title of duke in the Queensberry family, but extinct: now a revived barony in the York family.

By the Romans this town was named *Dubris*, and by the Saxons *Dofra*, probably from the British word *Dour*, which signifies water. The convenience of its situation drew the attention of the Roman governors, who ruled here while they possessed this part of the island; and there still remain indubitable testimonies of their care and respect for this important place. For the defence of the town, the Romans, or according to some, Arviragus, a British king, their confederate, by cutting out walls with infinite labour in the solid rock, constructed a stony fortress; and, as its venerable remains still prove, erected also a light-house for the benefit of navigation. The Saxons, Danes, and Normans, had a very high opinion of this place; and when the barons invited over the young prince, afterwards Louis VIII. of France, his father Philip Augustus conceived a bad opinion of the expedition, because the castle and port of Dover were held for king John, though a great part of the kingdom had submitted to Louis. In its most flourishing state, the fortress was impregnable, and the town a very opulent emporium. It had 21 wards, each of which furnished a ship for the public service, 10 gates, 7 parish-churches, many religious houses, hospitals, and other public edifices. The decay of the town was brought on by that of the harbour. To recover this, Henry VIII. spent no less than 63,000l. in constructing piers, and 5000l. in building a castle between this and Folkstone, called *Sandgate*; where the shore was flat, and the landing easy. Notwithstanding all this expence, however, it was again choaked up in the reign of queen Elizabeth, by whom it was again cleared at a vast expence, so that ships of some hundred tons could enter it. Since that time it has again declined, notwithstanding of many efforts for its relief, and great assistance from time to time given by parliament for this purpose. As the haven, however, is

Dover.

is ſtill capable of receiving veſſels of ſmall burden; and as the packets to France and Flanders are ſtationed here in time of peace, it is ſtill a place of ſome conſequence, and the people are active and induſtrious.

Dover Straits, the narrow channel between Dover and Calais, which ſeparates the iſland from the oppoſite continent. Britain is ſuppoſed by many to have been once peninſulated, the preſent ſtraits occupying the ſite of the iſthmus which joined it to Gaul. "No certain cauſe (ſays Mr Pennant *) can be given for the mighty convulſion which tore us from this continent; whether it was rent by an earthquake, or whether it was worn through by the continual daſhing of the waters, no Pythagoras is left to ſolve the *Fortuna locorum*:

* Art. Zool. Vol. I. Introd. p. ii.

> *Vidi ego, quod fuerat quondam ſolidiſſima tellus*
> *Eſſe fretum.*

But it is moſt probable, that the great philoſopher alluded to the partial deſtruction of the *Atlantica inſula*, mentioned by Plato as a diſtant tradition in his days. It was effected by an earthquake and a deluge, which might have rent aſunder the narrow iſthmus in queſtion, and left Britain, large as it ſeems at preſent, the mere wreck of its original ſize. The Scilly iſles, the Hebrides, Orkneys, Schetlands, and perhaps the Feroe iſlands, may poſſibly be no more than fragments of the once far-extended region. I have no quarrel about the word *iſland*. The little iſthmus, compared to the whole, might have been a junction never attended to in the limited navigations of very early times. The peninſula had never been wholly explored, and it paſſed with the ancients for a genuine iſland. The correſpondency of ſtrata on part of the oppoſite ſhores of Britain and France, leaves no room to doubt but that they were once united. The chalky-cliffs of Blancnez between Calais and Bologne, and thoſe to the weſtward of Dover, exactly tally: the laſt are vaſt and continued; the former ſhort, and the termination of the immenſe bed. Between Bologne and Folkſtone (about ſix miles from the latter) is another memorial of the junction of the two countries; a narrow ſubmarine hill, called the *Rip-raps*, about a quarter of a mile broad, and ten miles long, extending eaſtward towards the Goodwin Sands. Its materials are boulderſtones, adventitious to many ſtrata. The depth of water on it, in very low ſpring-tides, is only fourteen feet. The fiſhermen from Folkſtone have often touched it with a fifteen feet oar; ſo that it is juſtly the dread of navigators, many a tall ſhip has periſhed on it, and ſunk inſtantly into twenty-one fathoms water. In July 1782, the Belleſle of ſixty-four guns ſtruck, and lay on it during three hours; but, by ſtarting her beer and water, got clear off."

Theſe celebrated ſtraits are only twenty-one miles wide in the narroweſt part. From the pier at Dover to that at Calais is twenty-four. It is conjectured, that their breadth leſſens, and that they are two miles narrower than they were in ancient times. An accurate obſerver of fifty years remarks to me, that the increaſed height of water, from a decreaſe of breadth, has been apparent even in that ſpace. The depth of the channel at a medium in higheſt ſpring-tides is about twenty-five fathoms. The bottom either coarſe ſands or rugged ſcars, which have for ages unknown reſiſted the attrition of the currents. From the ſtraits both eaſtward and weſtward is a gradual increaſe of depth through the channel to a hundred fathoms, till ſoundings are totally loſt or unattended to. The ſpring-tides in the ſtraits riſe on an average twenty-four feet, the neap-tides fifteen. The tide flows from the German ſea, paſſes the ſtraits, and meets, with a great rippling, the weſtern tide from the ocean between Fairleigh near Haſtings and Bologne; a proof that if the ſeparation of the land was effected by the ſeas, it muſt have been by the overpowering weight of thoſe of the north.

Dover, Douglas.

Dover, one of the principal towns in the ſtate of Delaware. It is ſituated in the county of Kent, on St John's river, a few miles from its entrance into Delaware bay, in latitude 39° 30′ north; longitude weſt from Philadelphia 27 minutes.—Ever ſince the revolution it has been the ſeat of the ſtate government, and now appears to be pretty rapidly increaſing in populouſneſs and in ſize. Several handſome buildings have been erected here. Among others, a large elegant ſtate-houſe, lately finiſhed, occupies and adorns a conſpicuous part of the public ſquare. Four ſtreets interſect each other at right angles in the center of the town, whoſe incidencies form a ſpacious parade. The houſes are principally of brick. By the late enumeration, it appears there are between 5 and 600 inhabitants in this town.

DOUGLAS (Lord). See (*Hiſtory of*) Scotland.

Douglas (Gavin), biſhop of Dunkeld in Scotland, was the third ſon of Archibald earl of Angus, and born in the year 1474. Where he was educated, is not known; but it is certain that he ſtudied theology: a ſtudy, however, which did not eſtrange him from the muſes; for he employed himſelf at intervals in tranſlating into beautiful verſe the poem of Ovid *de Remedio Amoris*. The advantages of foreign travel, and the converſation of the moſt learned men in France and Germany, to whom his merit procured the readieſt acceſs, completed his education. With his ſuperior recommendations and worth it was impoſſible he could remain unnoticed. His firſt preferment was to be provoſt of the collegiate church of St Giles in Edinburgh; a place at that time of great dignity and revenue. In the year 1514, the queen mother, then regent of Scotland, appointed Douglas abbot of Aberbrothock, and ſoon after archbiſhop of St Andrew's; but the queen's power not being ſufficient to eſtabliſh him in the poſſeſſion of that dignity, he relinquiſhed his claim in favour of his competitor Foreman, who was ſupported by the pope. In 1515, he was by the queen appointed biſhop of Dunkeld; and that appointment was ſoon after confirmed by his holineſs Leo X. Nevertheleſs it was ſome time before he could obtain peaceable poſſeſſion of his ſee. The duke of Albany, who in this year was declared regent, oppoſed him becauſe he was ſupported by the queen; and, in order to deprive him of his biſhopric, accuſed him of acting contrary to law in receiving bulls from Rome. On this accuſation he was committed to the caſtle of Edinburgh, where he continued in confinement above a year; but the regent and the queen being at laſt reconciled, he obtained his liberty, and was conſecrated biſhop of Dunkeld. In 1517, he attended the duke of Albany to France; but returned ſoon after to Scotland. In 1521, the diſputes between the earls of Arran and Angus having thrown the kingdom into violent commotion, our prelate retired to England, where he became intimately acquainted with Polydore Virgil the historian. He died in London of the plague in 1522; and was buried in the Savoy. He wrote, 1. The Palace of Honour: a most ingenious poem under the similitude of a vision; in which he paints the vanity and inconstancy of all wordly glory. It abounds with incidents, and a very rich vein of poetry. The palace of happiness, in the picture of Cebes, seems to be the ground-work of it. 2. *Aureæ Narrationes*: a performance now lost; in which, it is said, he explained, in a most agreeable manner the mythology of the poetical fictions of the ancients. 3. *Comœdiæ aliquot sacræ*: None of which are now to be found. 4. Thirteen Bukes of Eneades, of the famose poet Virgil, translatet out of Latin verses into Scottish metre, every buke having its particular prologe. Imprinted at London 1553, in 4to; and reprinted at Edinburgh 1710, in folio. The last is the most esteemed of all his works. He undertook it at the desire of lord Henry Sinclair, a munificent patron of arts in those times: and he completed it in 18 months; a circumstance which his admirers are too fond of repeating to his advantage. David Hume of Godscroft, an author of uncommon merit, and an admirable judge of poetry, gives the following testimony in his favour. "He wrote (says he) in his native tongue divers things; but his chiefest work is his translation of Virgil, yet extant, in verse: in which he ties himself so strictly as is possible; and yet it is so well expressed, that whosoever will essay to do the like, will find it a hard piece of work to go through with it. In his prologues before every book, where he hath his liberty, he sheweth a natural and ample vein of poetry, so pure, pleasant, and judicious, that I believe there is none that hath written before or since but cometh short of him." It has been said, that he compiled an historical treatise *De rebus Scoticis*; but no remain of it hath descended to the present times.

Douglas, the principal town of the Isle of Man, and which has lately increased both in trade and buildings. The harbour, for ships of a tolerable burden, is the safest in the island, and is much mended by a fine mole that has been built. It is seated on the eastern side. W. Long. 4. 25. N. Lat. 54. 7.

DOUW (Gerhard), a celebrated painter, was born at Leyden in 1613; and received his first instructions in drawing and design from Bartholomew Dolendo an engraver, and also from Peter Kouwhoorn a painter on glass; but at the age of fifteen he became a disciple of Rembrandt. In that famous school he continued for three years; and then found himself qualified to study nature, the most unerring director.

From Rembrandt he learned the true principles of colouring, and obtained a complete knowledge of the chiaro-scuro; but to that knowledge he added a delicacy of pencil, and a patience in working up his colours to the highest degree of neatness, superior to any other master. He therefore was more pleased with those pictures of Rembrandt which were painted in his youth than those by which he was distinguished in his more advanced age; because the first seemed finished with more care and attention, the latter with more boldness, freedom, and negligence, which was quite opposite to the taste of Douw. But although his manner appears so different from that of his master, yet it was to Rembrandt alone that he owed all that excellence in colouring in which he triumphed over all the artists of his own country.

His pictures usually are of a small size, with figures so exquisitely touched, so transparent, so wonderfully delicate, as to excite astonishment as well as pleasure. He designed every object after nature, and with an exactness so singular, that each object appears as perfect as nature itself, in respect to colour, freshness, and force. His general manner of painting portraits was by the aid of a concave mirror, and sometimes by looking at the object through a frame with many exact squares of fine silk. But the latter custom is disused, as the eye of a good artist seems a more competent rule, though the rule of the former is still practised by the painters in miniature.

It is almost incredible what vast sums have been given and are given at this day for the pictures of Douw, even in his own country; as also in Italy and every polite part of Europe: for he was exceedingly curious in finishing them, and patiently assiduous beyond example. Of that patience Sandrart gives a strong proof in a circumstance which he mentions relative to this artist. He says, that having once, in company with Bamboccio, visited Gerhard Douw, they could not forbear to admire the prodigious neatness of a picture which he was then painting, in which they took particular notice of a broom; and expressing their surprise at the excessive neatness of the finishing that minute object, Douw told them he should spend three days more in working on that broom before he should account it entirely complete. In a family picture of Mrs Spiering, the same author says, that the lady had sat five days for the finishing one of her hands that leaned on an arm-chair. For that reason not many would sit to him for their portraits; and he therefore indulged himself mostly in works of fancy, in which he could introduce objects of still life, and employ as much time on them as suited his own inclination. Houbraken testifies, that his great patron Mr Spiering allowed him a thousand guilders a-year, and paid beside whatever he demanded for his pictures, and purchased some of them for their weight in silver; but Sandrart, with more probability, assures us, that the thousand guilders a-year were paid to Gerhard, on no other consideration than that the artist should give his benefactor the option of every picture he painted, for which he was immediately to receive the utmost of his demand. This great master died in 1674, aged 61.

Douw appears incontestably to be the most wonderful in his finishing of all the Flemish masters. Every thing that came from his pencil is precious, and his colouring hath exactly the true and the lovely tints of nature; nor do his colours appear tortured, nor is their vigour lessened by his patient pencil; for whatever pains he may have taken, there is no look of labour or stiffness; and his pictures are remarkable, not only for retaining their original lustre, but for having the same beautiful effect at a proper distance as they have when brought to the nearest view.

At Turin are several pictures by Gerhard Douw, wonderfully beautiful; especially one, of a Doctor attending a sick woman, and surveying an urinal. The execution of that painting is astonishingly fine, and although the shadows appear a little too dark, the whole has an inexpressible effect. In the gallery at Florence there is a night-piece by candle-light, which is exquisitely finished; and in the same apartment, a mountebank attended by a number of figures, which it seems impossible either sufficiently to commend or to describe.

DOULEIA, Δουλεια, among the Athenians, a kind of punishment, by which the criminal was reduced into the condition of a slave. It was never inflicted upon any but the *ατιμοι*, *sojourners* and *freed servants*.

To DOUSE, in sea language, is to lower suddenly, or slacken; and it is applied to a sail in a squall of wind, an extended hawser, &c.

DOWAGER, Dotissa (*q. d.* a widow endowed, or that has a jointure), a title, or addition, applied to the widows of princes, dukes, earls, and persons of high rank only.

Queen Dowager, is the widow of a king, and as such enjoys most of the privileges belonging to her as queen consort: but it is not high treason to violate her chastity or conspire her death, because the succession is not endangered thereby; but no man can marry her without special license from the king, on pain of forfeiting his lands and goods. See Queen.

DOWER, (*Dotarium*, *Doarium*, or *Dos*,) a portion of lands or tenements which a widow in Britain enjoys for term of life from her husband, in case she survives him: and, which, at her death, descends to their children. But she must have been the wife of the party at the time of his decease; or not divorced *a vinculo matrimonii*: nor, if she has eloped from her husband, and lives with an adulterer, shall she be entitled to dower, unless her husband be voluntarily reconciled to her. The widows of traitors are also barred of their dower by 5 and 6 Ed. VI. cap. 11. but not the widows of felons. An alien cannot be endowed, unless she be queen-consort. And if a woman levies a fine with her husband, or if a common recovery be had with the husband and wife of the husband's lands, she is barred of her dower. A widow, clear of these impediments, is by law intitled to be endowed of all lands and tenements, of which her husband was seized in fee-simple or fee tail at any time during the coverture; and of which any issue she might have had might by possibility have been heir. See Jointure.

DOWN, a county of Ireland in the province of Ulster, bounded on the east and south by St George's channel; on the west by the county of Armagh; and on the north by the county of Antrim. It lies opposite to the Isle of Man, Cumberland, and Westmoreland; and the north part of it fronts the Mull of Galloway in Scotland, and is about 44 miles from it. It is about 44 miles in length and 30 in breadth. It sends 14 members to parliament, two for the county, and 12 for the following boroughs, Down-Patrick, Newry, Newtown, Killeleagh, Bangor, and Hillsborough.

This county is rough and full of hills, and yet the air is temperate and healthy. The soil naturally produces wood, unless constantly kept open and ploughed; and the low grounds degenerate into bogs and moss, where the drains are neglected. But by the industry of the inhabitants it produces good crops of corn, particularly oats; and, where marl is found, barley. This last is exported from Killogh to Dublin. The staple commodity of this county is the linen manufacture.

Down, or *Down-Patrick*, a town of Ireland, in the county of Down, is one of the most ancient in that kingdom. It is a market-town and a bishoprick, said to be erected in the fifth century by St Patrick, but is now united to the see of Connor. Within 200 paces of the town, on the ascent of a hill, are the ruins of an old cathedral, remarkable for the tomb of St Patrick the founder, in which they say the bodies of St Bridget and St Columb are also laid. The town, which is seated on the south corner of Lough Coin, now called the *lake of Strangford*, is adorned with several handsome public buildings. Among the hills, and in many islands, are flights of Swans and other water-fowl; and the Lough abounds with salmon, mullets, and other sea-fish. About a mile from this town is St Patrick's well, which many people frequent to drink at some seasons of the year, and others to perform a penance enjoined them by the popish priests. The linen manufacture is carried on here, as it is in several places in Britain. W. Long. 5. 50. N. Lat. 54. 23.

Down, the fine feathers from the breasts of several birds particularly of the duck kind.—That of the eider-duck (see Anas, n° 17.) is the most valuable. These birds pluck it from their breasts and line their nests with it. We are told that the quantity of down found in one nest more than filled the crown of an hat, yet weighed no more than three quarters of an ounce. Br. Zool.—Three pounds of this down may be compressed into a space scarce bigger than one's fist; yet is afterwards so dilatable as to fill a quilt five feet square. Salern. Orn. p. 416.—That found in the nests is most valued, and termed *live down*; it is infinitely more elastic than that plucked from the dead bird, which is little esteemed in Iceland. The best sort is sold at 45 fish *per* pound when cleansed, and at 16 when not cleansed. There are generally exported every year, on the company's account, fifteen hundred or two thousand pounds of both sorts, exclusive of what is privately exported by foreigners. In 1750 the Iceland Company sold as much in quantity of this article as amounted to three thousand seven hundred and forty-five banco dollars, besides what was sent directly to Gluckstadt.—Von Troil. p. 146.

Down, or hair of plants. See Hair.

DOWNETON, or Dunkton, a borough-town of Wiltshire, five miles south of Salisbury. It sends two members to parliament.

DOWNHAM, a market-town of Norfolk, 10 miles south of Lynn, famous for its good butter; there being 1000, and sometimes 2000, firkins bought here every Monday, and sent up the river Ouse to Cambridge, from whence it is conveyed to London in the Cambridge-waggons.

DOWNS, a bank or elevation of sand, which the sea gathers and forms along its shores; and which serves it as a barrier. The word is formed from the French *dune*, of the Celtic *dum*, a "mountain." Charles de Visch. in his *Compend. Chronolog. Exord. & Progress. Abbat. Clariss. B. Mariæ, de Dunis*, says, *Vallem reperit arenarum collibus (quos incolæ* Duynen *vocant) undique cinctam.*

Downs are particularly used for a famous road for

ships,

ships, along the eastern coast of the county of Kent, from Dover to the North Foreland; where both the outward and homeward-bound ships frequently make some stay; and squadrons of men of war rendezvous in time of war.

It affords excellent anchorage; and is defended by the castles of Deal, Dover, and Sandwich.

DOWRY, the money or fortune which the wife brings her husband in marriage: it is otherwise called *maritagium*, marriage-goods, and differs from dower. See DOWER.

DOXOLOGY, an hymn used in praise of the Almighty, distinguished by the title of *greater* and *lesser*.

The lesser doxology was anciently only a single sentence, without response, running in these words, *Glory be to the Father, and to the Son, and to the Holy Ghost, world without end, Amen.* Part of the latter clause, *As it was in the beginning, is now, and ever shall be*, was inserted some time after the first composition. Some read this ancient hymn, *Glory be to the Father, and to the Son with the Holy Ghost.* Others, *Glory be to the Father in or by the Son, and by the Holy Ghost.* This difference of expression occasioned no disputes in the church, till the rise of the Arian heresy; but when the followers of Arius began to make use of the latter as a distinguishing character of their party, it was entirely laid aside by the Catholics, and the use of it was enough to bring any one under suspicion of heterodoxy.

The doxology was used at the close of every solemn office. The western church repeated it at the end of every psalm, and the eastern church at the end of the last psalm. Many of their prayers were also concluded with it, particularly the solemn thansgiving or consecration prayer at the eucharist. It was also the ordinary conclusion of their sermons.

The greater doxology, or angelic hymn, was likewise of great note in the ancient church. It began with these words, which the angels sung at our Saviour's birth, *Glory be to God on high, &c.* It was chiefly used in communion service, and in men's private devotions. Both the doxologies have a place in the church of England, the former being repeated after every psalm, and the latter used in the communion service.

DRABA, in botany: A genus of the siliculosa order, belonging to the tetradynamia class of plants; and in the natural method ranking under the 39th order, *Siliquosæ*. The silicula is entire, and oval oblong; with the valves a little plane, parallel to the partition: there is no style. There are six species; of which the only one worthy of notice is the verna, or early whitlow-grass. It hath naked stalks, with leaves a little serrated. The blossoms are white, and at night the flowers hang down. It grows on old walls and dry banks. It is one of the earliest flowering plants we have, and is good to eat as a salad. Goats, sheep, and horses eat it; cows are not fond of it; swine refuse it.

DRABLER, in the sea-language, a small sail in a ship, which is the same to a bonnet that a bonnet is to a course, and is only used when the course and bonnet are too shoal to clothe the mast. See BONNET and COURSE.

DRABLING, in angling, is a method of catching barbels. Take a strong line of six yards; which, before you fasten it to your rod, must be put through a piece of lead, that if the fish bite, it may slip to and fro, and that the water may something move it on the ground; bait with a lobe worm well secured, and so by its motion the barbel will be enticed into the danger without suspicion. The best places are in running water near piles, or under wooden bridges, supported with oaks floated and slimy.

DRABS, in the salt-works, a kind of wooden boxes for holding the salt when taken out of the boiling pan; the bottoms of which are made shelving or inclining forwards, that the briny moisture of the salt may drain off.

DRAC, an imaginary being, much dreaded by the country people in many parts of France. The dracs are supposed to be malicious or at least tricksome demons; but, which is very rare, if one of them happens to take a fancy to a man or woman, they are sure to be the better for it. They are still said to lay gold cups and rings on the surface over pits and rivers, as baits to draw women and children in; though their usual dwelling is some old empty house, whence they make excursions in human form, visible or invisible as best suits their purpose. The country folks shudder at the very name of the drac. Some are positive that they have seen him; for happy indeed is that village in which there is not a house execrated as the lurking-place of this tremendous drac.

DRACÆNA, in botany: A genus of the monogynia order, belonging to the hexandria class of plants. The corolla is sexpartite and erect; the filaments a little thicker about the middle; the berry trilocular and monospermous.

DRACHM, a Grecian coin, of the value of sevenpence three farthings. Drachm is also a weight used by our physicians; containing just sixty grains three scruples, or the the eighth part of an ounce.

DRACO, a celebrated lawgiver of Athens. When he exercised the office of archon, he made a code of laws for the use of his citizens, which, on account of their severity, were said to be written in letters of blood. By them idleness was punished with as much severity as murder, and death was denounced against the one as well as the other. Such a code of rigorous laws gave occasion to a certain Athenian to ask of the legislator, why he was so severe in his punishments? and Draco gave for answer, that as the smallest transgression had appeared to him deserving death, he could not find any punishment more rigorous for more attrocious crimes. These laws were at first enforced, but they were often neglected on account of their extreme severity; and Solon totally abolished them, except that one which punished a murderer with death. The popularity of Draco was uncommon, but the gratitude of his admirers proved fatal to him. When once he appeared on the theatre, he was received with repeated applause; and the people, according to the custom of the Athenians, showed their respect to their lawgiver by throwing garments upon him. This was done in such profusion, that Draco was soon hid under them, and smothered by the too great veneration of his citizens. He lived about 624 years before the Christian era.

DRACO, the *Dragon*, in zoology, a genus belonging

ing to the order of amphibia reptilia; the characters of which are these; it has four legs, a cylindrical tail, and two membranceous wings, radiated like the fins of a fish, by which he is enabled to fly, but not to any great distance at a time. There are two species. 1. The volans, or flying dragon, with the wings entirely distinct from the fore-legs. It is found in Africa and the East Indies. 2. The præpos, with the wings fixed to the fore-legs. It is a native of America. They are both harmless creatures: and feed upon flies, ants, and small insects.

Plate CLXIV.

Draco Volans, in meteorology, a fiery exhalation, frequent in marshy and cold countries.

It is most common in summer; and though principally seen playing near the banks of rivers, or in boggy places, yet sometimes mounts up to a considerable height in the air, to the no small terror of the amazed beholders; its appearance being that of an oblong, sometimes roundish, fiery body, with a long tail. It is entirely harmless, frequently sticking to the hands and cloaths of people without injuring them in the least.

Draco, in astronomy, a constellation of the northern hemisphere; whose stars, according to Ptolemy are 81; according to Tycho, 32; according to Hevelius, 40; according to Bayer, 33; and according to Mr Flamsteed, 80. See Astronomy, n° 406.

DRACOCEPHALUM, dragon's head; a genus of the gymnospermia order, belonging to the didynamia class of plants. The throat of the corolla is inflated, the upper lip concave. There are 13 species, most of them herbaceous, annual, or perennial plants, from 18 inches to three feet high, garnished mostly with entire leaves, and whorled spikes of small monopetalous and ringent flowers of a blue, white, or purple colour. They are all easily propagated by seeds, which may be sown either in the spring or autumn; and after the plants are come up they will require no other culture but to be kept clear from weeds.

DRACONARIUS, in antiquity, dragon-bearer. Several nations, as the Persians, Parthians, Scythians, &c. bore dragons on their standards; whence the standards themselves were called *dracones*, "dragons." The Romans borrowed the same custom from the Parthians; or, as Casaubon has it, from the Dacæ; or, as Codin, from the Assyrians.

The Roman dracones were figures of dragons painted in red on their flags, as appears from Ammianus Marcellinus: but among the Persians and Parthians they were like the Roman eagles, figures in full relievo; so that the Romans were frequently deceived, and took them for real dragons.

The soldier who bore the dragon or standard was called by the Romans *draconarius;* and by the Greeks δρακοναριος and δρακοντειοφορος; for the emperors carried the custom with them to Constantinople.

DRACONTIC month, the time of one revolution of the moon from her ascending node, called *caput draconis*, to her return thither.

DRACONTIUM, dragons: A genus of the polyandria order, belonging to the gynandria class of plants; and in the natural method ranking under the first order, *Palmæ*. The spatha is cymbiform, or shaped like a boat; the spadix covered all over; there is no calyx; there are five petals; the berries polyspermous. There are five species, all natives of the Indies. The only one which makes any appearance is the pertusum, with leaves having holes, and a climbing stalk. This is a native of most of the West India islands. It hath trailing stalks which put out roots at every joint, that fasten to the trunks of trees, walls, or any support which is near them, and thereby rise to the height of 25 or 30 feet. The leaves are placed alternately upon long footstalks: they are four or five inches long, two and an half broad; and have several oblong holes in each, which at first sight appears as if eaten by insects, but they are natural to the leaves The flowers are produced at the top of the stalk, which always swells to a much larger size in that part than in any other: these are covered with an oblong spatha or hood of a whitish green colour, which opens longitudinally on one side, and shows the pistil, which is closely covered with flowers of a pale yellow, inclining to white. This plant is easily propagated by cuttings; which if planted in pots filled with poor sandy earth, and plunged into a hot-bed, will soon put out roots; but the plants are so tender, that they must be preserved in a stove.

DRACUNCULI, in medicine, small long worms which breed in the muscular parts of the arms and legs, called *Guinea worms*. The common way of getting out these worms is by the point of a needle; and to prevent their forming there again, the usual custom is to wash the parts with wine or vinegar, with alum, nitre, or common salt, or with a strong lixivium of oak-ashes, and afterwards anointing them with an ointment of the common kind used for scorbutic eruptions, with a small mixture of quicksilver.

DRACUNCULUS, in botany. See Arum.

DRAFF, a name given in some places to the wash given to hogs, and the grains given to cows.

DRAG, in building. A door is said to *drag* when in opening or shutting it hangs or grates upon the floor.

Drag, in sea-language, is a machine consisting of a sharp, square, iron ring, encircled with a net, and commonly used to take the wheel off from the platform or bottom of the decks.

DRAGOMAN, or Drogman, a term of general use through the East for an interpreter, whose office is to facilitate commerce between the orientals and occidentals. These are kept by the ambassadors of Christian nations residing at the Porte for this purpose.

The word is formed from the Arabic *targeman* or *targiman* of the verb *taragem*, "he has interpreted." From *dragoman* the Italians formed *dragomano*, and, with a nearer relation to its Arabic etymology, *turcimanno*; whence the French and our *trucheman*, as well as *dragman* and *drogman*.

DRAGON, in astronomy. See Draco.

Dragon's Head and Tail (caput & cauda draconis), are the nodes of the planets; or the two points wherein the ecliptic is intersected by the orbits of the planets, and particularly that of the moon; making with it angles of five degrees and eighteen minutes. One of these points looks northward; the moon beginning then to have northward latitude, and the other southward, where she commences south. Thus her deviation from the ecliptic seems (according to the fancy of some) to make a figure like to that of a dragon, whose belly is where she has the greatest latitude; the intersection

section representing the head and tail, from which resemblance the denomination arises.

But note, that these points abide not always in one place, but have a motion of their own in the zodiac, and retrograde-wise 3 minutes 11 seconds *per* day; completing their circle in 18 years 225 days: so that the moon can be but twice in the ecliptic during her monthly period, but at all other times she will have a latitude or declination from the ecliptic.

It is about these points of intersection that all eclipses happen. They are usually denoted by these characters ☊ dragon's head, and ☋ dragon's tail.

DRAGON, in zoology. See DRACO.

DRAGON's Blood, a gummi-resinous substance brought from the East Indies, either in oval drops wrapped up in flag leaves, or in large masses composed of smaller tears. It is said to be obtained from the palmijuncus draco, the calamus rotang, the dracena draco, the pterocarpus draco, and several other vegetables.

The writers on the materia medica in general give the preference to the former, though the others are not unfrequently of equal goodness. The fine dragon's blood of either sort breaks smooth, free from any visible impurities, of a dark red colour, which changes upon being powdered into an elegant bright crimson. Several artificial compositions, coloured with the true dragon's blood, or Brazil wood, are sometimes sold in the room of this commodity. Some of these dissolve like gums in water; others crackle in the fire without proving inflammable; whilst the genuine sanguis draconis readily melts and catches flame, and is not acted on by watery liquors. It totally dissolves in pure spirit, and tinges a large quantity of the menstruum of a deep red colour. It is likewise soluble in expressed oils, and gives them a red hue, less beautiful than that communicated by anchusa. This drug in substance has no sensible smell or taste; when dissolved, it discovers some degree of warmth and pungency. It is usually, but without foundation, looked upon as a gentle astringent; and sometimes directed as such in extemporaneous prescription against seminal gleets, the fluor albus, and other fluxes. In these cases, it is supposed to produce the general effects of resinous bodies, lightly incrassating the fluids, and somewhat strengthening the solids. But in the present practice it is very little used either externally or internally.

A solution of dragons's blood in spirit of wine is used for staining marble, to which it gives a red tinge, which penetrates more or less deeply according to the heat of the marble during the time of application. But as it spreads at the same time that it sinks deep, for fine designs the marble should be cold. Mr du Fay says, that by adding pitch to this solution the colour may be rendered deeper.

DRAGON-Fish, or *Dragonet*, in ichthyology. See COLLIONYMUS.

DRAGON-Fly. See LIBELLULA.

DRAGON-Shell, in natural history, a name given by people curious in shells to a species of concamerated patella or limpet. This has a top very much bent; and is of an ash colour on the outside, but of an elegant and bright flesh-colour within. This has been found sticking on the back of a tortoise, as the common limpets do on the sides of rocks; and some have been found affixed to large shells of the pinna marina brought from the East Indies at different times.

DRAGONS, in botany. See DRACONTIUM.

DRAGONET, or *DRAGON-fish*, in ichthyology. See CALLIONYMUS.

DRAGONNEE, in heraldry. A lion dragonnee is where the upper half resembles a lion, the other half going off like the hinder part of a dragon. The same may be said of any other beast as well as a lion.

DRAGOON, in military affairs, a musqueteer mounted on horseback, who sometimes fights or marches on foot, as occasion requires.

Menage derives the word *dragoon* from the Latin *draconarius*, which in Vegetius is used to signify *soldier*. But it is more probably derived from the German *tragen* or *dragen*, which signifies *to carry*; as being infantry carried on horseback.

Dragoons are divided into brigades as the cavalry; and each regiment into troops; each troop having a captain, lieutenant, cornet, quarter-master, two serjeants, three corporals, and two drums. Some regiments have hautboys. They are very useful on any expedition that requires dispatch: for they can keep pace with the cavalry, and do the duty of infanty: they encamp generally on the wings of the army, or at the passes leading to the camp; and sometimes they are brought to cover the general's quarters: they march in the front and rear of the army.

The first regiment of dragoons raised in England was in 1681, and called the regiment of dragoons of North Britain. In battle or attacks they generally fight sword in hand after the first fire. Their arms are, a sword, firelock, and bayonet. In the French service, when the dragoons march on foot, their officers bear the pike and the serjeants the halbert, neither of which are used in the English service.

DRAGOONING, one of the methods used by Papists for converting refractory heretics, and bringing them within the pale of the true church.

The following method of dragooning the French Protestants, after the revocation of the edict of Nantes, under Louis XIV, is taken from a French piece, translated in 1686.

The troopers, soldiers, and dragoons went into the Protestants houses, where they marred and defaced their household stuff, broke their looking-glasses, and other utensils and ornaments, let their wine run about their cellars, and threw about their corn and spoiled it. And as to those things which they could not destroy in this manner, such as furniture of beds, linen, wearing apparel, plate, &c. they carried them to the market-place, and sold them to the Jesuits and other Roman catholics. By these means the Protestants in Montaubon alone were, in four or five days, stripped of above a million of money. But this was not the worst.

They turned the dining-rooms of gentlemen into stables for their horses: and treated the owners of the houses where they quartered with the highest indignity and cruelty, lashing them about from one to another, day and night, without intermission, nor suffering them to eat or drink; and when they began to sink under the fatigue and pains they had undergone, they laid them on a bed, and when they thought them some-

Dragooning. somewhat recovered, made them rise, and repeated the same tortures. When they saw the blood and sweat run down their faces and other parts of their bodies, they sluiced them with water, and putting over their heads kettle-drums, turned upside down, they made a continual din upon them till these unhappy creatures lost their senses. When one party of these tormentors were weary, they were relieved by another, who practised the same cruelties with fresh vigour.

At Negrepliffe, a town near Montaubon, they hung up Isaac Favin, a Protestant citizen of that place, by his arm-pits, and tormented him a whole night, by pinching and tearing off his flesh with pinchers. They made a great fire round a boy of about 12 years old, who, with hands and eyes lifted up to heaven, cried out, "My God, help me!" And when they found the youth resolved to die rather than renounce his religion, they snatched him from the fire just as he was on the point of being burnt.

In several places the soldiers applied red-hot irons to the hands and feet of men and breasts of women. At Nantes they hung up several women and maids by their feet, and others by their arm-pits, and thus exposed them to public view stark naked. They bound to posts mothers that gave suck, and let their sucking infants lie languishing in their sight for several days and nights, crying, mourning, and gasping for life. Some they bound before a great fire, and being half roasted, let them go; a punishment worse than death. Amidst a thousand hideous cries and a thousand blasphemies, they hung up men and women by the hair, and some by their feet, on hooks in chimnies, and smoaked them with wisps of wet hay till they were suffocated. They tied some under the arms with ropes, and plunged them again and again into wells; they bound others like criminals, put them to the torture, and with a funnel filled them with wine till the fumes of it took away their reason, when they made them say, they consented to be catholics. They stripped them naked, and after a thousand indignities, stuck them with pins and needles from head to foot. They cut and slashed them with knives; and sometimes with red-hot pinchers took hold of them by the nose and other parts of the body, and dragged them about the rooms till they made them promise to be catholics, or till the cries of these miserable wretches, calling upon God for help, forced them to let them go. They beat them with staves, and thus bruised, and with broken bones, dragged them to church, where their forced presence was taken for an abjuration. In some places they tied fathers and husbands to their bed-posts, and before their eyes ravished their wives and daughters with impunity. They blew up men and women with bellows till they burst them. If any to escape these barbarities endeavoured to save themselves by flight, they pursued them into the fields and woods, where they shot at them like wild beasts, and prohibited them from departing the kingdom (a cruelty never practised by Nero or Dioclesian) upon pain of confiscation of effects, the galleys, the lash, and perpetual imprisonment; insomuch that the prisons of the sea-port towns were crammed with men, women, and children, who endeavoured to save themselves by flight from their dreadful persecution. With these scenes of desolation and horror, the popish clergy feasted their eyes, and made them only a matter of laughter and sport.

Though my heart aches (says the writer of the piece from which we are transcribing) whilst I am relating these barbarities, yet for a perpetual memorial of the infernal cruelty practised by these monsters, I beg the reader's patience to lay before him two other instances, which, if he hath a heart like mine, he will not be able to read without watering these sheets with his tears.

"The first is of a young woman, who being brought before the council, upon refusing to abjure her religion, was ordered to prison. There they shaved her head, singed off the hair from other parts of her body; and having stripped her stark naked, led her through the streets of the city, where many a blow was given her, and stones flung at her: then they set her up to the neck in a tub full of water, where, after she had been for a while, they took her out, and put on her a shift dipped in wine, which, as it dried and stuck to her sore and bruised body, they snatched off again, and then had another ready dipped in wine to clap on her. This they repeated six times, thereby making her body exceeding raw and sore. When all these cruelties could not shake her constancy, they fastened her by her feet in a kind of gibbet, and let her hang in that posture, with her head downward, till she expired.

"The other is of a man in whose house were quartered some of these missionary dragoons. One day, having drank plentifully of his wine, and broken their glasses at every health, they filled the floor with the fragments, and by often walking over them reduced them to very small pieces. This done, in the insolence of their mirth, they resolved on a dance, and told their Protestant host that he must be one of their company; but as he would not be of their religion, he must dance quite barefoot; and thus barefoot they drove him about the room, treading on the sharp points of the broken glasses. When he was no longer able to stand, they laid him on a bed, and, in a short time, stripped him stark naked, and rolled him from one end of the room to the other, till every part of his body was full of the fragments of glass. After this they dragged him to his bed. and having sent for a surgeon, obliged him to cut out the pieces of glass with his instruments, thereby putting him to the most exquisite and horrible pains that can possibly be conceived.

"These, fellow Protestants, were the methods used by the most Christian king's apostolic dragoons to convert his heretical subjects to the Roman catholic faith! These, and many other of the like nature, were the torments to which Louis XIV. delivered them over to bring them to his own church! and as popery is unchangeably the same, these are the tortures prepared for you, if ever that religion should be permitted to become settled amongst you; the consideration of which made Luther say of it, what every man that knows any thing of Christianity must agree with him in, "If you had no other reason to go out of the Roman church, this alone would suffice, that you see and hear, how, contrary to the law of God, they shed innocent blood. This single circumstance shall, God willing, ever separate me from the papacy. And if I was now subject to it, and could blame nothing in any of their doctrines; yet for this crime of of cruelty, I would fly from her communion, as from a den of thieves and murderers."

DRAGS, in the sea-language, are whatever hangs over the ship in the sea, as shirts, coats, or the like; and boats, when towed, or whatever else that after this manner may hinder the ship's way when she sails, are called *drags*.

DRAINS, a name given, in the fen countries, to certain large cuts or ditches of 20, 30, nay sometimes 40 feet wide, carried through the marshy ground to some river or other place capable of discharging the water they carry out of the fen-lands.

An effectual method of drawing off the water from such grounds as are hurt by springs oozing out upon them (usually distinguished by the name of *wet* or *spouting* ground, or *bogs*), has been a desideratum in agriculture. Mr Anderson is almost the only person who has treated this matter scientifically, and his observations seem to be very rational and well founded.

Essays on Agriculture, Vol. II. p. 119, &c.

"Springs (says he) are formed in the bowels of the earth, by water percolating through the upper strata where that is of a porous texture, which continues to descend downwards till it meets with a stratum of clay that intercepts it in its course; where, being collected in considerable quantities, it is forced to seek a passage through the porous strata of sand, gravel, or rock, that may be above the clay, following the course of these strata till they approach the surface of the earth, or are interrupted by any obstacle which occasions the water to rise upwards, forming springs, bogs, and the other phenomena of this nature; which being variously diversified in different circumstances, produce that variety of appearances in this respect that we often meet with.

"This being the case, we may naturally conclude, that an abundant spring need never be expected in any country that is covered to a great depth with sand without any stratum of clay to force it upwards, as is the case in the sandy desarts of Arabia, and the immeasurable plains of Lybia: neither are we to expect abundant springs in any soil that consists of an uniform bed of clay from the surface to a great depth; for it must always be in some porous stratum that the water flows in abundance; and it can be made to flow horizontally in that, only when it is supported by a stratum of clay, or other substance that is equally impermeable by water. Hence the *rationale* of that rule so universally established in digging for wells, that if you begin with sand or gravel, &c. you need seldom hope to find water till you come to clay; and if you begin with clay, you can hope for none in abundance till you reach to sand, gravel, or rock.

"It is necessary that the farmer should attend to this process of nature with care, as his success in draining bogs, and every species of damp and spouting ground, will in a great measure depend upon his thorough knowledge of this,—his acuteness in perceiving in every case the variations that may be occasioned by particular circumstances, and his skill in varying the plan of his operations according to these. As the variety of cases that may occur in this respect is very great, it would be a very tedious task to enumerate the whole, and describe the particular method of treating each; I shall therefore content myself with enumerating a few particular cases, to show in what manner the principles above established may be applied to practice.

"Let fig. 1. represent a perpendicular section of a part of the earth, in which AB is the surface of the ground, beneath which are several strata of porous substances which allow the water to sink through them till it reaches the line CD, that is supposed to represent the upper surface of a solid bed of clay; above which lies a stratum of rock, sand, or gravel. In this case, it is plain, that when the water reaches the bed of clay, and can sink no farther, it must be there accumulated into a body; and seeking for itself a passage, it flows along the surface of the clay, among the sand or gravel, from D towards C; till at last it issues forth, at the opening A, a spring of pure water.

Plate CLXV.

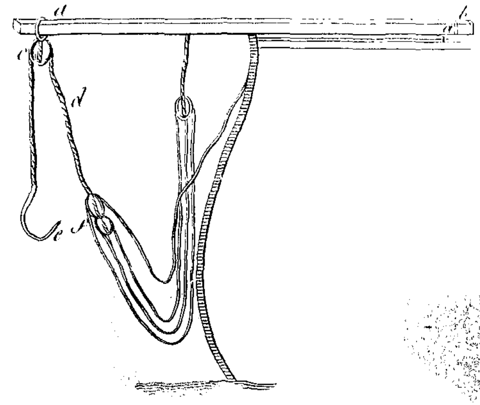
"If the quantity of water that is accumulated between D and C is not very considerable, and the stratum of clay approaches near the surface; in that case, the whole of it will issue by the opening at A, and the ground will remain dry both above and below it. But, if the quantity of water is so great as to raise it to a considerable height in the bed of sand or gravel, and if that stratum of sand is not discontinued before it reaches the surface of the ground, the water, in this case, would not only issue at A, but would likewise ooze out in small streams thro' every part of the ground between A and *a*; forming a barren patch of wet sandy or gravelly ground upon the side of a declivity, which every attentive observer must have frequently met with.

"To drain a piece of ground in this situation is perhaps the most unprofitable task that a farmer can engage in; not only because it is difficult to execute, but also because the soil that is gained is but of very little value. However, it is lucky that patches of this kind are seldom of great breadth, although they sometimes run along the side of a declivity in a horizontal direction for a great length. The only effectual method of draining this kind of ground, is to open a ditch as high up as the highest of the springs at *a*, which should be of such a depth as not only to penetrate through the whole bed of sand or gravel, but also to sink so far into the bed of clay below, as to make a canal therein sufficiently large to contain and carry off the whole of the water. Such a ditch is represented by the dotted lines *a e z*: but as the expence of making a ditch of such a depth as this would suppose, and of keeping it afterwards in repair, is very great, it is but in very few cases that this mode of draining would be advisable; and never, unless where the declivity happens to be so small, as that a great surface is lost for little depth, as would have been the case here if the surface had extended in the direction of the dotted line *a d*.

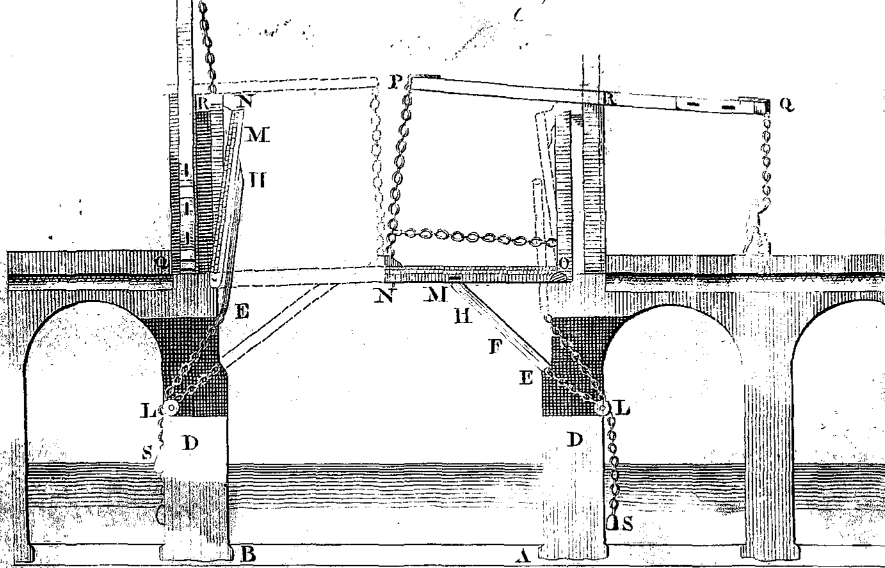
"But supposing that the stratum of clay, after approaching toward the surface at A, continued to keep at a little depth below ground: and that the soil which lay above it was of a sandy or spongy nature, so as to allow the water to penetrate it easily; even supposing the quantity of water that flowed from D to C was but very inconsiderable, instead of rising out at the spring A, it would flow forward along the surface of the clay among the porous earth that forms the soil, so as to keep it constantly drenched with water, and of consequence render it of very little value.

"Wetness

Davit



Draw Bridge



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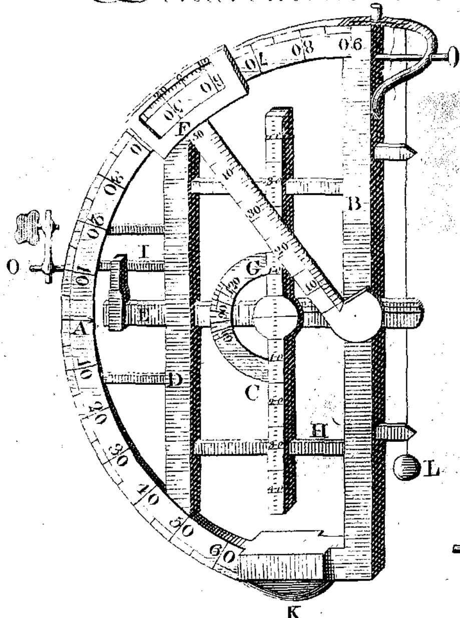

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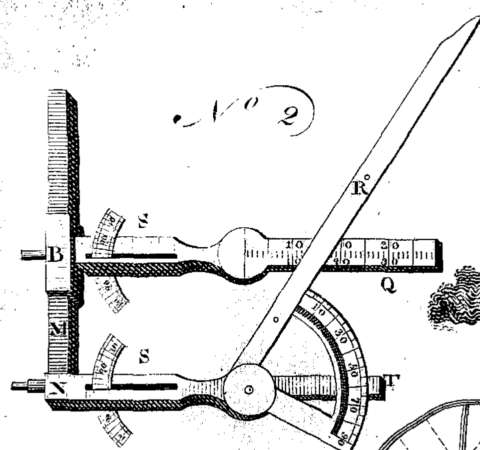
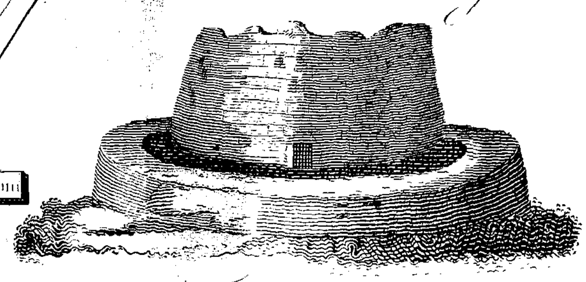


A Dun or Burgh



Drains

Fig. 4

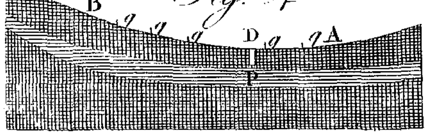


Fig. 3

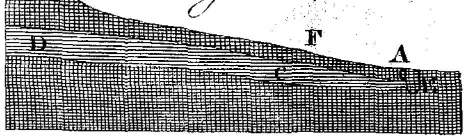


Fig. 1

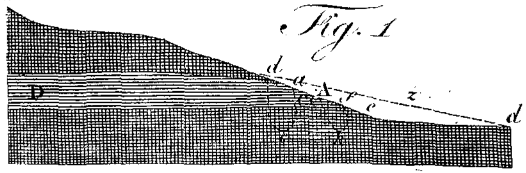
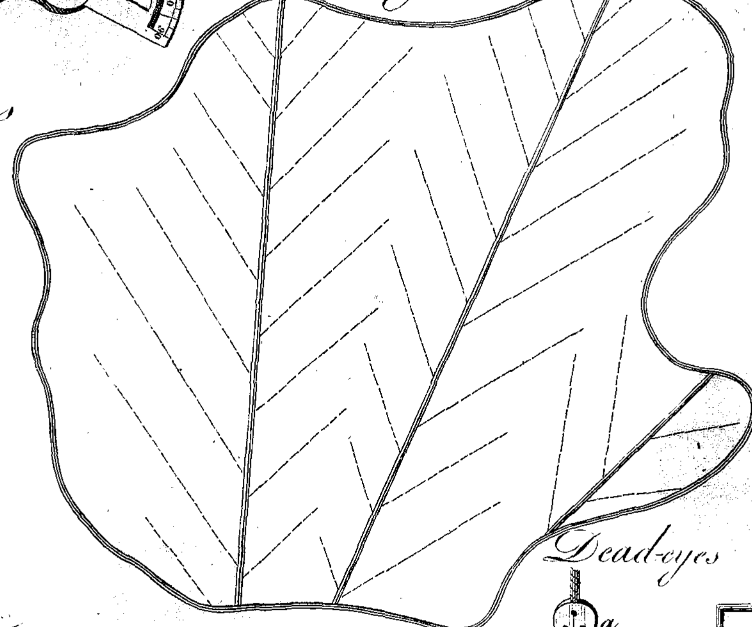
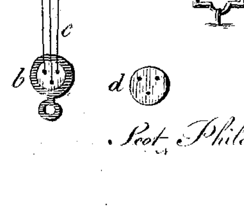


Fig. 2

Fig. 5



Dead-eyes



Scot Philada.

Drains.

"Wetneſs ariſing from this cauſe, is uſually of much greater extent than the former: and, as it admits of an eaſy cure, it ought not to be one moment delayed; as a ditch of a very moderare depth opened at A, and carried through a part of the ſtratum of clay (as repreſented by the dotted lines A *k f*), would intercept and carry off the whole of the water, and render the field as dry as could be deſired. It is, therefore, of very great conſequence to the farmer, accurately to diſtinguiſh between theſe two caſes, ſo nearly allied to each other in appearance; and, as this can be eaſieſt done by boring, every one who has much ground of this kind ought to provide himſelf with a ſet of boring-irons, which he will likewiſe find uſe for on other occaſions.

"I might here enumerate a great variety of caſes which might be reduced to the ſame head with the foregoing: but as any attentive reader may, after what has been ſaid, be able eaſily to diſtinguiſh theſe, I ſhall only in general obſerve, that every ſoil of a ſoft and porous texture, that lies upon a bed of hard clay, whatever its ſituation in other reſpects may be, will in ſome meaſure be ſubjected to this diſeaſe. And if it is upon a declivity of any conſiderable length, the undermoſt parts of the field will be much damaged by it, unleſs ditches are thrown up acroſs the declivity at proper diſtances from one another, to intercept the water in its deſcent.

"It may not likewiſe be improper here to obſerve, that in caſes of this nature, unleſs where the ſoil is of a very great depth, the malady will always be increaſed by raiſing the ridges to a conſiderable height; as will appear evident by examining fig. 2. in which the line A B repreſents the ſurface of a field of this nature, and C D the ſurface of the bed of clay. Now, if this field were raiſed into high ridges, as at F F F, ſo that the furrows E E E deſcended below the ſurface of the clay, it is plain, that all the water that ſhould ſink through the middle of the ridge, would run along the ſurface of the clay till it came to the ſides of the ridge L L L L L L, which would thus be kept continually ſoaked with water. Whereas, if the ground had been kept level, as in the part of the field from G to H, with open furrows H, at moderate diſtances from each other, the water would immediately ſink to the clay, and be carried off by the furrows, ſo as to damage the ſoil far leſs than when the ridges are high. If the ſoil is ſo thin as that the plough can always touch the clay, the ridges ought to be made narrow and quite flat, as from G to H: but if there is a little greater depth of ſoil, then it ought to be raiſed into ridges of a moderate height, as from H to B, ſo as to allow the bottom of the furrow to reach the clay: but neither is this neceſſary where the ſoil is of any conſiderable depth.

"I have ſeen ſome induſtrious farmers, who having ground in this ſituation, have been at the very great expence of making a covered drain in each furrow. But, had they rightly underſtood the nature of the diſeaſe, they never would have thought of applying ſuch a remedy; as muſt appear evident at firſt ſight to thoſe who examine the figure. The ſucceſs was what might be expected from ſuch a fooliſh undertaking.

"Theſe obſervations, it is hoped, will be ſufficient as to the manner of treating wet, ſandy, or porous ſoils, I now proceed to take notice of ſuch as are of a ſtiff clayey nature, which are often very different in appearance, and require a different treatment from theſe.

Plate CLXV.

"Suppoſe that (in fig. 3.) the ſtratum of ſand or gravel D C ſhould be diſcontinued, as at E, and that the ſtratum above it ſhould be of a coherent clayey nature. In this caſe, the water that flowed towards E, being there pent in on every ſide, and being accumulated there in great quantities, it muſt at legth force a paſſage for itſelf in ſome way; and preſſing ſtrongly upon the upper ſurface, if any one part is weaker than the reſt, it there would burſt forth and form a ſpring, (as ſuppoſe at A). But if the texture of every part of this ſtratum were equally ſtrong, the water would ſqueeze thro' many ſmall crannies, and would ooze out in numberleſs places, as between A and F, ſo as to occaſion that kind of wetneſs that is known by the name of a *ſpouting clayey ſoil*.

"The cure in this caſe, is much more eaſily effected than in any of the former; for if a ditch of a conſiderable ſize is opened, as at A, towards the lowermoſt ſide of the ſpouting ground, ſo deep as to penetrate through the upper ſtratum of clay, and reach to the gravel, the water will riſe up through it at firſt with very great violence, which will gradually decreaſe as the preſſure from the water behind is diminiſhed; and when the whole of the water accumulated in this ſubterraneous reſervoir is run off, there being no longer any preſſure upon the clay above it, the whole ſoon becomes as dry as could be deſired, and continues ſo ever afterwards, if the ditch is always kept open. This I ſpeak from experience, I having rendered ſome fields of this kind that were very wet, quite dry by this method of treating them.

"It will hardly be neceſſary for me here to put the farmer upon his guard, to be particularly careful in his obſervations, that he may diſtinguiſh between the wetneſs that is produced from this cauſe, and that which proceeds from the cauſe before mentioned; becauſe the treatment that would cure the one would be of no uſe at all to the other. The attentive obſerver likewiſe will readily perceive, that if any field that is wet from this cauſe admits of being ploughed, it will be in equal danger of being hurt by being raiſed into high ridges, with the other kind of damp ground before mentioned. For as the depth of earth above the reſervoir would be ſmaller in the deep furrows than any where elſe, there would, of conſequence, be leſs reſiſtence to the water in that place, ſo that it would ariſe there in greater abundance. And if, in this caſe, a farmer ſhould dig a drain in each furrow, as a conſiderable quantity of water would riſe into them, in ſome caſes, the ground might be improved, or even quite drained thereby, eſpecially if they ſhould have accidentally reached the gravel in any one place; although at an expence much greater than was neceſſary. I take notice of this circumſtance in ſome meaſure to prevent the prejudice that ſome inattentive obſervers might entertain againſt what was ſaid before of this method of draining, from their having accidentally ſeen ſome fields that may have been bettered by it.

"Bogs are only a variety of this laſt-mentioned kind of wet ground; and, therefore, ought in general to be drained after the ſame manner with them. Clay is a ſubſtance that ſtrongly reſiſts the entrance of water

Drains.

into it; but when it is long drenched with it, it is, in process of time, in some measure dissolved thereby; loses its original firmness of texture and consistence; and becomes a sort of semi-fluid mass, which is called a *bog*; and as these are sometimes covered with a strong scurf of a particular kind of grass, with very matted roots, which is strong enough to bear a small weight without breaking, although it yields very much, it is in these circumstances called a *swaggle*. But, whatever be the nature of the bog, it is invariably occasioned by water being forced up through a bed of clay, as just now described, and dissolving or softening, if you will, a part thereof. I say only a part; because whatever may be the depth of the bog or swaggle, it generally has a partition of solid clay between it and the reservoir of water under it, from whence it originally proceeds: for if this were not the case, and the quantity of water were considerable, it would meet with no sufficient resistance from the bog, and would issue through it with violence, and carry the whole semi-fluid mass along with it. But this would more inevitably be the case, if there was a crust at the bottom of the bog, and if that crust should ever be broken, especially if the quantity of water under it were very considerable: and as it is probable, that, in many cases of this sort, the water slowly dissolves more and more of this under-crust, I make no doubt, but that, in the revolution of many ages, a great many eruptions of this kind may have happened, although they may not have been deemed of importance enough to have the history of them transmitted to posterity. Of this kind, although formed of a different substance, I consider the flow of the Solway-moss in Northumberland to have been; which, upon the 16th of November 1771, burst its former boundaries, and poured forth a prodigious stream of semi-fluid matter, which in a short time covered several hundred acres of very fine arable ground. Nor will any one, who is acquainted with the nature of moss,—who knows its resemblance to clay in its quality of absorbing and retaining water, and its very easy diffusibility therein be surprised at this; as, from all these properties, it is much better adaped for forming an extensive bog, and therefore in greater danger of producing an extensive devastation by an eruption of the water into it, than those that are formed of any kind of clay whatever.

"If the bog, or swampy ground, is upon a declivity, the ditch ought to be carried across the field about the place where the lowest springs arise. But if the surface of the ground is level, or nearly so, as between A and B, and the springs break out in several places, *q q q q q q*, so as to form soft quagmires interspersed through the whole of the field, it will be of little consequence in what part the drain is opened; for if it is dug up so deep as to allow the water to rise in it with freedom, it will issue through that opening, and the field will be left perfectly dry.

Fig. 4.

"But as it may frequently happen that the stratum or gravel should be at a considerable depth beneath the surface of the earth, and as it may be sometimes even below the level of the place into which the drain must be emptied, it might sometimes be extremely difficult to make a ditch so deep as to reach the bed of sand or gravel. But it is lucky for us that this is not absolutely necessary in the present case; as a drain of two or three feet deep, as at D, will be equally effectual with one that should go to the gravel. All that is necessary in this case, is to sink pits (P) in the course of the drain, at a moderate distance from one another which go so deep as to reach the gravel; for as the water there meets with no resistance, it readily flows out at these openings, and is carried off by the drain without being forced up through the earth; so that the ground is left entirely dry ever after.

"I have likewise drained several fields in this way; and as I have generally found the appearances pretty much alike, I shall, for the information of the inexperienced reader, give a short account of them.

"If you attempt to make your pit in one of these soft quaggy places where the water is found in great abundance, you will meet with very great difficulty in forming it; for as the substance of which it is composed is soft, it will always flow into the hole as fast as you dig it; on which account I would advise, not to attempt to make the pit in the swaggle, but as near it in the solid earth as you conveniently can. However, if it is pretty firm, and of no great extent, it is sometimes practicable to make a pit in the soft bog at the driest time of the year. This I have sometimes practised, which gave me an opportunity of observing the nature of these bogs more perfectly than I otherwise would have had. In the trials of this kind that I have made, this soft quaggy ground has seldom been above three or four feet deep, below which I have always found a stratum of hard tough clay usually mixed with stones; and so firm, that nothing but a mattock or pick-axe could penerate it: and as this is comparatively so much drier than the ground above it, an inexperienced operator is very apt to imagine that this is the bottom that he is in search of. In digging thro' this stratum, you will frequently meet with small springs oozing out in all directions; some of them that might fill the tube of a small quill, and others so small as to be scarce perceptible: but without regarding these, you must continue to dig on without intermission till you come to the main body of the reservoir, if I may so call it, that is contained in the rock, gravel, or sand; which you will generally find from two to four feet below the bottom of the swaggle, and which you will be in no danger of mistaking when you come to it: for, if there has been no opening made before that in the field, as soon as you break the crust immediately above the gravel or rock, the water bursts forth like a torrent, and on some occasions rise like a *jet d'eau*, to a considerable height above the bottom of the ditch; and continues to flow off with great impetuosity for some time, till the pent-up water being drained off, the violent boiling up begins to subside, and the strength of the current to abate; and, in a short time, it flows gently out like any ordinary spring;—allowing it to remain in this state, the quaggy earth begins to subside and gradually becomes firmer and firmer every day; so that, in the space of a few months, those bogs which were formerly so soft as hardly to support the weight of a small dog, become so firm, that oxen and horses may tread upon them without any danger of sinking, at the very wettest season of the year. I have had a field of this nature, that by having only one such pit as I have now described opened in it, was entirely drained to the distance of above a hundred yards

Drains.

yards around it in every direction. But as it is possible that the stratum in which the water runs may be in some places interrupted, it will be in general expedient to make several of these pits, if the field is of great extent; always carrying the drain forward thro' the lowermost part of the field, or as near the quag as you conveniently can; and sinking a pit wherever you may judge it will be most necessary. But if the stratum of gravel is not interrupted, there will be no violent burst of water at opening any of these after the first, as I have frequently experienced. To keep these wells from closing up after they are made, it is always expedient to fill them up with small stones immediately after they are made, which ought to rise to the height of the bottom of the drain.

"I have often imagined that the expence of digging these pits might be saved by boring a hole through this solid stratum of clay with a large wimble made on purpose; but as I never experienced this, I cannot say whether or not it would answer the desired end exactly.

"If the whole field that is to be drained consists of one extensive bog, it will require a long time before the whole work can be entirely finished, as it will be impossible to open a drain through it till one part of it is first drained and becomes solid ground. In a situation of this kind, the undertaker, after having opened a drain to convey the water from the lowest part of the bog, must approach as near to the swampy ground as he can, and there make his first pit; which will drain off the water from the nearest parts of the bog. When this has continued open for some time, and that part of the bog is become so solid as to admit of being worked, let him continue the ditch as far forward thro' it as the situation it is in will admit of, and there sink another pit; and proceed gradually forward in the same manner; making cross cuts where necessary, till the whole be finished.

"In this manner may any bog or track of spouting ground of this nature be rendered dry at a very inconsiderable expence; and as there can be no other method of draining ground of this sort effectually, I recommend the study of it to the attention of every diligent farmer who may have occasion for it. Let him first be extremely cautious in examining all the circumstances of his particular fields, that he may be certain which of the classes above enumerated it may be ranked with; and, when he is perfectly sure of that, he may proceed without fear, being morally certain of success.

"There is, however, one kind of damp ground not yet particularly specified, that I have purposely omitted taking notice of till this time, as I have never had any opportunity of examining particularly into the nature of it, nor of ascertaining by experience what is the most proper method of treating it.—The soil I have now particularly in my eye consists of a deep strong clay that does not vary its nature even on the surface, but in as far as manures may have rendered it more friable and tender: the colour usually inclines to a reddish cast, and, for the most part, it is situated upon the side of some declivity. This bed of clay reaches to a great depth, without any variation, and is intermixed with a considerable quantity of small round stones. Many soils of the sort now described, are apt to be continually moist and full of water during the winter season; but when the dry weather of summer sets in, the moisture is diminished, and the surface becomes hard, and it is rent into many large gaps which allow free admission to the sun and air, so as to scorch up almost every plant that is sowed upon it: and as these soils are usually in themselves naturally fertile when drained, it were to be wished that some method could be discovered that would be less expensive than what is usually practised with regard to some soils of this kind in Essex; where they make covered drains of two and a half feet deep, running diagonally through the whole field, at the distance of 20 feet from each other."

Drains.

Concerning the making of these drains we have the following directions in the Georgical Essays, by T. B. Bayley, Esq; of Hope near Manchester.—" First make the main drains down the slope or fall of the field. When the land is very wet, or has not much fall, there should, in general, be two of these to a statute acre; for the shorter the narrow drains are, the less liable they will be to accidents. The width of the trench for the main drains should be 30 inches at top, but the width at the bottom must be regulated by the nature and size of the materials intended to be used. If the drain is to be made of bricks 10 inches long, 3 inches thick, and 4 inches in breadth, then the bottom of the drain must be 12 inches; but if the common sale bricks are used, then the bottom must be proportionably contracted. In both cases there must be an interstice of one inch between the bottom brick and the sides of the trench, and the vacuity must be filled up with straw, rushes, or loose mould. For the purpose of making these drains, I order my bricks to be moulded 10 inches long, 4 broad, and 3 thick; which dimensions always make the best drain.

"The method I pursue in constructing my main drains is as follows.—When the ground is soft and spongy, the bottom of the drain is laid with bricks placed across. On these, on each side, two bricks are laid flat, one upon the other, forming a drain six inches high and four broad; which is covered with bricks laid flat. When the bottom of the trench is found to be a firm and solid body, as clay or marle, the bottom of the drain does not then require being laid with bricks. In that case the sides are formed by placing one brick edgewise, instead of two laid flat.

"This latter method is much cheaper, and in such land equally durable with the other. Where stones are used instead of bricks, the bottom of the drain should be about eight inches in width. And here it will be proper to remark, that, in all cases, the bottom of the main drains must be sunk four inches below the level of the narrow ones, even at the point where the latter fall into them.

"The main drains should be kept open till the narrow ones are begun from them, after which they may be finished: but before the earth is returned upon the stones or bricks, it will be adviseable to throw in straw, rushes, or brush-wood, to increase the freedom of the drain.

"The small narrow drains should be cut at the distance of 16 or 18 feet from each other; and should fall into the main drain at very acute angles, to prevent any stoppage. At the point where they fall in, and eight or ten inches above it, they should be made

Drake. Plate. CLXV. firm with brick or stone. These drains should be 18 inches wide at top, and 16 at bottom."—Fig. 5. represents a field with drains laid out according to Mr Bayley's method. The black line represents the main drains, and the dotted lines represent the narrow drains communicating with the former from all parts of the field.

DRAKE, in ornithology, the male of the duck kind. See ANAS.

DRAKE (Sir Francis), the renowned English admiral, was the son of Edmund Drake a sailor, and born near Tavistock in Devonshire, in the year 1545. He was brough up at the expence and under the care of Sir John Hawkins, who was his kinsman; and, at the age of 18, was the purser of a ship trading to Biscay. At 20, he made a voyage to Guinea; and, at 22 had the honour to be made captain of the Judith. In that capacity he was in the harbour of St John de Ulloa, in the gulph of Mexico, where he behaved most gallantly in the glorious actions under Sir John Hawkins, and returned with him to England with great reputation, though not worth a groat. Upon this he projected a design against the Spaniards in the West Indies; which he no sooner published, than he had volunteers enough ready to accompany him. In 1570, he made his first expedition with two ships; and the next year with one only, in which he returned safe, if not with such advantages as he expected. He made another expedition in 1572, wherein he did the Spaniards some mischief, and gained considerable booties. In these expeditions he was much assisted by a nation of Indians, who then were, and have been ever since, engaged in perpetual wars with the Spaniards. The prince of these people was named *Pedro*; to whom Drake presented a fine cutlass from his side, which he saw the Indian greatly admired. Pedro, in return, gave him four large wedges of gold; which Drake threw into the common stock, saying, That he thought it but just that such as bore the charge of so uncertain a voyage on his credit, should share the utmost advantage that voyage produced. Then, embarking his men with all the wealth he had obtained, which was very considerable, he bore away for England, where he arrived in August 1573.

His success in this expedition, joined to his honourable behaviour towards his owners, gained him a high reputation; and the use he made of his riches; a still greater. For, fitting out three stout frigates at his own expence, he sailed with them to Ireland; where, under Walter earl of Essex, the father of the famous unfortunate earl, he served as a volunteer, and did many glorious actions. After the death of his noble patron, he returned into England; where Sir Christopher Hatton introduced him to her Majesty, and procured him countenance and protection at court. By this means he acquired a capacity of undertaking that grand expedition which will render his name immortal. The first thing he proposed was a voyage into the South Seas through the Straits of Magellan; which was what hitherto no Englishman had ever attempted. The project was well received at court: the queen furnished him with means; and his own fame quickly drew together a sufficient force. The fleet with which he sailed on his extraordinary undertaking, consisted only of five vessels, small when compared with modern ships, and no more than 164 able men. He sailed on the 13th of December 1577; on the 25th fell in with the coast of Barbary, and on the 29th with cape Verd. On the 13th of March he passed the equinoctial, made the coast of Brazil on the 5th of April, and entered the River de la Plata, where he lost the company of two of his ships; but meeting them again, and taking out their provisions, he turned them adrift. On the 29th of May he entered the port of St Julian's, where he continued two months for the sake of laying in provisions: on the 20th of August he entered the Straits of Magellan, and on the 25th of September passed them, having then only his own ship. On the 25th of November he came to Machao, which he had appointed for a place of rendezvous in case his ships separated; but captain Winter, his vice admiral, having repassed the Straits, was returned to England. Thence he continued his voyage along the coasts of Chili and Peru, taking all opportunities of seizing Spanish ships, and attacking them on shore, till his men were sated with plunder; and then, coasting America to the height of 48 degrees, he endeavoured to find a passage that way back into our seas, but could not. However, he landed, and called the country *New Albion*, taking possession of it in the name and for the use of queen Elizabeth: and, having careened his ship, set sail from thence, on the 29th of September 1579, for the Moluccas. He is supposed to have chosen this passage round, partly to avoid being attacked by the Spaniards at a disadvantage, and partly from the lateness of the season, whence dangerous storms and hurricanes were apprehended. On the 13th of October he fell in with certain islands inhabited by the most barbarous people he had met with in all his voyage: on the 4th of November he had sight of the Moluccas; and, coming to Ternate, was extremely well received by the king thereof, who appears, from the most authentic relations of this voyage, to have been a wise and polite prince. On the 10th of December he made Celebes: where his ship unfortunately ran upon a rock, the 9th of January following; from which, beyond all expectation, and in a manner miraculously, they got off, and continued their course. On the 16th of March he arrived at Java Major; and from thence he intended to have directed his course to Malacca; but found himself obliged to alter his purpose, and to think of returning home. On the 25th of March 1580, he put this design in execution; and on the 15th of June he doubled the Cape of Good Hope, having then on board 57 men, and but three casks of water. On the 12th of July he passed the line, reached the coast of Guinea on the 16th, and there watered. On the 11th of September he made the island of Tercera; and on the 3d of November entered the harbour of Plymouth. This voyage round the world was performed in two years and about ten months. Shortly after his arrival, the queen going to Deptford, went on board his ship; where, after dinner, she conferred on him the order of knighthood, and declared her absolute approbation of all he had done. She likewise gave directions for the preservation of his ship, that it might remain a monument of his own and his country's glory. This celebrated ship, which had been contemplated many years at Deptford, at length decaying, it was broke up, and a chair, made out of the planks, was presented to the university of Oxford; upon on which the famous Abraham Cowley made the following verses:

"To this great ship, which round the world has run,
"And match'd in race the chariot of the sun;
"This Pythagorean ship (for it may claim,
"Without presumption, so deserv'd a name,
"By knoweldge once, and transformation now)
"In her new shape this sacred port allow.
"Drake and his ship could not have wish'd, from fate,
"An happier station, or more bless'd estate.
"For, lo! a seat of endless rest is given,
"To her in Oxford, and to him in heaven.

Works, Vol. II.

In the year 1585, he sailed with a fleet to the West Indies; and took the cities of St Jago, St Domingo, Carthagena, and St Augustin. In 1587, he went to Lisbon with a fleet of 30 sail; and having intelligence of a great fleet assembled in the bay of Cadiz, which was to have made part of the armada, he with great courage entered that port, and burnt there upwards of 10,000 tons of shipping: which he afterwards merrily called *burning the king of Spain's beard*. In 1588, when the armada from Spain was approaching the British coasts, Sir Francis Drake was appointed vice-admiral under Charles lord Howard of Effingham, high admiral of England, where fortune favoured him as remarkably as ever: for he made prize of a very large galleon commanded by Don Pedro de Valdez, who was reputed the projector of this invasion. This affair happened in the following manner: On the 22d of July, Sir Francis observing a great Spanish ship floating at a distance from both fleets, sent his pinnace to summon the commander to yield. Valdez replied, with much Spanish solemnity, that they were 450 strong; that he himself was Don Pedro, and stood much upon his honour; and thereupon propounded several conditions, upon which he was willing to yield. But the vice-admiral replied, That he had no leisure to parley: but if he thought fit instantly to yield, he might; if not, he should soon find that Drake was no coward. Pedro, hearing the name of Drake, immdiately yielded, and with 46 of his attendants came on board Drake's ship. This Don Pedro remained about two years Sir Francis Drake's prisoner in England; and, when he was released, paid him for his own and his captains liberties, a ransom of 3500l. Drake's soldiers were well recompensed with the plunder of this ship; for they found in it 55,000 ducats of gold, which was divided among them.

A little before this formidable Spanish armament put to sea, the ambassador of his catholic majesty had the confidence to propound to queen Elizabeth, in Latin verse, the terms upon which she might hope for peace; which, with an English translation by Dr Fuller, we will insert in this place, because Drake's expedition to the West Indies makes a part of this message. The verses are these:

Te veto ne pergas bello defendere Belgas:
Quæ Dracus eripuit nunc restituatur oportet:
Quas puter evertit jubeo te condere cellas:
Religio Papæ fac restituatur ad unguem.

"These to you are our commands,
"Send no help to th' Netherlands:
"Of the treasure took by Drake,
"Restitution you must make;
"And those abbeys build anew,
"Which your father overthrew;
"If for any peace you hope,
"In all points restore the pope."

The queen's extempore return:

Ad Græcas, bone rex, fient mandata kalendas.

"Worthy king, know, this your will
"At Latter-Lammas we'll fulfil.

In the year 1589, Sir Francis Drake commanded as admiral the fleet sent to restore Don Antonio king of Portugal, the command of the land-forces being given to Sir John Norris: but they were hardly got to sea, before the commanders differed, and so the attempt proved abortive. The war with Spain continuing, a more effectual expedition was undertaken by Sir John Hawkins and Sir Francis Drake, against their settlements in the West Indies, than had hitherto been made during the whole course of it: but the commanders here again not agreeing about the plan, this also did not turn out so successfully as was expected. All difficulties, before these two last expeditions, had given way to the skill and fortune of Sir Francis Drake; which probably was the reason why he did not bear these disappointments so well as he otherwise would have done. A strong sense of them is supposed to have thrown him into a melancholy, which occasioned a bloody flux; and of this he died on board his own ship, near the town of Nombre de Dios in the West Indies, on the 28th of January 1595-6. His death was lamented by the whole nation, and particularly by his countrymen; who had great reason to love him from the circumstances of his private life, as well as to esteem him in his public character. He was elected burgess for the town of Bossiny, alias Tintagal, in the county of Cornwall, in the 27th parliament of queen Elizabeth; and for Plymouth in Devonshire, in the 35th of the same reign. This town had very particular obligations to him: for, in the year 1587, he undertook to bring water into it, through the want of which, till then, it had been grievously distressed: and he performed it by conducting thither a stream from springs at eight miles distance, that is to say, in a straight line: for in the manner he brought it, the course of it runs upwards of 20 miles.

DRAKENBORCH (Arnold), professor of eloquence and history at Utrecht, made himself known by several works, and particularly by his Notes on Titus Livius and Silius Italicus; his fine editions of which are highly esteemed.

DRAMA, a poem containing some certain action, and representing a true picture of human life, for the delight and improvement of mankind.

The principal species of the drama are two, comedy and tragedy. Some others there are of less note, as pastoral, satire, tragi-comedy, opera, &c. See the article Poetry.

DRAMATIC, an epithet given to pieces written for the stage. See Poetry.

DRANK, among farmers, a term used to denote wild oats, which never fail to infest worn-out lands; so that, when ploughed lands run to these weeds and thistles; the farmer knows it is high time to fallow them, or else to sow them with hay-seed, and make pasture of them.

DRAPERY, in sculpture and painting, signifies the representation of the clothing of human figures, and also hangings, tapestry, curtains, and most other things that

that are not carnations or landscapes. See PAINTING, CRAYON, DRAWING, and MINIATURE.

DRASTIC, in physic, an epithet bestowed on such medicines as are of present efficacy, and potent in operation; and is commonly applied to emetics and cathartics.

DRAVE, a large navigable river, which, taking its rise in the archbishopric of Saltzburgh, in Germany, runs south-east through Stiria; and continuing its course, divides Hungary from Sclavonia, and falls into the Danube at Esseck.

DRAUGHT, in medicine. See POTION.

DRAUGHT, in trade, called also *cloff* or *clouch*, is a small allowance on weighable goods, made by the king to the importer, or by the seller to the buyer, that the weight may hold out when the goods are weighed again.

The king allows 1 ℔ draught for goods weighing no less than 1 Cwt. 2 ℔ for goods weighing between 1 and 2 Cwt. 3 ℔ for goods weighing between 2 and 3 Cwt. 4 ℔ from 3 to 10 Cwt. 7 ℔ from 10 to 18 Cwt. 9 ℔ from 18 to 30 or upwards.

DRAUGHT is also used sometimes for a bill of exchange, and commonly for an order for the payment of any sum of money due, &c. Then the person who gives the order is said to draw upon the other.

DRAUGHT, or, as it is pronounced, DRAFT, in architecture, the figure of an intended building described on paper; wherein are laid down, by scale and compass, the several divisions and partitions of the apartments, rooms, doors, passages, conveniences, &c. in their due proportion.

It is usual, and exceedingly convenient, before a building is begun to be raised, to have draughts of the ichnography, or ground-plot of each floor or story; as also of the form and fashion of each front, with the windows, doors, ornaments, &c. in an orthography, or upright. Sometimes the several fronts, &c. are taken, and represented in the same draught, to show the effect of the whole building: this is called a *scenography*, or *perspective*.

DRAUGHT, the depth of a body of water necessary to float a ship: hence a ship is said to draw so many feet of water, when she is borne up by a column of water of that particular depth. Thus, if it requires a body of water whose depth is equal to 12 feet, to float or buoy up a ship on its surface, she is said to draw 12 feet water; and that this draught may be more readily known, the feet are marked on the stem and stern post, regularly from the keel upwards.

DRAUGHT-Hooks, are large hooks of iron, fixed on the cheeks of a cannon-carriage, two on each side, one near the trunnion hole, and the other at the train, distinguished by the name of *fore* and *hind draught-hooks*. Large guns have draught-hooks near the middle transom, to which are fixed the chains that serve to keep the shafts of the limbers on a march. The fore and hind hooks are used for drawing a gun backwards or forwards, by men with strong ropes, called *draught-ropes*, fixed to these hooks.

DRAUGHT-Horse, in farming, a sort of coarse-made horse, destined for the service of a cart or plough.

DRAWBACK, in commerce, certain duties, either of the customs or of the excise, allowed upon the exportation of some home manufactures; or upon certain foreign merchandise, that have paid duty on importation.

In Britain the oaths of the merchants importing and exporting are required to obtain the drawback on foreign goods, affirming the truth of the officers certificate on the entry, and the due payment of the duties: and these may be made by the agent or husband of any corporation or company; or by the known servant of any merchant usually employed in making his entries, and paying his customs. In regard to foreign goods entered outward, if less quantity or value be fraudulently shipped out than what is expressed in the exporter's certificate, the goods therein mentioned, or their value, are forfeited, and no drawback to be allowed for the same. Foreign goods exported by certificate in order to obtain the drawback, not shipped or exported, or relanded in Great Britain, unless in case of distress to save them from perishing, are to lose the benefit of the drawback, and are forfeited, or their value, with the vessel, horses, carriages, &c. employed in the relanding thereof: and the persons employed in the relanding them, or by whose privity they are relanded, or into whose hands they shall knowingly come, are to forfeit double the amount of the drawback. Officers of the customs conniving at or assisting in any fraud relating to certificate goods, besides other penalties, are to forfeit their office, and suffer six months imprisonment without bail or mainprize; as are also masters, or persons belonging to the ships employed therein. Bonds given for the exportation of certificate-goods to Ireland must not be delivered up, nor drawback allowed for any goods, till a certificate under the hands and seals of the collector or comptroller, &c. of the customs be produced, testifying the landing.

DRAW-Bridge, a bridge made after the manner of a float, to draw up or let down, as occasions serve, before the gate of a town or castle. See BRIDGE.

A draw-bridge may be made after several different ways; but the most common are made with plyers, twice the length of the gate, and a foot in diameter. The inner square is traversed with a cross, which serves for a counterpoise; and the chains which hang from the extremities of the plyers to lift up or let down the bridge, are of iron or brass.

In navigable rivers it is sometimes necessary to make the middle arch of bridges with two moveable platforms, to be raised occasionally, in order to let the masts and rigging of ships pass through. This kind of draw-bridge is represented in Plate CLXV. where A B is the width of the middle arch; A L and B L, the two piers that support the draw-bridge N O, one of the platforms of which is raised, and the other let down, having the beam P Q for its plyer. To N O are suspended two moveable braces E H, E H; which resting on the support E, press against the bracket M, and thereby strengthen the draw-bridge. These braces are conducted to the rest by means of the weight S, pulling the chain S L F.

DRAW-Net, a kind of net for taking the larger sort of wild-fowl, which ought to be made of the best sort of pack-thread, with wide meshes; they should be about two fathoms deep and six long, verged on each side with a very strong cord, and stretched at each end on long poles. It should be spread smooth and flat upon the ground; and strewed over with grass, sedge,

 or

Draw-net. or the like, to hide it from the fowl; and the ſportſman is to place himſelf in ſome ſhelter of graſs, fern, or ſome ſuch thing.

DRAWING, in general, denotes the action of pulling out, or hauling along; thus we read of tooth-drawing, wire-drawing, &c. Drawing.

DRAWING,

THE art of repreſenting the appearances of objects upon a plain ſurface, by means of lines, ſhades, and ſhadows, formed with certain materials adapted to the purpoſe.

§ 1. *Of the proper Materials for Drawing, and the Manner of uſing them.*

THE firſt thing neceſſary for a beginner is to furniſh himſelf with proper materials, ſuch as black-lead pencils, crayons, of black, white, or red chalk, crow-quill pens, a rule and compaſſes, camels-hair pencils, and Indian ink. He muſt accuſtom himſelf to hold the pencil farther from the point than one does a pen in writing; which will give him a better command of it, and contribute to render the ſtrokes more free and bold. The uſe of the pencil is to draw the firſt ſketches or outlines of the piece, as any ſtroke or line that is amiſs may in this be more eaſily rubbed out than in any other thing; and when he has made the ſketch as correct as he can with the pencil, he may then draw carefully the beſt outline he has got, with his crow-quill pen and ink (A): after which he may diſcharge the pencil-lines, by rubbing the piece gently with the crumb of ſtale bread or India rubber. Having thus got the outline clear, his next work is to ſhade the piece properly, either by drawing fine ſtrokes with his pen where it requires to be ſhaded, or by waſhing it with his pencil and the Indian ink. As to his rule and compaſſes, they are never or very rarely to be uſed, except in meaſuring the proportions of figures after he has drawn them, to prove whether they are right or not; or in houſes, fortifications, and other pieces of architecture.

§ 2. *Of drawing Lines, Squares, Circles, and other regular and irregular Figures.*

HAVING got all theſe implements in readineſs, the firſt practice muſt be to draw ſtraight and curve lines, with eaſe and freedom, upwards and downwards, ſideways to the right or left, or in any direction whatſoever. He muſt alſo learn to draw, by command of hand, ſquares, circles, ovals, and other geometrical figures: for as the alphabet, or a knowledge of the letters, is an introduction to grammar; ſo is geometry to drawing. The practice of drawing theſe ſimple figures till he is maſter of them, will enable him to imitate, with greater eaſe and accuracy, many things both in nature and art. And here it is proper to admoniſh him, never to be in a hurry; but to make himſelf perfectly maſter of one figure before he proceeds to another: the advantage, and even neceſſity, of this, will appear as he proceeds. Two obſervations more may be added: 1. That he accuſtom himſelf to draw all his figures very large, which is the only way of acquiring a free bold manner of deſigning. 2. That he practiſe drawing till he has gained a tolerable maſtery of his pencil, before he attempts to ſhadow any figure or object of any kind whatever.

§ 3. *Of Drawing Eyes, Ears, Legs, Arms, Hands, Feet, &c.*

As to the drawing of eyes and ears, legs and arms, the learner will have very little more to do than to copy carefully the examples given in Plate CLXVI. and CLXVII. taken from Sebaſtian le Clerc's drawing book. But the actions and poſtures of the hands are ſo many and various, that no certain rules can be given for drawing them, that will univerſally hold good. Yet as the hands and feet are difficult members to draw, it is very neceſſary, and well worth while to beſtow ſome time and pains about them, carefully imitating their various poſtures and actions, ſo as not only to avoid all lameneſs and imperfection, but alſo to give them life and ſpirit. To arrive at this, great care, ſtudy, and practice, are requiſite; particularly in imitating the beſt prints or drawings that can be got of hands and feet (ſome good examples of which are given in Plate CLXVII.); for, as to the mechanical rules of drawing them by lines and meaſures, they are not only perplexed and difficult, but alſo contrary to the practice of the beſt maſters. One general rule, however, may be given (which is univerſally to be obſerved in all ſubjects), and that is, Not to finiſh perfectly at firſt any ſingle part, but to ſketch out faintly, and with light ſtrokes of the pencil, the ſhape and proportion of the whole hand, with the action and turn of it; and after conſidering carefully whether this firſt ſketch be perfect, and altering it wherever it is amiſs, you may then proceed to the bending of the joints, the knuckles, the veins, and other ſmall particulars, which when the leaner has got the whole ſhape and proportion of the hand or foot, will not only be more eaſily but alſo more perfectly deſigned.

§ 4. *Of Drawing Faces.*

THE head is uſually divided into four equal parts. (1.) From the crown of the head to the top of the forehead. (2.) From the top of the forehead to the eye-brows. (3.) From the eye-brows to the bottom of the noſe. (4.) From thence to the bottom of the chin. But this proportion is not conſtant; thoſe features in different men being often very different as to length and ſhape. In a well-proportioned face, however, they are nearly right. To direct the learner therefore in forming a perfect face, his firſt buſineſs is to draw an oval, or rather the form of an egg; in the middle

(A) The ink made uſe of for this purpoſe muſt not be common, but Indian ink; which is much ſofter than the other, and does not run: by mixing it with water, it may be made to any degree of ſtrength, and uſed in a pen like common ink.

middle of which, from the top to the bottom, draw a perpendicular line. Through the centre or middle of this line draw a diameter line, directly acroſs from one ſide to the other of your oval. On theſe two lines all the features of your face are to be placed as follows: Divide your perpendicular line into four equal parts: the firſt muſt be allotted to the hair of the head; the ſecond is from the top of the forehead to the top of the noſe between the eye-brows; the third is from thence to the bottom of the noſe; and the fourth includes the lips and chin. Your diameter line, or the breadth of the face, is always ſuppoſed to be the length of five eyes; you muſt therefore divide it into five equal parts, and place the eyes upon it ſo as to leave exactly the length of one eye betwixt them. This is to be underſtood only of a full front face, Plate CLXVI. fig. *a*; for if it turn to either ſide, then the diſtances are to be leſſened on that ſide which turns from you, leſs or more in proportion to its turning, (fig. *b b b*.) The top of the ear is to riſe parallel to the eye-brows, at the end of the diameter line; and the bottom of it muſt be equal to the bottom of the noſe. The noſtrils ought not to come out farther than the corner of the eye in any face; and the middle of the mouth muſt always be placed upon the perpendicular line.

§ 5. *Of Drawing Human Figures.*

When the learner is tolerably perfect in drawing faces, heads, hands, and feet, he may next attempt to draw the human figure at length. In order to which, let him firſt ſketch the head; then draw a perpendicular line from the bottom of the head ſeven times its length (for the length of the head is about one-eighth part of the length of the figure).

The beſt proportioned figures of the ancients are $7\frac{3}{4}$ heads in height. If, therefore, the figure ſtands upright, as fig. (*a*, Plate CLXVIII.) draw a perpendicular line from the top of the head to the heel, which muſt be divided into two equal parts. The bottom of the belly is exactly the centre. Divide the lower part into two equal parts again, the middle of which is the middle of the knee. For the upper part of the figure, the method muſt be varied. Take off with your compaſſes the length of the face (which is three parts in 4 of the length of the head); from the throat-pit to the pit of the ſtomach is one face, from thence to the navel is another, and from thence to the lower rim of the belly is a third. The line muſt be divided into ſeven equal parts. Againſt the end of the firſt diviſion, place the breaſts; the ſecond comes down to the navel; the third to the privities; the fourth to the middle of the thigh; the fifth to the lower part of the knee; the ſixth to the lower part of the calf; and the ſeventh to the bottom of the heel, the heel of the bearing leg being always exactly under the pit of the throat. But as the eſſence of all drawing conſiſts in making at firſt a good ſketch, the learner muſt in this particular be very careful and accurate; he ought to draw no one part perfect or exact till he ſee whether the whole draught be good; and when he has altered that to his mind, he may then finiſh one part after another as curiouſly as he can.

There are ſome who, having a ſtatue to copy, begin with the head, which they finiſh, and then proceed in the ſame manner to the other parts of the body, finiſhing as they go: but this method generally ſucceeds ill; for if they make the head in the leaſt too big or too little, the conſequence is a diſproportion between all the parts, occaſioned by their not having ſketched the whole proportionably at firſt. Let the learner remember, therefore, in whatever he intends to draw, firſt to ſketch its ſeveral parts, meaſuring the diſtances and proportions between each with his finger or pencil, without uſing the compaſſes; and then judge of them by the eye, which by degrees will be able to judge of truth and proportion, and will become his beſt and principal guide. And let him obſerve, as a general rule, Always to begin with the right ſide of the piece he is copying: for by that means he will always have what he has done before his eyes; and the reſt will follow more naturally, and with greater eaſe: whereas if he begin with the left ſide, his hand and arm will cover what he does firſt, and deprive him of the ſight of it; by which means he will not be able to proceed with ſo much eaſe, pleaſure, or certainty.

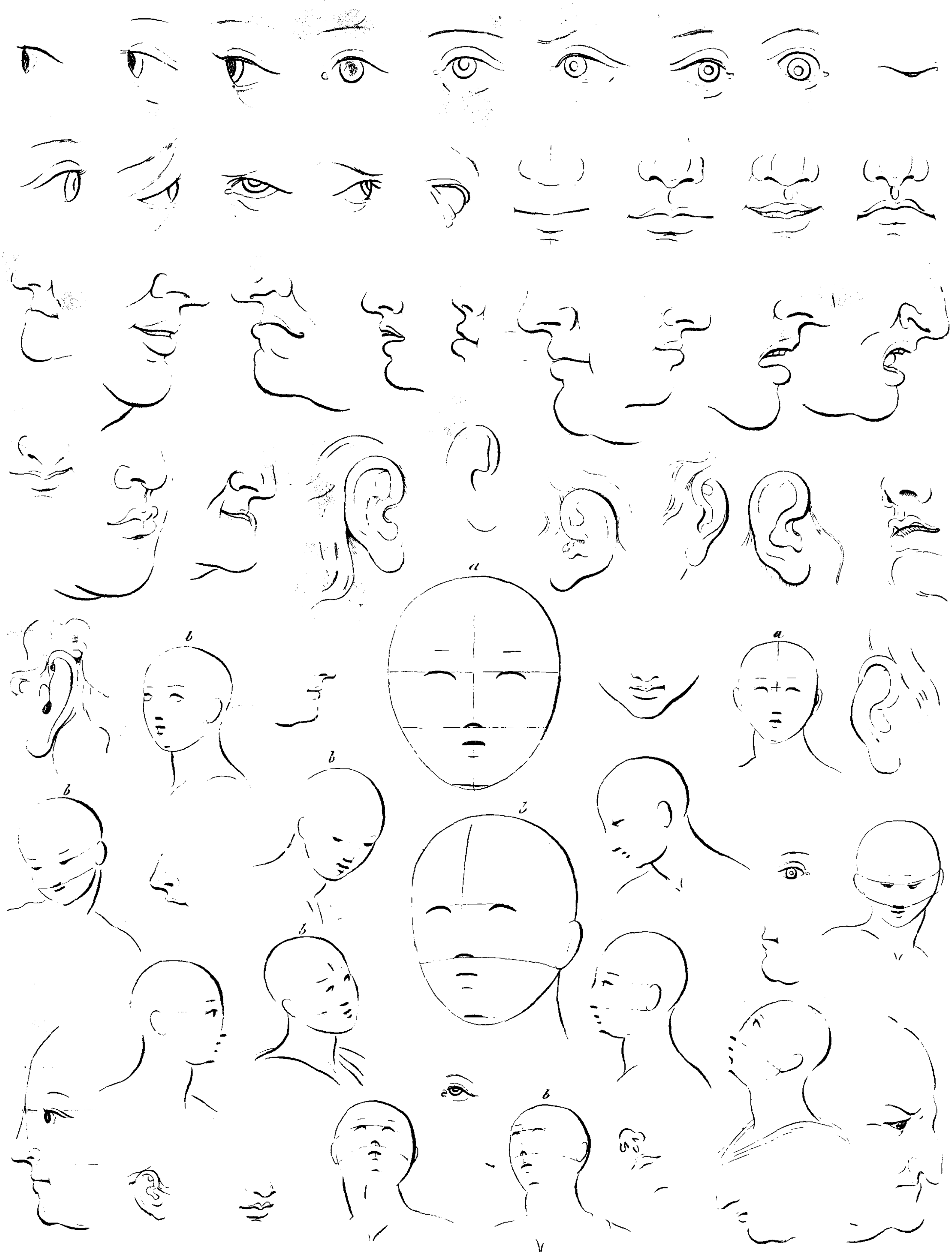
As to the order and manner of proceeding in drawing the human body, he muſt firſt ſketch the head; then the ſhoulders in the exact breadth; then draw the trunk of the body, beginning with the arm-pits (leaving the arms till afterwards), and ſo draw down to the hips on both ſides; and be ſure he obſerve the exact breadth of the waiſt. When he has done this, let him then draw that leg which the body ſtands upon, and afterwards the other which ſtands looſe; then the arms, and laſt of all the hands.

He muſt take notice alſo of the bowings and bendings that are in the body; making the part which is oppoſite to that which bends correſpond to it in bending with it. For inſtance: If one ſide of the body bend in, the other muſt ſtand out anſwerable to it; if the back bend in, the belly muſt ſtick out; if the knee bend out, the ham muſt fall in; and ſo of any other joint in the body. Finally, he muſt endeavour to form all the parts of the figure with truth, and in juſt proportion: not one arm or one leg bigger or leſs than the other; not broad Herculean ſhoulders, with a thin and ſlender waiſt; nor raw and bony arms, with thick and gouty legs: but let there be a kind of harmonious agreement amongſt the members, and a beautiful ſymmetry throughout the whole figure.

Proportions and Meaſures of the Human body. The centre or middle part, between the two extremes of the head and feet of a new born child, is in the navel, but that of an adult is in the os pubis: and the practice of dividing the meaſure of children into four, five, or ſix parts, whereof the head is one, is made uſe of by painters and ſculptors.

A child of two years old has about five heads in its whole length, but one of four or five years old has near ſix: about the fifteenth or ſixteenth years, ſeven heads are the proportion or meaſure, and the centre inclines to the upper part of the pubis. Hence it appears, as the growth of the body advances, there is a gradual approach to the proportion of an adult of near eight heads in the whole length, of which, as mentioned above, the head makes one.

Agreeable to theſe principles, the following Table is conſtructed, exhibiting the proportions of the parts of a man and a women, as they were fixed by the ancients, and meaſured by M. Audran from the Apollo



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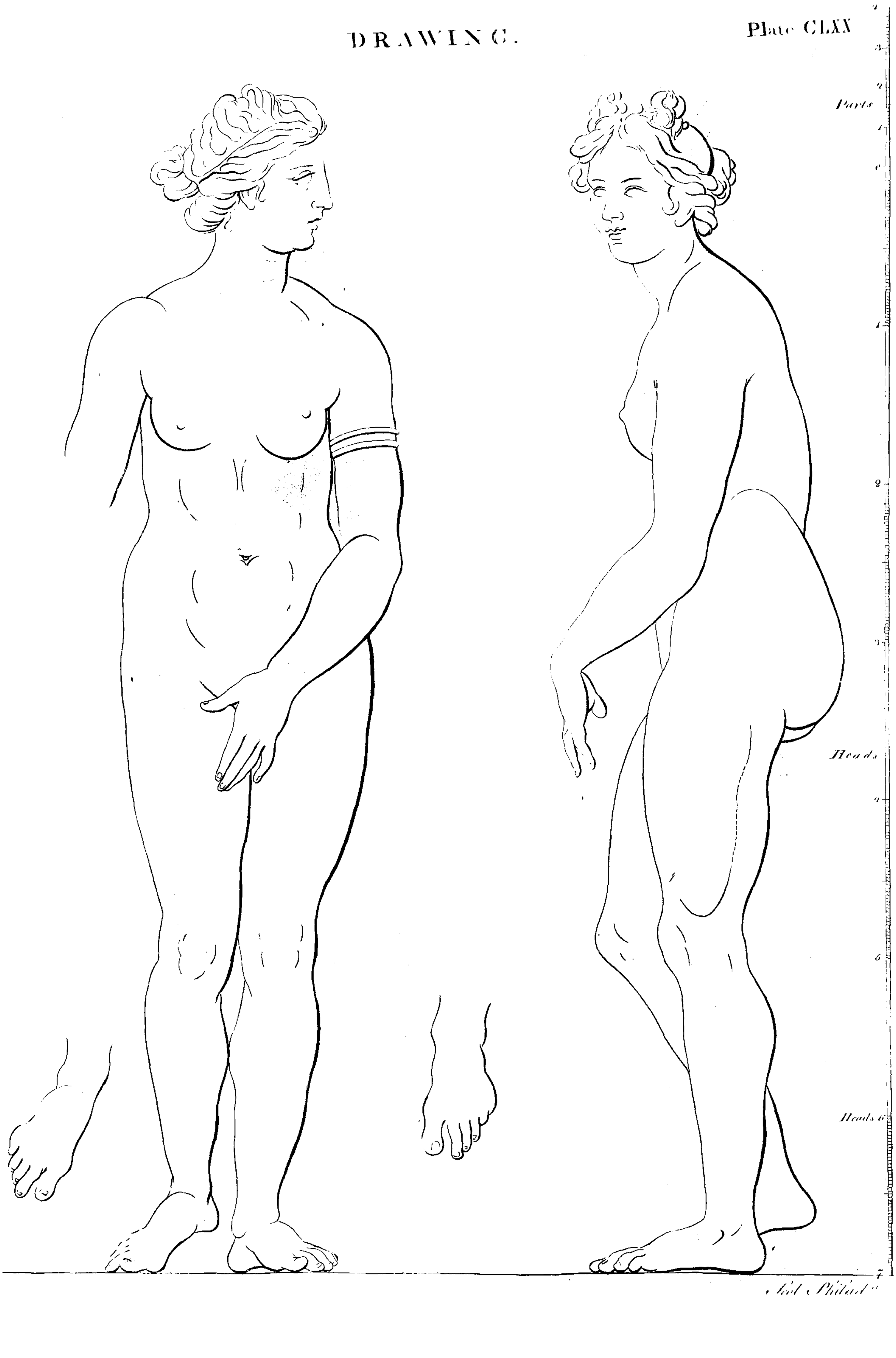

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pollo Pythius (Plate CLXIX.) in the garden of the Vatican at Rome, and the Venus Aphroditus (Plate CLXX.) belonging to the family of the Medicis. Supposing the figures to stand upright and duly poised on both legs, the whole height of the former is divided into 31½ parts, being 7 heads 3 parts and 6 minutes; and that of the latter into 31 parts, being 7 heads and 3 parts.

Length of the Head and Trunk of the Body.	*Apollo.*			*Venus.*		
	Hds.	Pts.	Min.	Hds.	Pts.	Min
From the top of the head to the bottom of the chin 4 parts or -	1	0	0	1	0	0
the bottom of the chin to the top of the sternum or breast bone -	0	1	7	0	1	8
the top of the sternum to the pit of the stomach - -	0	3	10	0	3	6
the pit of the stomach to the navel - -	0	2	10	0	2	7
the navel to the pubis - - -	0	3	6	0	3	9
Length of the head and trunk of the body -	3	3	9	3	3	6

Length of the Lower Extremities.						
From the pubis to the small of the thigh above the patella or knee-pan -	1	2	6	1	2	3
the small of the thigh to the joint or middle of the knee -	0	1	9	0	1	6
the joint of the knee to the small of the leg above the ankle -	1	1	9	1	2	0
the top to the bottom of the ankle - -	0	1	0	0	1	0
the bottom of the ankle to the bottom of the heel -	0	0	9	0	0	9
Length of the lower extremities - -	3	3	9	3	3	6
Length of the head and trunk, as above - -	3	3	9	3	3	6
Total length of the figures - - -	7	3	6	7	3	0

Length of the Fore-Arm or Upper Extremities.						
From the top of the shoulder to the elbow - -	1	2	3	1	2	5
the elbow to the hand - - -	1	1	2	1	0	6
the joint of the hand to the root of the middle finger -	0	1	8	0	1	6
the root to the tip of the middle finger - -	0	1	10	0	1	7
Length of the upper extremities - -	3	2	11	3	1	10

Breadth between the outward angles of the eyes - -	0	1	6	0	1	7
of the face at the temples - - -	0	2	2	0	2	2
of the upper part of the neck - - -	0	2	0	0	1	11
over the shoulders - - -	2	0	0	1	3	8
of the body below the arm-pits - -	1	2	5	1	1	8
between the nipples - - -	1	0	7	0	3	8
from the bottom of the chin to the horizontal line of the nipples	1	0	7	1	0	1
of the body at the small of the waist - -	1	1	0	1	0	8
over the loins or os ilium - - -	1	1	3	1	1	6
over the haunches or tops of the thigh-bones	1	1	5	1	2	3
of the thigh at the top - - -	0	3	0	0	3	1
of the thigh below the middle - -	0	2	8½	0	2	7
of the thigh above the knee - -	0	1	8	0	2	0
of the leg below the knee - -	0	1	6	0	1	10½
at the calf of the leg - - -	0	2	4	0	2	3
below the calf - - -	0	1	7	0	1	11½
above the ankle - - -	0	1	2	0	1	2
of the ankle - - -	0	1	4	0	1	3
below the ankle - - -	0	1	1½	0	1	1
middle of the foot - - -	0	1	4	0	1	3
at the roots of the toes - - -	0	1	7	0	1	7
of the arm over the biceps muscle - -	0	1	8	0	1	9
of the arm above the elbow - -	0	1	6	0	1	5
of the arm below the elbow over the long supinator -	0	1	10	0	1	7
at the wrist - - - -	0	1	1	0	1	0
of the hand over the first joint of the thumb -	0	1	9	0	1	8
of the hand over the roots of the fingers - -	0	1	7	0	1	6

	Apollo. Hds.	Pts.	Min.	*Venus.* Hds.	Pts.	Min.
Breadth over the heads of the ſcapulæ or ſhoulder blades	1	2	0	1	1	4
Length of both arms and hands, each of the Apollos being 3 h. 2 p. 11 m. and the Venus 3 h. 1 p. 5 m.	7	1	10	6	2	10
Breadth betwixt the tips of the middle fingers of each hand when the arms are ſtretched out horizontally	8	3	10	8	0	2
SIDE VIEW.						
Length from the top of the head to the ſhoulder	1	1	8	1	1	6
from the top of the ſhoulder to the loins above the hip	1	3	3	1	1	7
from the loins to the lower part of the hip	1	0	2	1	2	1
from the hip to the ſide of the knee, oppoſite to the top of the patella	1	2	0	1	0	11
from the ſide of the knee to the bottom of the heel	2	0	5	2	0	11
Length of the figures	7	3	6	7	3	0
SIDE VIEW.						
Thickneſs from the fore to the back part of the ſkull	0	3	6	0	3	4
from the wing of the noſe to the tip of the ear	0	1	8½	0	1	6
of the upper part of the neck	0	2	0	0	1	11
from the breaſt to the back over the nipples	1	0	6	1	0	6
from the belly to the ſmall of the back	0	3	6	0	3	7
from the belly above the navel to the back of the loins	0	3	9	1	0	2
from the bottom of the belly to the round of the hip	1	0	0	1	0	5
from the fore-part of the thigh to the bottom of the hip	0	3	2	0	3	7
of the thigh at the middle	0	3	3	0	3	6½
of the thigh above the knee	0	2	1	0	2	3
at the middle of the knee below the patella	0	2	1	0	2	2
of the leg below the knee	0	1	9	0	1	11
of the leg at the calf	0	1	8	0	1	9
of the leg at the ankle	0	1	5½	0	1	4
of the foot at the thickeſt part	0	2	0	0	1	3
length of the foot	1	0	6	1	0	4½
from the fore-part of the bend of the foot to the lower and back part of the heel	0	2	0	0	2	2
of the arm over the biceps	0	2	0	0	1	9
over the elbow	0	1	6	0	1	6
below the elbow	0	1	5	0	1	7
at the wriſt	0	1	1	0	0	11
below the joint of the wriſt	0	1	0	0	0	10
of the hand at the roots of the fingers	0	0	5½	0	0	5
at the roots of the nails	0	0	3½	0	0	3

The other moſt admired antique ſtatues differ a little from theſe proportions, the Laocoon meaſuring 7 h. 2 p. 3 m. the Hercules 7 h. 3 p. 7 m. the Pyramus 7 h. 2 p. the Antinous 7 h. 2 p. the Grecian ſhepherdeſs 7 h. 3 p. 6 m. and the Mirmillo 8 h. But all their other proportions are allowed to be harmonious and agreeable to the characters of the figures they repreſent.

The moſt remarkable differences of the ſymmetry or proportions of a man and of a woman to be obſerved from the Table are: Firſt, the ſhoulders of a man are broader, meaſuring two heads; and the haunches narrower, meaſuring 1 h. 1 p. 5 m. whereas the ſhoulders of a woman meaſure only 1 h. 3 p. 8 m. and the haunches meaſure 1 h. 2 p. 3 m. The ſternum or breaſt bone of a man is longer, meaſuring 3 p. 8 m. and the ſternum of the woman only 3 p. 3 m. On the contrary, the pelvis of a man is leſs, meaſuring from the top to the bottom only 4 p. whereas the pelvis of a woman meaſures from the top to the bottom 4 p. 3 m.

It is a leading principle, in which every perſon converſant in deſigning has agreed, that without a perfect knowledge of the proportions, nothing can be produced but monſtrous and extravagant figures; and it is alſo univerſally admitted, that the ancient Greek and Roman ſculptors attained the higheſt ſucceſs in producing the moſt perfect models.

The greateſt of the modern artiſts who have examined their figures with attention, admit, that ſeveral of the ancient ſculptors in ſome degree have excelled nature, they never having found any man ſo perfect in all his parts as ſome of their figures are. Their opportunities indeed were great; Greece abounded with beauties; and Rome being miſtreſs of the world, every thing that was curious and beautiful was brought to it from all parts. Their motives were alſo powerful; religion, glory, and intereſt. They conſidered it as a kind

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Scot Philad.

kind of religious worſhip to give the figures of their gods ſo much nobleneſs and beauty as to be able to attract the love and veneration of the people. Their own glory was alſo concerned, particular honours bebeing beſtowed on thoſe who ſucceeded ; and for their fortune they had no further care to take when they once arrived at a certain degree of merit.

Attitudes and Action of the Muſcles. If a ſtrong perſon is to be repreſented in a vigorous action, ſuch as Hercules, &c. after a ſuitable proportion to ſuch a figure and the action is deſigned, the parts or limbs employed in the chiefeſt force of the action ought to be conſidered. If the figure is ſtanding, the foot muſt be placed in a right line, or perpendicular to the trunk or bulk of the body, where the centre of gravity may be placed *in æquilibrio*. This centre is determined by the heel ; or, if the figure is upon tiptoe, then the ball of the great toe is in the centre. The muſcles of the leg which ſupports the body ought to be ſwelled, and their tendons drawn more to an extenſion than thoſe of the other leg, which is only placed ſo as to receive the weight of the body towards that way to which the action inclines it. For example, ſuppoſe Hercules with a club ſtriking at any thing before him towards the left ſide : Then let his right leg be placed ſo as to receive the whole weight of the body, and the left looſely touching the ground with its toes. Here the external muſcles of the right leg ought to be expreſſed very ſtrong ; but thoſe of the left ſcarcely appearing more than if it were in ſome ſedentary poſture, except in the preſent caſe. The foot being extended, the muſcles which compoſe the calf of the leg are in action and appear very ſtrong ; though it is not meant that *all* the muſcles of the right leg, which ſupport the weight of the body, ought to be expreſſed very ſtrong or equally ſwelled, but thoſe moſt tumified which are chiefly concerned in the action or poſture that the leg is then in. For example, if the leg or tibia is extended, then the extending muſcles placed on the thigh are moſt ſwelled : if it is bended, then the bending muſcles and their tendons appear moſt. The like may be obſerved of the whole body in general when it is put into vigorous action. The Laocoon in the Vatican garden at Rome furniſhes an example of this muſcular appearance through the whole ; but in the Antinous, Apollo, and other figures of the ancients, in the Vatican and other places, in poſtures where no conſiderable actions are deſigned, we ſee their muſcles expreſſed but faintly, or ſcarcely appearing.

The clavicles or collar bones, and muſcles in general, do not appear in women as in men ; nor will any action in which a woman uſes her utmoſt ſtrength occaſion ſuch ſwellings or riſings of the muſcles to appear as they do in men, ſince the great quantity of fat placed under the ſkin of women ſo clothes their muſcles, &c. as to prevent any ſuch appearances.

Effects of the Exertion of the Muſcles. The following are the moſt obvious effects of the exertion of ſeveral of the muſcles ; of thoſe, to wit, which chiefly demand the attention of an artiſt.

If either of the maſtoid muſcles (Plate CLXXI. 1. 1.) act, the head is turned to the contrary ſide, and the muſcle which performs that action appears very plain under the ſkin.

if the arms are lifted up, the deltoid muſcles placed on the ſhoulders, which perform that action, ſwell, and make the extremities of the ſpines of the ſhoulder-blades (Plate CLXXII. 3. 3.), called the tops of the ſhoulders, appear indented or hollow.

The ſhoulder-blades following the elevation of the arms, their baſes (Plate CLXXII. 4. 4.) incline at that time obliquely downward.

If the arms are drawn down, put forwards, or pulled backwards, the ſhoulder-blades neceſſarily vary their poſitions accordingly. All theſe particulars are to be learned by conſulting the life only ; when being well acquainted with what then appears in every action, the artiſt will be able to form an adequate idea how it ought to be expreſſed. Theſe circumſtances are little known ; hence ſeldom attended to in deſigning.

When the cubit or fore-arm is bended, the biceps (Plate CLXXI. 5. 5.) has its belly very much raiſed, as appears in the left arm. The like may be obſerved of the triceps (Plate CLXXII. 6. 6.) when the arm is extended, as obſerved in the right arm.

The ſtraight muſcles of the abdomen (Plate CLXXI. 7. 7.) appear very ſtrong when riſing from a decumbent poſture.

Thoſe parts of the great ſerratus muſcle (ib. 8. 8.) which are received in the teeth or beginnings of the oblique deſcending muſcle immediately below, are very much ſwelled when the ſhoulder on the ſame ſide is brought forwards ; that ſerratus muſcle then being in action in drawing the ſcapula forwards.

The long extending muſcles of the trunk (Plate CLXXII. 9. 9.) act alternately in walking, after this manner : If the right leg bears the weight of the body, and the left is in tranſlation as on tiptoe, the laſt mentioned muſcles of the back on the left ſide may be obſerved to be tumified on the other ſide about the region of the loins, and ſo on the other ſide.

The trochanters, or outward and uppermoſt heads of the thigh-bones (Plate CLXXII. 10. 10.), vary in their poſitions in ſuch a manner as no preciſe obſervations can explain their ſeveral appearances ; but the ſtudy after the life ought to be carefully attended to.

If the thigh is extended, as when the whole weight of the body reſts on that ſide, the gluteus or buttock muſcle (Plate CLXXII. 11. 11.) makes a very different appearance from what offers at another time ; but if the thigh is drawn backwards, that muſcle appears ſtill more and more tumified.

When the whole leg is drawn upwards forwards, and at the ſame time the foot is inclined inwards, the upper part of the ſartorius muſcle (Plate CLXXI. 12. 12.) appears riſing very ſtrong ; in other poſitions of the thigh, that muſcle makes a furrowing appearance in its whole progreſs.

If a man is upon tiptoe the extending muſcles of the leg placed on the fore-part of the thigh (Plate CLXXI. 13. 13. 13.), and thoſe of the foot that compoſe the calf of the leg (Plate CLXXII. 14. 14.), appear very ſtrong, and the long peronæus (Plate CLXXI. 15.) makes a conſiderable indentation or furrowing at that time in its progreſs on the outſide of the leg.

Many other remarks might here be offered ; but a due attention to nature will ſoon diſcover them.

§ *Of Light and Shade.*

After the learner has made himſelf in ſome meaſure perfect in drawing outlines, his next endeavour muſt be to ſhade them properly. It is this which gives an appearance of ſubſtance, ſhape, diſtance, and diſtinction, to whatever bodies he endeavours to repreſent, whether animate or inanimate. The beſt rule for doing this is, to conſider from what point, and in what direction, the light falls upon the objects which he is delineating, and to let all his lights and ſhades be placed according to that direction throughout the whole work. That part of the object muſt be lighteſt which hath the light moſt directly oppoſite to it; if the light falls ſideways on the picture, he muſt make that ſide which is oppoſite to it lighteſt, and that ſide which is fartheſt from it darkeſt. If he is drawing the figure of a man, and the light be placed above the head, then the top of the head muſt be made lighteſt, the ſhoulders next lighteſt, and the lower parts darker by degrees. That part of the object, whether in naked figures, or drapery, or buildings that ſtands fartheſt out, muſt be made the lighteſt, becauſe it comes neareſt to the light; and the light loſeth ſo much of its brightneſs, by how much any part of the body bends inward, becauſe thoſe parts that ſtick out hinder the luſtre and full brightneſs of the light from ſtriking on thoſe parts that fall in. Titian uſed to ſay, that he knew no better rule for the diſtribution of lights and ſhadows than his obſervations drawn from a bunch of grapes. Sattins and ſilks, and all other ſhining ſtuffs, have certain glancing reflections, exceeding bright where the light falls ſtrongeſt. The like is ſeen in armour, braſs pots, or any other glittering metal, where you ſee a ſudden brightneſs in the middle or centre of the light, which diſcovers the ſhining nature of ſuch things. Obſerve alſo, that a ſtrong light requires a ſtrong ſhade, a fainter light a fainter ſhade; and that an equal balance be preſerved throughout the piece between the lights and ſhades. Thoſe parts which muſt appear round require but one ſtroke in ſhading, and that ſometimes but very faint; ſuch parts as ſhould appear ſteep or hollow, require two ſtrokes acroſs each other, or ſometimes three, which is ſufficient for the deepeſt ſhade. Care muſt be alſo taken to make the outlines faint and ſmall in ſuch parts as receive the light; but where the ſhades fall, the outline muſt be ſtrong and bold. The learner muſt begin his ſhading from the top, and proceed downward, and uſe his utmoſt endeavours both by practice and obſervation to learn how to vary the ſhadings properly; for in this conſiſts a great deal of the beauty and elegance of drawing. Another thing to be obſerved is, that as the human ſight is weakened by diſtances, ſo objects muſt ſeem more or leſs confuſed or clear according to the places they hold in the piece: Thoſe that are very diſtant,—weak, faint, and confuſed; thoſe that are near and on the foremoſt ground,—clear, ſtrong, and accurately finiſhed.

§ 7. *Of Drapery.*

In the art of clothing the figures, or caſting the drapery properly and elegantly upon them, many things are to be obſerved. 1. The eye muſt never be in doubt of its object; but the ſhape and proportion of the part or limb, which the drapery is ſuppoſed to cover, muſt appear; at leaſt ſo far as art and probability will permit: and this is ſo material a conſideration, that many artiſts draw firſt the naked figure, and afterwards put the draperies upon it. 2. The drapery muſt not ſit too cloſe to the parts of the body: but let it ſeem to flow round, and as it were to embrace them; yet ſo as that the figure may be eaſy, and have a free motion. 3. The draperies which cover thoſe parts that are expoſed to great light muſt not be ſo deeply ſhaded as to ſeem to pierce them; nor ſhould thoſe members be croſſed by folds that are too ſtrong, leſt by the too great darkneſs of their ſhades the members look as if they were broken. 4. The great folds muſt be drawn firſt, and then ſtroked into leſſer ones: and great care muſt be taken that they do not croſs one another improperly. 5. Folds in general ſhould be large, and as few as poſſible. However, they muſt be greater or leſs according to the quantity and quality of the ſtuffs of which the drapery is ſuppoſed to be made. The quality of the perſons is alſo to be conſidered in the drapery. If they are magiſtrates, their draperies ought to be large and ample; if country clowns or ſlaves, they ought to be coarſe and ſhort; if ladies or nymphs, light and ſoft. 6. Suit the garments to the body, and make them bend with it, according as it ſtands in or out, ſtraight or crooked, or as it bends one way or another; and the cloſer the garment ſits to the body, the narrower and ſmaller muſt be the folds. 7. Folds well imagined give much ſpirit to any kind of action; becauſe their motion implies a motion in the acting member, which ſeems to draw them forcibly, and makes them more or leſs ſtirring as the action is more or leſs violent. 8. An artful complication of folds in a circular manner greatly helps the effect of fore-ſhortenings. 9. All folds conſiſt of two ſhades, and no more; which you may turn with the garment at pleaſure, ſhadowing the inner ſide deeper, and the outer more faintly. 10. The ſhades in ſilk and fine linen are very thick and ſmall, requiring little folds and a light ſhadow. 11. Obſerve the motion of the air or wind, in order to draw the looſe apparel all flying one way: and draw that part of the garment that adheres cloſeſt to the body before you draw the looſer part that flies off from it; leſt by drawing the looſe part of the garment firſt, you ſhould miſtake the poſition of the figure, and place it awry. 12. Rich ornaments, when judiciouſly and ſparingly uſed, may ſometimes contribute to the beauty of draperies. But ſuch ornaments are far below the dignity of angels or heavenly figures; the grandeur of whoſe draperies ought rather to conſiſt in the boldneſs and nobleneſs of the folds, than in the quality of the ſtuff or the glitter of ornaments. 13. Light and flying draperies are proper only to figures in great motion, or in the wind: but when in a calm place, and free from violent action, their draperies ſhould be large and flowing; that, by their contraſt, and the fall of the folds, they may appear with grace and dignity. Thus much for drapery; an example or two of which are given in Plate CLXVIII. But ſee farther the articles Crayon and Painting.

§ 8. *On the Paſſions.*

The paſſions, ſays M. Le Brun, are motions, of the ſoul, either upon her purſuing what ſhe judges to be for her good, or ſhunning what ſhe thinks hurtful to her;

her; and commonly, whatever causes emotion of passion in the soul, creates also some action in the body. It is therefore necessary for a painter to know which are the different actions in the body that express the several passions of the soul, and how to delineate them.

M. Le Brun has been extremely happy in expressing many of the passions, and the learner cannot study any thing better than the examples which he has left us of them. However, as M. De Piles justly observes, it is absurd as well as impossible to pretend to give such particular demonstrations of them as to fix their expression to certain strokes, which the painter should be obliged to make use of as essential and invariable rules. This, says he, would be depriving the art of that excellent variety of expression which has no other principle than diversity of imagination, the number of which is infinite. The same passion may be finely expressed several ways, each yielding more or less pleasure in proportion to the painter's understanding and the spectator's discernment.

Though every part of the face contributes towards expressing the sentiments of the heart, yet the eye-brow, according to M. Le Brun, is the principal seat of expression, and where the passions best make themselves known. It is certain, says he, that the pupil of the eye, by its fire and motion, very well shows the agitation of the soul, but then it does not express the kind or nature of such an agitation; whereas the motion of the eye-brow differs according as the passions change their nature. To express a simple passion, the motion is simple; to express a mixed passion, the motion is compound: if the passion be gentle, the motion is gentle; and if it be violent, the motion is so too. We may observe farther, says he, that there are two kinds of elevation in the eye-brows. One, in which the eye-brows rise up in the middle; this elevation expresses agreeable sensations, and it is to be observed that then the mouth rises at the corners: Another, in which the eye-brows rise up at the ends, and fall in the middle; this motion denotes bodily pain, and then the mouth falls at the corners. In laughter, all the parts agree; for the eye-brows, which fall toward the middle of the forehead, make the nose, the mouth, and the eyes, follow the same motion. In weeping, the motions are compound and contrary; for the eye-brows fall toward the nose and over the eyes, and the mouth rises that way. It is to be observed also, that the mouth is the part of the face which more particularly expresses the emotions of the heart: for when the heart complains, the mouth falls at the corners; and when it is at ease, the corners of the mouth are elevated; and when it has an aversion, the mouth shoots forward, and rises in the middle.

"The head (says M. De Piles) contributes more to "the expression of the passions than all the other parts "of the body put together. Those separately can only "show some few passions, but the head expresses them "all. Some, however, are more peculiarly expressed "by it than others: as humility, by hanging it down; "arrogance, by lifting it up, languishment, by inclin-"ing it on one side; and obstinacy, when with a stiff "and resolute air it stands upright, fixed, and stiff "between the two shoulders. The head also best "shows our supplications, threats, mildness, pride, "love, hatred, joy, and grief. The whole face, and "every feature, contributes something: especially the "eyes; which, as Cicero says, are the windows of the "soul. The passions they more particularly discover "are, pleasure, languishing, scorn, severity, mildness, "admiration, and anger; to which one might add joy "and grief, if they did not proceed more particularly "from the eye-brows and mouth; but when those two "passions fall in also with the language of the eyes, "the harmony will be wonderful. But though the "passions of the soul are most visible in the lines and "features of the face, they often require the assistance "also of the other parts of the body. Without the "hands, for instance, all action is weak and imperfect; "their motions, which are almost infinite, create num-"berless expressions; it is by them that we *desire*, *hope*, "*promise*, *call*, *send back*; they are the instruments of "*threatening*, *prayer*, *horror*, and *praise*; by them we "*approve*, *condemn*, *refuse*, *admit*, *fear*, *ask*; express "our *joy* and *grief*, our *doubts*, *regrets*, *pain*, and *ad-"miration*. In a word, it may be said, as they are "the language of the dumb, that they contribute "not a little to speak a language common to all na-"tions, which is the language of painting. But to "say how these parts must be disposed for expressing "the various passions, is impossible, nor can any exact "rules be given for it, both because the task would "be infinite, and because every one must be guided "in this by his own genius and the particular turn of "his own studies." See the article Passions, and the Plate there referred to.

§ 9. *Of drawing Flowers, Fruits, Birds, Beasts,* &c.

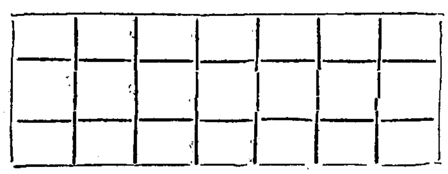
The learner may proceed now to make some attempts at drawing flowers, fruits, birds, beasts, and the like; not only as it will be a more pleasing employment, but as it is an easier task, than the drawing of hands and feet, and other parts of the human body, which require not only more care, but greater exactness and nicer judgment. Very few rules or instructions are requisite upon this head; the best thing the learner can do is, to furnish himself with good prints or drawings by way of examples, and with great care and exactness to copy them. If it is the figure of a beast, begin with the forehead, and draw the nose, the upper and under jaw, and stop at the throat. Then go to the top of the head, and form the ears, neck, back, and continue the line till you have given the full shape of the buttock. Then form the breast, and mark out the legs and feet, and all the smaller parts. And, last of all, finish it with the proper shadows. It is not amiss, by way of ornament, to give a small sketch of landskip; and let it be suitable and natural to the place or country of the beast you draw. Much the same may be said with regard to birds. Of these, as well as beasts and other objects, the learner will find many examples among the plates given in this work.

§ 10. *Of drawing Landscapes, Buildings,* &c.

Of all the parts of drawing, this is the most useful and necessary, as it is what every man may have occasion for at one time or another. To be able on the spot, to take the sketch of a fine building, or a beautiful prospect; of any curious productions of art, or un-

uncommon appearance in nature; is not only a very desirable accomplishment, but a very agreeable amusement. Rocks, mountains, fields, woods, rivers, cataracts, cities, towns, castles, houses, fortifications, ruins, or whatsoever else may present itself to view on our journeys or travels in our own or foreign countries, may be thus brought home, and preserved for our future use either in business or conversation. On this part, therefore, more than ordinary pains should be bestowed.

All drawing consists in nicely measuring the distances of each part of the piece by the eye. In order to facilitate this, let the learner imagine in his own mind, that the piece he copies is divided into squares. For example: Suppose or imagine a perpendicular and a horizontal line crossing each other in the centre of the picture you are drawing from; then suppose also two such lines crossing your own copy. Observe in the original, what parts of the design those lines intersect, and let them fall on the same parts of the supposed lines in the copy: We say, the supposed lines; because though engravers, and others who copy with great exactness, divide both the copy and original into many squares, as below: yet this is a method not to be re-



commended, as it will be apt to deceive the learner, who will fancy himself a tolerable proficient, till he comes to draw after nature, where these helps are not to be had, when he will find himself miserably defective and utterly at a loss.

If he is to draw a landscape from nature, let him take his station on a rising ground, where he will have a large horizon; and mark his tablet into three divisions, downwards from the top to the bottom; and divide in his own mind the landscape he is to take, into three divisions also. Then let him turn his face directly opposite to the midst of the horizon, keeping his body fixed, and draw what is directly before his eyes upon the middle division of the tablet; then turn his head, but not his body, to the left hand, and delineate what he views there, joining it properly to what he had done before; and, lastly, do the same by what is to be seen upon his right hand, laying down every thing exactly both with respect to distance and proportion. One example is given on plate CLXVIII.

The best artists of late, in drawing their landscapes, make them shoot away one part lower than another. Those who make their landscapes mount up higher and higher, as if they stood at the bottom of a hill to take the prospect, commit a great error: the best way is to get upon a rising ground, make the nearest objects in the piece the highest, and those that are farther off to shoot away lower and lower till they come almost level with the line of the horizon, lessening every thing proportionably to its distance, and observing also to make the objects fainter and less distinct the farther they are removed from the eye. He must make all his lights and shades fall one way, and let every thing have its proper motion: as trees shaken by the wind, the small boughs bending more, and the large ones less: water agitated by the wind, and dashing against ships or boats; or falling from a precipice upon rocks and stones, and spirting up again into the air, and sprinkling all about: clouds also in the air, now gathered with the winds; now violently condensed into hail, rain, and the like: Always remembering, that whatever motions are caused by the wind must be made all to move the same way, because the wind can blow but one way at once.

Finally, it must be observed, that in order to attain any considerable proficiency in drawing, a knowledge of Perspective is absolutely necessary; see that article.

DRAY, a kind of cart used by brewers for carrying barrels of beer or ale; also a sledge drawn without wheels.

Dray, among sportsmen, denotes squirrel nests built in the top of trees.

DRAYTON (Michael), an eminent English poet, born of an ancient family in Warwickshire in 1563. His propensity to poetry was extremely strong, even from his infancy; and we find the most of his principal poems published, and himself highly distinguished as a poet, by the time he was about 30 years of age.—It appears from his poem of Moses's Birth and Miracles, that he was a spectator at Dover of the famous Spanish armada, and it is not improbable that he was engaged in some military employment there. It is certain, that not only for his merit as a writer, but his valuable qualities as a man, he was held in high estimation, and strongly patronized by several personages of consequence; particularly by Sir Henry Goodere, Sir Walter Aston, and the Countess of Bedford; to the first of whom he owns himself indebted for great part of his education, and by the second he was for many years supported.

His poems are very numerous; and so elegant, that his manner has been copied by many modern writers of eminence since. Among these the most celebrated one is the Poly-Albion, a chorographical description of England, with its commodities, antiquities, and curiosities, in metre of 12 syllables; which he dedicated to Prince Henry, by whose encouragement it was written: and whatever may be thought of the poetry, his descriptions are allowed to be exact. He was styled *poet laureat* in his time: which, as Ben Johnson was then in that office, is to be understood in a loose sense of approbation as an excellent poet: and was bestowed on others as well as Drayton, without being confined strictly to the office known by that appellation. He died in 1631; and was buried in Westminster-abbey among the poets, where his bust is to be seen, with an epitaph penned by Ben Johnson.

DREAMS, are all those thoughts which people feel passing through their minds, and those imaginary transactions in which they often fancy themselves engaged, when in the state of sleep.

Scarce any part of nature is less open to our observation than the human mind in this state. The dreamer

Dreams. dreamer himself cannot well observe the manner in which dreams arise or disappear to him. When he awakes, he cannot recollect the circumstances of his dreams with sufficient accuracy. Were we to watch over him with the most vigilant attention, we could not perceive with certainty what emotions are excited in his mind, or what thoughts pass through it, during his sleep. But though we could ascertain these phenomena, many other difficulties would still remain. What parts of a human being are active, what dormant, when he dreams? Why does not he always dream while asleep? Or why dreams he at all? Do any circumstances in our constitution, situation, and peculiar character, determine the nature of our dreams?

We may lay before our readers such facts as have been ascertained concerning dreaming, and the most plausible conjectures that have been offered to explain those particulars, about which we can only conjecture, or have at least hitherto obtained nothing more certain than conjecture.

1. In dreaming, we are not conscious of being asleep. This is well known from a thousand circumstances. When awake, we often recollect our dreams; and we remember on such occasions, that while those dreams were passing through our minds, it never occurred to us that we were separated by sleep from the active world. We are often observed to act and talk in dreaming as if we were busily engaged in the intercourse of social life.

2. In dreaming, we do not consider ourselves as witnessing or bearing a part in a fictitious scene: we seem not to be in a similar situation with the actors in a dramatic performance, or the spectators before whom they exhibit, but engaged in the business of real life. All the varieties of thought that pass through our minds when awake may also occur in dreams; all the images which imagination presents in the former state, she is also able to call up in the latter; all the same emotions may be excited, and we are often actuated by equal violence of passion; none of the transactions in which we are capable of engaging while awake is impossible in dreams: in short, our range of action and observation is equally wide in the one state as in the other; and while dreaming, we are not sensible of any distinction between our dreams and the events and transactions in which we are actually concerned in our intercourse with the world.

3. It is said, that all men are not liable to dream. Dr Beattie, in a very pleasing essay on this subject, relates, that he knew a gentleman who never dreamed except when his health was in a disordered state: and Locke mentions somewhere, that a certain person of his acquaintance was a stranger to dreaming till the 26th year of his age; and then began to dream in consequence of having a fever. These instances, however, are too few, and we have not been able to obtain more; and, besides, it does not appear that those persons had always attended, with the care of a philosopher making an experiment, to the circumstances of their sleep. They might dream, but not recollect their dreams on awaking; and they might both dream and recollect their dreams immediately upon awaking, yet afterwards suffer the remembrance of them to slip out of the memory. We do not advance this therefore as a certain fact concerning dreaming; we are rather inclined to think it a mistake.

But though it appears to be by no means certain that any of the human race are through the whole of life absolute strangers to dreaming; yet is is well known that all men are not equally liable to dream. The same person dreams more or less at different times; and as one person may be more exposed than another to those circumstances which promote this exercise of fancy, one person may therefore dream more than another. The same diversity will naturally take place in this as in other accidents to which mankind are in general liable.

4. Though in dreams imagination appears to be free from all restraint, and indulges in the most wanton freaks; yet it is generally agreed, that the imaginary transactions of the dreamer bear always some relation to his particular character in the world, his habits of action, and the circumstances of his life. The lover we are told, dreams of his mistress; the miser of his money; the philosopher renews his researches in sleep often with the same pain and fatigue as when awake; and even the merchant, at times, returns to balance his books, and compute the profits of an adventure, when slumbering on his pillow. And not only do the more general circumstances of a person's life influence his dreams; his passions and habits are nearly the same when asleep as when awake. A person whose habits of life are virtuous, does not in his dreams plunge into a series of crimes: nor are the vicious reformed when they pass into this imaginary world. The choleric man finds himself offended by slight provocations as well in his dreams as in his ordinary intercourse with the world, and a mild temper continues pacific in sleep.

5. The character of a person's dreams is influenced by his circumstances when awake in a still more unaccountable manner. Certain dreams usually arise in the mind after a person has been in certain situations. Dr Beattie relates, that he once, after riding 30 miles in a high wind, passed a part of the succeeding night in dreams beyond description terrible. The state of a person's health, and the manner in which the vital functions are carried on, have a considerable influence in determining the character of dreams. After too full a meal, or after eating of an unusual sort of food, a person has always dreams of a certain nature.

6. In dreaming, the mind for the most part carries on no intercourse through the senses with surrounding objects. Touch a person gently who is asleep, he feels not the impression. You may awake him by a smart blow; but when the stroke is not sufficiently violent to awake him, he remains insensible of it. We speak softly beside a person asleep without fearing that he overhear us. His eye-lids are shut; and even though light should fall upon the eye-ball, yet still his powers of vision are not awakened to active exertion, unless the light be so strong as to rouse him from sleep. He is insensible both to sweet and to disagreeable smells. It is not easy to try whether his organs of taste retain their activity, without awakening him; yet from analogy it may be presumed that these too are inactive. With respect to the circumstances here enumerated, it

Dreams.

it is indifferent whether a person be dreaming or buried in deep sleep.

Yet their is one remarkable fact concerning dreaming which may seem to contradict what has been here asserted. In dreams, we are liable not only to speak aloud in consequence of the suggestions of imagination, but even to get up, and walk about and engage in little enterprises, without awaking. Now, as we are in this instance so active, it seems that we cannot be then insensible of the presence of surrounding objects. The sleep-walker is really sensible in a certain degree of the presence of the objects around him; but he does not attend to them with all their circumstances, nor do they excite in him the same emotions as if he were awake. He feels no terror on the brink of a precipice; and in consequence of being free from fear, he is also without danger in such a situation unless suddenly awaked. This is one of the most inexplicable phenomena of dreaming.

There is also another fact not quite consonant with what has been above advanced. It is said, that in sleep a person will continue to hear the noise of a cataract in the neighbourhood, or regular strokes with a hammer, or any similar sound sufficiently loud, and continued uninterruptedly from before the time of his falling asleep. We know not whether he awakes on the sudden cessation of the noise. This fact is asserted on sufficient evidence: it is curious. Even when awake, if very deeply intent on any piece of study, or closely occupied in business, the sound of a clock striking in the neighbourhood, or the beating of a drum, will escape us unnoticed: and it is therefore the more surprising that we should thus continue sensible to sounds when asleep.

7. Not only do a person's general character, habits of life, and state of health, influence his dreams; but those concerns in which he has been most deeply interested during the preceding day, and the views which have arisen most frequently to his imagination, very often afford the subjects of his dreams. When I look forward with anxious expectation towards any future event, I am likely to dream either of the disappointment or the gratification of my wishes. Have I been engaged through the day, either in business or amusements which I have found exceedingly agreeable, or in a way in which I have been extremely unhappy? either my happiness or my misery is likely to be renewed in my dreams.

8. Though dreams have been regarded among almost all nations through the world, at least in some periods of their history, as prophetic of future events; yet it does not appear that this popular opinion has been established on good grounds. Christianity, indeed, teaches us to believe, that the supreme Being may, and actually does, operate on our minds, and influence at times the determinations of our will, without making us sensible of the restraint to which we are thus subjected. And, in the same manner, no doubt, the suggestions which arise to us in dreams may be produced. The imaginary transactions in which we are then engaged, may be such as are actually to occupy us in life; the strange and seemingly incoherent appearances which are then presented to the mind's eye, may allude to some events which are to befall ourselves or others. It is, therefore, by no means impossible, or inconsistent with the general analogy of nature, that dreams should have a respect to futurity. We have no reason to regard the dreams which are related in the Holy Scriptures to have been prophetic of future events, as not inspired by heaven, or to laugh at the idea of a prophetic dream as absurd or ridiculous.

Yet it would be too much to allow to dreams all that importance which has been ascribed to them by the priesthood among heathen nations, or by the vulgar among ourselves. We know how easily ignorance imposes on itself, and what arts imposture adopts to impose upon others. We cannot trace any certain connection between our dreams and those events to which the simplicity of the vulgar pretends that they refer. And we cannot, therefore, if disposed to confine our belief to certain or probable truths, join with the vulgar in believing them really referable to futurity.

9. It appears that the brutes are also capable of dreaming. The dog is often observed to start suddenly up in his sleep, in a manner which cannot be accounted for any other way than by supposing that he is roused by some impulse received in a dream. The same thing is observable of others of the inferior animals. That they should dream, is not an idea inconsistent with what we know of their economy and manners in general. We may, therefore, consider it as a pretty certain truth, that many, if not all, of the lower species are liable to dream as well as human beings.

It appears, then, that in dreaming we are not conscious of being asleep: that to a person dreaming, his dreams seem realities: that though it be uncertain whether mankind are all liable to dreams, yet it is well known that they are not all *equally* liable to dream: that the nature of a person's dreams depends in some measure on his habits of action, and on the circumstances of his life: that the state of the health too, and the manner in which the vital functions are carried on, have a powerful influence in determining the character of a person's dreams: that in sleep and in dreaming, the senses are either absolutely inactive, or nearly so: that such concerns as we have been very deeply interested in during the preceding day, are very likely to return upon our minds in dreams in the hours of rest: that dreams may be rendered prophetic of future events; and therefore, wherever we have such evidence of their having been prophetic as we would accept on any other occasion, we cannot reasonably reject the fact on account of its absurdity; but that they do not appear to have been actually such, in those instances in which the superstition of nations, ignorant of true religion, has represented them as referring to futurity, nor in those instances in which they are viewed in the same light by the vulgar among ourselves: and, lastly, that dreaming is not a phenomenon peculiar to human nature, but common to mankind with the brutes.

We know of no other facts that have been fully ascertained concerning *dreaming*. But we are by no means sufficiently acquainted with this important phenomenon in the history of mind. We cannot tell by what laws of our constitution we are thus liable to be so frequently engaged in imaginary transactions, nor what are the particular means by which the delusion is accomplished. The delusion is indeed remarkably strong. One will sometimes have a book presented to him in a dream, and fancy that he reads, and actually

enter

enter into the nature of the imaginary composition before him, and even remember, after he awakes, what he knows, that he only fancied himself reading (A). Can this be delusion? If delusion, how or for what purposes is it produced? The mind, it would appear, does not, in sleep, become inactive like the body; or at least is not always inactive while we are asleep. When we do not dream, the mind must either be inactive, or the connection between the mind and the body must be considered as in some manner suspended: and when we dream, the mind, though it probably acts in concert with the body, yet does not act in the same manner as when we are awake. It seems to be clouded or bewildered, in consequence of being deprived for a time of the service of the senses. Imagination becomes more active and more capricious: and all the other powers, especially judgment and memory, become disordered and irregular in their operation.

Various theories have been proposed to explain what appears here most inexplicable. The ingenious Mr Baxter, in his Treatise on the Immateriality of the Human Soul, endeavours to prove that dreams are produced by the agency of some spiritual beings, who either amuse or employ themselves seriously, in engaging mankind in all those imaginary transactions with which they are employed in dreaming. This theory, however, is far from being plausible. It leads us entirely beyond the limits of our knowledge. It requires us to believe without evidence. It is unsupported by any analogy. It creates difficulties still more inexplicable than those which it has been proposed to remove. Till it appear that our dreams cannot possibly be produced without the interference of other spiritual agents, possessing such influence over our minds as to deceive us with fancied joys, and involve us in imaginary afflictions, we cannot reasonably refer them to such a cause. Besides, from the facts which have been stated as well known concerning dreams, it appears that their nature depends both on the state of the human body and on that of the mind. But were they owing to the agency of other spiritual beings, how could they be influenced by the state of the body? Those must be a *curious* set of spiritual beings who depend in such a manner on the state of our corporeal frame. Better not to allow them existence at all, than to place them in such a dependance.

Wolfius, and after him M. Formey, have supposed, that dreams never arise in the mind, except in consequence of some of the organs of sensation having been previously excited. Either the ear or the eye, or the organs of touching, tasting, or smelling, communicate information, somehow, in a tacit, secret manner; and thus partly rouse its faculties from the lethargy in which they are buried in sleep, and engage them in a series of confused and imperfect exertions. But what passes in dreams is so very different from all that we do when awake, that it is impossible for the dreamer himself to distinguish, whether his powers of sensation *perform* any part on the occasion. It is not necessary that imagination be always excited by sensation. Fancy, even when we are awake, often wanders from the present scene. *Absence of mind* is incident to the studious: the poet and the mathematician many times forget where they are. We cannot discover from any thing that a person in dreaming displays to the observation of others, that his organs of sensation take a part in the imaginary transactions in which he is employed. In those instances, indeed, in which persons asleep are said to hear sounds; the sounds which they hear are said also to influence, in some manner, the nature of their dreams. But such instances are singular. Since then it appears that the person who dreams is himself incapable of distinguishing, either during his dreams, or by recollection when awake, whether any new impressions are communicated to him in that state by his organs of sensation; that even by watching over him, and comparing our observations of his circumstances and emotions, in his dreams, with what he recollects of them after awaking, we cannot, except in one or two singular instances, ascertain this fact; and that the mind is not incapable of acting while the organs of sensation are at rest, and on many occasions refuses to listen to the information which they convey; we may, without hesitation, conclude, that the theory of Wolfius and Formey has been too hastily and incautiously advanced.

Other physiologists tell us, that the mind, when we dream, is in a state of *delirium*. Sleep, they say, is attended with what is called a *collapse* of the brain; during which either the whole or a part of the nerves of which it consists, are in a state in which they cannot carry on the usual intercourse between the mind and the organs of sensation. When the whole of the brain is in this state, we become entirely unconscious of existence, and the mind sinks into inactivity: when only a part of the brain is *collapsed*, as they term it, we are then neither asleep nor awake, but in a sort of delirium between the two. This theory, like the last mentioned, supposes the mind incapable of acting without the help of sensation: it supposes that we know the nature of a state of which we cannot ascertain the phenomena; it also contradicts a known fact, in representing dreams as confused images of things around us, not fanciful combinations of things not existing together in nature or in human life. We must treat it likewise, therefore, as a baseless fabric.

In the last edition of this work, a theory somewhat different from any of the foregoing was advanced on this subject. It was observed, that the nervous fluid, which is allowed to be secreted from the blood by the brain, appears to be likewise absorbed from the blood by the extremities of the nerves. It was further advanced, that as this fluid was to be considered as the principle of sensibility; therefore, in all cases in which a sufficient supply of it was not absorbed from the blood by the extremities of the nerves, the parts of the body to which those nerves belonged, must be, in some degree, deprived of sensation. From these positions it was inferred, that as long as impressions of external objects continue to communicate a certain motion from the sentient extremities of the nerves to the brain,—so long we continue awake; and that, when there

(A) The writer of this article has been told by a respectable old gentleman of his acquaintance, since dead, that he had frequently dreams of this nature. The fact may therefore be considered as unquestionable.

there is a deficiency of this vital fluid in the extremities of the nerves, or when from any other cause it ceases to communicate to the brain the peculiar motion alluded to, we must naturally fall *asleep*, and become insensible of our existence. It followed of consequence, that, in sleep, the nervous fluid between the extreme parts of the nerves and the brain must either be at rest, or be deficient, or be prevented by some means from passing into the brain: and it was concluded, that whenever irregular motions of this fluid were occasioned by any internal cause, *dreaming* was produced.—In this manner it appeared that we might be deceived with regard to the operation of any of the senses;—so as to fancy that we saw objects not actually before us,—to hear imaginary sounds,—to taste,—to feel, and to smell in imagination. The instances of visions which will sometimes arise, and as it were swim before us when awake, though our eyes be shut, *tinnitus aurium*, which is often a symptom in nervous diseases, and the strange feelings in the case of the amputated limb, were produced in proof of this theory, and applied so as to confirm it.

We are still of opinion, that this theory is more plausible, and goes farther towards explaining the nature of *dreaming*, and the manner in which *dreams* are produced, than any other with which we are acquainted. But it must be confessed, upon a review, that even in it there is too much supposition. The nature of the nervous fluid is but imperfectly known, and even its existence not very fully ascertained. The nature of the connection by which the soul and body are united, seems to be almost beyond our comprehension. And till we can apply experiment and observation in a better manner to this branch of physiology, it must undoubtedly remain unknown. To something mysterious in the nature of that connection, the delusion produced in dreams is in all probability owing.

Amid this uncertainty with respect to the manner in which our powers of mind and body perform their functions in dreaming; it is pleasing to find that we can, however, apply to useful purposes the imperfect knowledge which we have been able to acquire concerning this series of phenomena. Our dreams are affected by the state of our health, by the manner in which we have passed the preceding day, by our general habits of life, by the hopes which we most fondly indulge, and the fears which prevail most over our fortitude when we are awake. From recollecting our dreams, therefore, we may learn to correct many improprieties in our conduct; to refrain from bodily exercises, or from meats and drinks that have unfavourable effects on our constitution; to resist, in due time, evil habits that are stealing upon us; and to guard against hopes and fears which detach us from our proper concerns, and unfit us for the duties of life. Instead of thinking what our dreams may forebode, we may with much better reason reflect by what they have been occasioned, and look back to those circumstances in our past life to which they are owing. The sleep of innocence and health is sound and refreshing; their dreams delightful and pleasing. A distempered body, and a polluted or perturbed mind, are haunted in sleep with frightful, impure, and unpleasing dreams.

Some very beautiful fables have been written both by ancients and moderns in the form of dreams. The *Somnium Scipionis* is one of the finest of Cicero's compositions. He who shall carefully peruse this piece with Mecrobius's commentary upon it, will acquire from them considerable knowledge of ancient philosophy. In the periodical publications, which have diffused so much elegant and useful knowledge through Britain, the Tatlers, Spectators, Guardians, &c. we find a number of excellent dreams. Addison excelled in this way of writing. The public are now less partial to this species of composition than they formerly were.

Dr Beattie, in his valuable essay on the subject of dreaming, quotes a very fine one from the Tatler, and gives it due praise.

The reader who is disposed to speculate farther on this subject, may consult Beattie's Essays, Hartley on Man, and the principal writers on physiology.

DRELINCOURT (Charles), minister of the reformed church at Paris, was born at Sedan in 1595, where his father enjoyed a considerable post. He had all the qualifications that compose a respectable clergyman; and though he defended the Protestant cause against the Romish religion, was much esteemed even among the Catholics. He is best known in England by his consolations against the Fears of Death, which work was translated, and is often printed. He married the daughter of a rich merchant at Paris, by whom he had 16 children. His third son, professor of physic at Leyden, was physician to the Prince and Princess of Orange before their accession to the crown of England. Bayle has given him a high character. Mr Drelincourt died in 1660.

DRENCH, among farriers, a physical potion for horses. The ingredients for this purpose are to be beat coarsely, and either mingled with a decoction or with wine. Then let all infuse about a quarter of an hour, and give it to the horse with a horn after he has been tied up two hours to the rack.

DREPANE, the ancient name of Corcyra, from the curvity of its figure, resembling a sickle.

DREPANE, *Drepanum*, (anc. geog.), a town of Bithynia, situated between the Sinus Astacenus and the Bosphorus Thracius; called *Helenopolis* by Constantine, in honour of his mother Nicephorus Callistus.

DREPANUM (anc. geog), the promontory Rhium in Achaia; so called because bent in the manner of a sickle.—Another *Drepanum* on the Arabic Gulf, on the side of Egypt. A third on the north side of Crete, situated between Cydonia and the Sinus Amphimallus. A fourth on the west side of Cyprus. A fifth, a promontory of Cyrenaica, on the Mediterranean.

DREPANUM, *-i*, or *Drepana -orum*, a town and port on the west side of Sicily, and to the west of mount Eryx: *Drepanitani* the people. Now *Trepano*, a city and port-town on the westmost point of Sicily. E. Long. 12. 8. Lat. 38. 0.

DRESDEN, the capital city of the electorate of Saxony in Germany. It is seated on the river Elbe, which divides it into two parts. One part is called *Old Dresden*, and the other the *New Town*, in the German language *New Stadt*. They are joined together by a stone bridge, supported by 19 piers, and 630 paces in length.

length. As this bridge was too narrow for the crowds of people that were continually paffing and repaffing, King Auguftus, in 1730, caufed two walks for foot-paffengers to be built, one on each fide, in a very wonderful manner; the one for thofe that go into the city, and the other for thofe that return back. Thefe are bordered with iron pallifadoes of curious workmanfhip. Drefden is furrounded by ftrong and handfome fortifications; and contains, according to the lateft accounts, 110,000 inhabitants.

All the buildings of this city are conftructed with fquare free ftone, and are almoft all of the fame height. They have ftone from the neighbourhood of Pirna. about ten miles from this city, which is readily brought down the Elbe. In general the houfes are high and ftrong; the ftreets wide, ftraight, well paved, clean, and well illuminated in the night; and there are large fquares, difpofed in fuch a manner, that Drefden may pafs for one of the handfomeft cities in the world. The elector's palace is a magnificent ftructure, and abounds in many valuable curiofities both of nature and art. The collection of pictures is reckoned one of the fineft that exifts, and is valued at 500,000l.

Above 700 men are here conftantly employed in the porcelain manufacture, the annual expence of which is eftimated at no more than 80,000 crowns; and the manufacture yields to the king 200,000 crowns yearly, befides the magnificent prefents which he occafionally makes, and the large quantity referved for the ufe of his houfehold.

The other moft confiderable article of trade is filver, of which the mines near Fridburg produce every 15 days near the value of 20,000 dollars. The metal is brought into the city in ingots, where it is immediately coined and delivered to the proprietors.

The court of Drefden is one of the moft remarkable in Europe for fplendor and profufion. Six thoufand five hundred ducats are yearly allowed for comfits and fimilar articles, which is near twice as much as the king of Pruffia allows for the whole expence of his table. The revenues of the elector are eftimated at about 1,576,000l.; which arife from the taxes on lands, and a capitation of fix dollars on all males as foon as they commence an apprenticefhip or begin to work. People of a higher rank are taxed according to their clafs, and are liable to be called to account if they affume not an exterior appearance correfpondent to the extent of their fortune. Every foreigner pays capitation after refiding fix months in the country. The Jews are taxed at 50, their wives at 30, and their children at 20 dollars. There is alfo an excife on all eatables and liquors; and 10 *per cent.* is levied out of the incomes of the people.

Though this city lies in a low fituation, yet it hath agreeable profpects. It is fupplied with a prodigious quantity of provifions, not only out of the neighbourhood, but from Bohemia, which are brought every market-day, which is once a-week. E. Long. 13. 34. N. Lat. 51. 12.

DRESSING of Hemp and Flax. See *Flax-Dreffing*.

Dressing of Meats, the preparing them for food by means of culinary fire.

The defign of dreffing is to loofen the compages or texture of the flefh, and difpofe it for diffolution and digeftion in the ftomach. Flefh not being a proper food without dreffing, is alleged as an argument that man was not intended by nature for a carnivorous animal.

The ufual operations are roafting, boiling, and ftewing.—In roafting, it is obferved, meat will bear a much greater and longer heat than either in boiling or ftewing; and in boiling, greater and longer than in ftewing. The reafon is, that roafting being performed in the open air, as the parts begin externally to warm, they extend and dilate, and fo gradually let out part of the rarefied included air, by which means the internal fucculfions, on which the diffolution depends, are much weakened and abated. Boiling being performed in water, the preffure is greater, and confequently the fucculfions to lift up the weight are proportionably ftrong; by which means the coction is haftened: and even in this way there are great differences; for the greater the weight of water, the fooner is the bufinefs done.

In ftewing, though the heat be infinitely fhort of what is employed in the other ways, the operation is much more quick, becaufe performed in a clofe veffel, and full; by which means the fucculfions are oftener repeated, and more ftrongly reverberated. Hence the force of Papin's digeftor; and hence an illuftration of the operation of digeftion.

Boiling, Dr Cheyne obferves, draws more of the rank ftrong juices from meat, and leaves it lefs nutritive, more diluted, lighter, and eafier of digeftion: roafting, on the other hand, leaves it fuller of the ftrong nutritive juices, harder to digeft, and needing more dilution. Strong, grown, and adult animal food, therefore, fhould be boiled; and the younger and tenderer roafted.

Dressing, in furgery, the treatment of a wound or any difordered part. The apparatus of dreffing confifts of doffils, tents, plafters, compreffes, bandages, bands, ligatures, and ftrings. See Surgery.

DREXELIUS (Jeremiah), a Jefuit celebrated for his piety and writings, was born at Aufburg, and became preacher in ordinary to the elector of Bavaria. He wrote feveral pious and practical pieces, which have been printed together in two volumes folio; and died in 1638.

DREVET (Peter) the Younger, an eminent French engraver, was a member of the royal academy of painting and fculpture: and died at Paris in 1739, at 42 years of age. His portraits are neat and elegant; but laboured to the laft degree. He particularly excels in reprefenting lace, filk, fur, velvet, and other ornamental parts of drefs.—His father was excellent in the fame art; and had inftructed, but was furpaffed by the fon. The younger Drevet did not confine himfelf to portraits. We have feveral hiftorical prints by him, which in point of neatnefs and exquifite workmanfhip are fcarcely to be equalled. His moft efteemed and beft hiftorical print is very valuable; but the firft impreffions of it are rarely to be met with: it is, The Prefentation of Chrift in the Temple; a very large plate, lengthwife, from Louis de Bologna. The following deferve alfo to be particularized. The Meeting of Abraham's Servant with Rebecca at the

Well; a large upright plate, from An. Coypel; and Abraham, with his Son Isaac on the Altar, the same, from the same, dated 1707; the first impressions of which are before the work upon the right thigh of Isaac was altered, the curved lines from the button almost down to the knee being in those impressions arched downwards, but in posterior ones arched upwards. Among his portraits, the two following are justly held in the highest estimation: M. Bossuet Bishop of Meaux; a whole-length figure standing, a middling sized upright plate, from Rigaud: and Samuel Bernard; a whole-length figure sitting in a chair, a large upright plate. The first impressions of the last are, before the words *Conseiller d'Etat* were inserted upon the plate.

DREUX, a town in the Isle of France, remarkable for its antiquities; and for the battle which was fought in December 1562 between the Papists and the Protestants, wherein the former gained the victory. Some think it took its name from the priests of Gaul, called the *Druids*, in the times of paganism. It consists of two parishes, St Stephen's and Notre Dame, called the *great church*, which is pretty well built. It is seated on the river Blaise, at the foot of a mountain, on which is a ruined castle. E. Long. 1. 27. N. Lat. 48. 44.

DRIEPER, or Dniper, a river of Russia, which rises in the forest of Volkonski, near the source of the Volga, about 100 miles from Smolensko. It passes by Smolensko and Mohilef, separates the Ukraine from Poland, flows by Kiof, and falls into the Black Sea between Otzakof and Kinburn. By the acquisition of the province of Mohilef, its whole course is now included within the Russian territories. It begins to be navigable at a little distance above Smolensko, though in some seasons of the year it is so shallow near the town, that the goods must be transported upon rafts and small flat-bottomed boats.

DRIFT, in navigation, the angle which the line of a ship's motion makes with the nearest meridian, when she drives with her side to the wind and waves, and is not governed by the power of the helm: it also implies the distance which the ship drives on that line.

A ship's way is only called *drift* in a storm; and then when it blows so vehemently as to prevent her from carrying any sail, or at least restrains her to such a portion of sail as may be necessary to keep her sufficiently inclined to one side, that she may not be dismasted by her violent labouring produced by the turbulence of the sea.

Drift, in mining, a passage cut out under the earth betwixt shaft and shaft, or turn and turn; or a passage or way wrought under the earth to the end of a meer of ground, or part of a meer.

Drift-sail, a sail used under water, veered out right a-head by sheets, as other sails are. It serves to keep the ship's head right upon the sea in a storm, and to hinder her driving too fast in a current.

DRILL, in mechanics, a small instrument for making such holes as punches will not conveniently serve for. Drills are of various sizes, and are chiefly used by smiths and turners.

Drill, or *Drill-Box*, a name given to an instrument for sowing land in the new method of horse-hoeing husbandry. See Agriculture.

Drill-Sowing, a method of sowing grain or seed of any kind, so that it may all be at a proper depth in the earth, which is necessary to its producing healthful and vigorous plants. For this purpose a variety of drill-ploughs have been invented and recommended; but from the expence attending the purchase, and the extreme complication of their structure, there is not an instrument of that kind, as yet discovered, that is likely to be brought into general use. This method, however, is greatly recommended in the Georgical Essays, where we have the following observations and experiments.—"Grain sown by the hand, and covered by the harrows, is placed at unequal depths; the seeds consequently sprout at different times, and produce an unequal crop. When barley is sown late, and a drought succeeds, the grain that was buried in the moisture of the earth soon appears, while such as was left near the surface lies baking in the heat of the sun, and does not vegetate till plentiful rains have moistened the soil. Hence an inequality of the crop, an accident to which barley is particularly liable. The same observation, but in a more striking manner, may be made upon the sowing of turnips. It frequently happens that the husbandman, is obliged to sow his seed in very dry weather, in hopes that rain will soon follow; and either rolls or covers it with a bush-harrow. We will suppose, that, contrary to his expectations, the dry weather continues. The seed, being near the surface, cannot sprout without rain. The husbandman is mortified at his disappointment, but is soon satisfied and made easy by a perfect acquiescence in what he thinks is the will of Providence. The scourge that he feels must not be placed to the dispensation of Providence, but has its source in the ignorance of the man himself. Had he judiciously buried the seed in the moist part of the soil with the drill plough, or harrowed it well with the common harrow, his seed would have vegetated in due season, and bountifully repaid him for his toil.

"In the year 1769, a 15 acre close was prepared for turnips. The land was in fine condition as to lightness, and had been well manured. On the 24th of June, 14 acres were sown with turnip seed broad-cast, and harrowed in with a bush-harrow. The remaining acre was sowed the same day with the drill-plough, allowing 14 inches between the rows, and the shares being set near two inches deep. At the time of sowing, the land was extremely dry, and the drought continued from the time of sowing to the 5th of July: so that the broad cast did not make its appearance till about the 8th of that month, at which time the drill turnips, were in rough leaf, having appeared upon the surface the sixth day after sowing.

"In the driest seasons, at the depth of two inches or less, we are sure of finding a sufficiency of moisture to make the seed germinate. When that is once accomplished, a small degree of moisture will carry on the work of vegetation, and bring the tender plants forward to the surface. When extreme dry weather obliges the broad-cast farmer to sow late, he has no opportunity of sowing a second time if the fly should get into the field. The drill secures him in some degree against that misfortune, by giving him a full command over the seasons.

"The excellence of the drill-plough is not confined to turnip-seed; it is an useful instrument for sowing all kinds

kinds of grain. By burying the seeds at an equal depth, it secures an equal crop in all circumstances of the weather. But this is not the only consideration to the cultivator. It saves near one half of his seed, which is an object of importance to the tillage farmer.

"In the spring of the year 1769, an acre of barley was sowed in equidistant rows with the drill-plough, in a field which was sown with the same grain and upon the same day broad-cast.—The broad-cast took three bushels per acre; the drill required only six pecks. The drills were eight inches asunder, and the seed was lodged about two inches within the soil. The drill acre was finished within the hour, and the most distinguishing eye could not discover a single grain upon the surface.

"In the course of growing, the drill barley seemed greener and bore a broader leaf than the broad-cast. When the ears were formed throughout the field, the ear of the drill barley was plainly distinguished to be near half an inch longer than the broad-cast, and the grains seemed fuller and better fed.

"Drill-sowing, however, though it may be recommended as a most rational and judicious practice, has many difficulties to overcome, and perhaps will never be brought into general use. A proper instrument is wanting that would come cheap to the farmer, and have the requisites of strength and simplicity to recommend it. The present instruments cannot by any means be put into the hands of common servants. Should we ever be so happy as to see this objection removed, it is probable that all kinds of grain will be cultivated in drills. Corn growing in that manner has a freer enjoyment of air, and the farmer has an opportunity of hand-hoeing and weeding without injury to the growing crop. This is an object of the utmost consequence in the cultivation of beans and winter corn.

"The best instrument for drilling of grain is the invention of the ingenious Mr Craick, and made by Mr Crichton coach-maker in Edinburgh. It works with four coulters, and the price is 12l. With it, one man, a horse, and a boy, can easily sow four acres a-day."

DRILLING is popularly used for exercising soldiers. The word is derived from the French *drille*, which signifies a *raw soldier*.

DRIMYS, in botany: A genus changed by Murray, in the 14th edit. of *Syst. Veget.* to WINTERA; which see.

DRINK, a part of our ordinary food in a liquid form. See FOOD.

The general use of drink, is to supply fluid; facilitate solution; in consequence of that, to expedite the evacuation of the stomach, and promote the progress of the aliment through the intestines: for, by the contraction of the longitudinal fibres of the stomach, the pylorus is drawn up, and nothing but fluid can pass; which, by its bulk, makes a hurried progress through the intestines, and so determines a greater excretion by stool, as less then can be absorbed by the lacteals. Hence a large quantity of common water has been found purgative; and, *cæteris paribus*, that aliment which is accompanied with the largest proportion of drink, makes the largest evacuation by stool. Here a question has arisen, about where the feculent part of the aliment is first remarkably collected. It is commonly thought to be in the great guts: but undoubtedly it often begins in the lower part of the ileum, especially when the drink is in small proportion, and when the progress of the aliment is slow; for when the contents of the guts are very fluid, they are quickly pushed on, and reach the great guts before they deposit any feculency. Another effect of drink is, to facilitate the mixture of the lymph, refluent from every part of the system, with the chyle. In the blood-vessels, where all must be kept fluid in order to proper mixture, drink increases the fluidity, and gives tension, by its bulk, without concomitant acrimony or too much elasticity, and so strength and oscillatory motion: hence drink contributes to sanguification, as sometimes food gives too dense a nutriment to be acted upon by the solids; and hence also we can see how drink promotes the secretions. These are the effects of drink in general; but what has been said must be taken with some limitations; for the more liquid the food, it is sooner evacuated, and less nourishment is extracted. Hence drink is, in some degree, opposed to nourishment: and so, *cæteris paribus*, those who use least drink are most nourished.

All the effects of drink abovementioned are produced by simple water; and it may be said, that other liquors are fit for drink in proportion to the water they contain. Water, when used as drink, is often impregnated with vegetable and farinaceous substances; but, as drinks, these impregnations are of little consequence: they add, indeed, a little nourishment; but this is not to be regarded in a healthy state. Sometimes we impregnate water with the *fructus acido-dulces*; and then, indeed, it acquires other qualities, of considerable use in the animal economy. All drinks, however, may be reduced to two heads: first, pure water, or where the additional substance gives no additional virtue; secondly, the *fermentatæ*. Of the first we have already spoken; and the latter have not only the qualities of the first, but also qualities peculiar to themselves.

Fermented liquors are more or less poignant to the taste, and better calculated to quench thirst. Thirst may be owing to various causes: first, to defect of fluid in the system, which occasions a scanty secretion in the mouth, fauces, and stomach; the dryness of the mouth and fauces will also in this case be increased, by their continual exposure to the perpetual flux and reflux of the evaporating air. Secondly, thirst depends on a large proportion of solid viscid food: thirdly, on an alkalescent aliment, especially if it has attained any thing of the putrefactive taint: fourthly, on the heat of the system; but this seems to operate in the same manner as the first cause, giving a sense of dryness from its dissipation of the fluids. The fermented liquors are peculiarly adapted for obviating all these causes; stimulating the mouth, fauces, and stomach, to throw out the saliva and gastric liquor by their poignancy: by their acescency they are fitted to destroy alkalescent acrimony, to quench thirst from that cause: by their fluidity they dilute viscid food; though here, indeed, they answer no better than common water. In two ways they promote the evacuation by stool, and progress through the intestines: first, by their fluidity and bulk; secondly, by their acescency, which, uniting with the bile, forms the peculiar stimulus formerly mentioned. Carried into the blood-vessels, in so far as they retain any of the saline nature, they stimulate the

excre-

excretories, and promote urine and ſweat; correcting thus alkaleſcency, not only by mixture, but diſſipation of the degenerated fluids.

Many phyſicians, in treating of fermented liquors, have only mentioned theſe qualities rejecting their nutritious virtue, which certainly ought to be taken in; though by expediting the evacuation by ſtool they make leſs of the nutritious parts of the aliment to be taken up, and by ſtimulating the excretories make theſe nutritious parts to be for a ſhorter time in the ſyſtem. All theſe and many more effects ariſe from fermented liquors. Their aceſcency ſometimes promotes the diſeaſe of aceſcency, by increaſing that of vegetables, acting as a ferment, and ſo producing flatulency, purging, cholera, &c.: ſo that, with vegetable aliment, as little drink is neceſſary, the moſt innocent is pure water; and it is only with animal food that fermented liquors are neceſſary. In warmer climates, *fermentatæ* would ſeem neceſſary to obviate alkaleſcency and heat. But it ſhould be conſidered, that though fermented liquors contain an acid, yet they alſo contain alcohol; which, though it adds ſtimulus to the ſtomach, yet is extremely hurtful in the warmer climates, and wherever alkaleſcency prevails in the ſyſtem. Nature, in theſe climates has given men an appetite for water impregnated with acid fruits, *e. g.* ſherbet; but the uſe of this needs caution, as in theſe countries they are apt to ſhun animal food, uſing too much of the vegetable, and often thus cauſing dangerous refrigerations, choleras, diarrhœas, &c.

Of varieties of fermented liquors. We ſhall only mention here the chief heads on which theſe varieties depend First, they are owing to the quality of the ſubject, as more or leſs viſcid; and to its capacity alſo of undergoing an active fermentation, although perhaps the more viſcid be more nutritious. Hence the difference between ales and wines; by the firſt meaning fermented liquors from *farinacea*, by the ſecond from the fruits of plants. It depends, ſecondly, on the acerbity, acidity, nature, and maturation, of the fruit. Thirdly, the variety depends on the conduct of the fermentation. In general, fermentation is progreſſive, being at firſt active and rapid, detaching the fixed air or *gas ſylveſtre*, at the ſame time acquiring more acid than before. Theſe qualities of flatulency and acidity remain for ſome time; but as the fermentation goes on, the liquor becomes more perfect, no air is detached, and alcohol is produced; ſo that fermented liquors differ according to the progreſs of the fermentation, and have different effects on the ſyſtem. When fermentation is ſtopped before it comes to maturity, though naturally it proceeds in this way, yet by addition of new ferment it may again be renewed with a turbid inteſtine motion.

DRIVERS, among ſportſmen, a machine for driving pheaſant-powts, conſiſting of good ſtrong ozier wands, ſuch as the baſket-makers uſe; theſe are to be ſet in a handle, and twiſted or bound with ſmall oziers in two or three places. With this inſtrument the ſportſman drives whole eyes of young powts into his nets. See the next article.

DRIVING, among ſportſmen, a method of taking pheaſant-powts. It is thus: The ſportſman finds out the haunts of theſe birds; and having fixed his nets there, he calls upon them together by a pheaſant-call, imitating the voice of the dam; after this he makes a noiſe with his driver, which will make them run a little way forward in a cluſter; and this he is to repeat till he has made ſure of them, which an expert ſportſman never fails to do, by driving them into his nets.

Driving, in metallurgy, is ſaid of ſilver, when, in the operation of refining, the lead being burnt away, the remaining copper riſes upon its ſurface in red fiery bubbles.

Driving, in the ſea-language, is ſaid of a ſhip, when an anchor being let fall will not hold her faſt, nor prevent her ſailing away with the wind or tide. The beſt help in this caſe is to let fall more anchors, or to veer out more cable; for the more cable ſhe has out, the ſafer ſhe rides. When a ſhip is a-hull or a-try, they ſay ſhe drives to leeward.

DROGHEDA, by the Engliſh called *Tredah*, a town of Ireland, in the province of Leinſter and county of Lowth, and ſituated on a bay of the ſame name, in W. Long. 6. 17. N. Lat. 53. 45. It was formerly very remarkable for its ſituation and ſtrength. In conſequence of this it was much diſtinguiſhed by the old Engliſh monarchs. Edward II. granted it a market and fair; and to theſe were added other great privileges in ſucceeding ages, particularly the right of coinage. It was bravely defended againſt the rebels in 1641. After the ceſſation of arms it was taken by the duke of Ormond and the earl of Inchiquin; but was retaken by Cromwell in 1649. At this time it ſuffered ſo much, that for a long time after it remained almoſt in ruins. The buildings were exceedingly ſhattered; and the town being taken by ſtorm, not only the garriſon, but the inhabitants, men, women, and children, were moſtly put to the ſword. By degrees, however, it recovered, and is at preſent a large and populous place. It is a town and county; and as ſuch ſends two repreſentatives to parliament. It has a great ſhare of inland trade, and an advantageous commerce with England: and though the port is but indifferent, and narrow at its entrance, with a bar over which ſhips of burden cannot paſs but at high water, yet a great deal of buſineſs is done; ſo that, from a low and declining port, it is now become rich and thriving.

Drogheda is perhaps one of the ſtrongeſt inſtances that can be mentioned of the ineſtimable benefit of a river in any degree navigable: for though the Boyne is not capable of carrying veſſels bigger than barges, or pretty large boats, yet the conveniency that this affords of conveying coals by water-carriage through a great extent of country, introduced a correſpondence between this place and Whitehaven in Cumberland, to which the revival of its commerce has been in a great meaſure owing.

DROITWITCH, a town of Worceſterſhire in England, noted for excellent white ſalt made from the ſalt ſprings in its neighbourhood. It ſends two members to parliament. W. Long. 2. 16. N. Lat. 52. 20.

DROMEDARY. See Camelus.

DROMORE, a town of Ireland, in the county of Down. It is a very ancient town, and the ſeat of a biſhopric. The ſee was founded by St Colman in the 6th century. It was refounded by King James I. who, by his charters (now preſerved in the Rolls-office), granted it very great and uncommon privileges. Among other

Drone. other marks of royal favour, he diſtinguiſhes the biſhops of this ſee by the ſtyle of "A. B. by Divine Providence biſhop of Dromore:" whereas all other biſhops in Ireland, except thoſe of Meath and Kildare, are ſtyled, "by Divine Permiſſion:" This ſee, although the leaſt in its extent, is ſo complete and perfect in its endowment and juriſdiction, that it need not envy the greateſt and moſt opulent.

DRONE, a kind of large bees which make their appearance in hives about the month of May, but never work nor prepare any honey; and are at laſt all killed by the reſt. Under the article Bee, n° 20 *et ſeq.* we have given an account of the experiments of Meſſrs Debraw and Schirach concerning theſe animals: but ſince that article was printed, a Treatiſe upon Bees and their Management has appeared by Mr Bonner near Berwick on Tweed, who has made the management of bees his ſtudy for a great number of years, and who diſſents from the opinions of the abovementioned gentlemen for the following reaſons, which we ſhall give in his own words. Having mentioned the opinions of Mr Debraw concerning the little drones mentioned in the article abovementioned, he proceeds thus:

"1. Can it be thought that the prying eyes of multitudes in many generations ſhould have eſcaped ſeeing thoſe little drones (they being according to his account, vaſtly numerous) thruſt their poſterior parts into the cells? Yet none ever ſaw them do it except himſelf; while many have ſeen the queen do it, though but a ſingle bee.

"2. It is well known the queen is very long behind the wings, wiſe nature having made her ſo, in order that ſhe might thruſt her poſterior part into the cells, and yet her wings ſcarcely touch them, nor receive the leaſt injury. If theſe imaginary little drones had to thruſt their poſterior parts into the cells in the ſame manner as the queen, certainly their wings would have been made in the ſame manner ſhort, and their poſterior parts long and taper, which is not the caſe. Whereas were a bee of any kind (the queen excepted) to thruſt its hinder part into a common cell, its wings or coats would come over its head, and be antic like, and injure both them and its body. Beſides, I ſcarcely think they could get into the common cells that way at any rate for want of room.

"3. Mr Debraw grants, that without a queen or eggs bees will not begin to work, as well knowing they cannot propagate their ſpecies without her; and yet he ſays, thoſe bees which wanted little drones began to work, and the queen laid eggs, and all went forward, till they were not impregnated, and then they gave over work, and deſerted the hive. Certainly thoſe ſagacious creatures would have been as ſenſible that they wanted drones at the very firſt, when they were put into the hive, and that they could not do without them, as they are ſenſible when they want a queen, and that it is needleſs to begin work without her; and it might be added, that two different kinds of drones in one hive does not appear to be probable, or ſerve any end.

"But I ſhall narrate ſome of my own experiments on that head, which will put it, I hope, beyond diſpute: On September 1ſt, I had a hive breeding faſt; I took out all her bees (among which were only four large drones, which I killed), and I put them in a hive that had nothing in her but empty combs: I waited ten days, when, by looking between the combs, I ſaw her have new-ſealed up maggots in her cells. I then took all her bees out, and ſhook them into a tub full of water, and recovered them gradually; and when recovering, I preſſed every one of them, in order to ſee if I could find any of thoſe little drones, but could not find one; but all and every one of them had ſtings: they were in number 3000. After which I ſearched the hive I took them out of, and cut out all her combs that had eggs in them, and found they had new laid eggs, four days old eggs, and maggots in them. I then recovered the queen and all the bees, and put in the ſame hive again, which had not an egg in her now, and waited other twenty days, and ſaw her in fine days working very well; a ſure indication ſhe was breeding again. I then turned her up, and cut out one of her brood-combs, and ſaw in it new laid eggs, four days old eggs, and maggots, and ſome young almoſt fit for emerging out of their cells.

"The very ſame day I made a further experiment: I had a hive which I ſaw had ſome brood-combs in her, but ſhe had not had a large drone for four weeks before in her: ſhe had not above 500 bees in her, which favoured me, becauſe few in number. I took the hive into a cloſe place in my houſe, in order that not a ſingle bee ſhould eſcape me: I then took all her bees out of her, and immerſed them in water; and when recovering, I preſſed every one of them, and each bee had a ſting, as in the former experiment.

"I think the above experiments may ſatisfy any judicious perſon, that there is no ſuch thing in being as little drones, unleſs in Mr Debraw's brain. And if Mr Debraw, who can find 57 in a ſmall ſwarm of bees, will ſend me the odd ſeven, I will ſend him one of my beſt hives for them, and he will ſcarcely think he is ill paid. I add, I never ſaw a hive in ſpring, however few bees in her, but ſhe bred ſome if ſhe had a queen, though to be ſure few in proportion to her bees.

"By this time the reader will be very ready, no doubt, to aſk me the uſe of the drones. I beg to be excuſed on that head, as I have not the leaſt idea of their uſe in a hive; they do not fecundate the queen, for ſhe can lay and breed too though ſhe never ſee them. Their heat does not appear to me to be neceſſary for hatching the young, as they are moſtly hatched before any are bred in a hive: and when drones are in the hive, the weather is ſo warm, and ſo many common bees in it, that they appear to have rather too much heat, by their lying out of their hives often.

"I have many times had good hives with few or no drones in them all the year: and Keys is quite wrong when he ſays a top ſwarm will not do without drones in her; for I am poſitive to the contrary, as in the ſummer 1785 I took off four ſwarms of mine own in one day with not a ſingle drone in any of them, and they all throve well, and bred drones in themſelves about four weeks after.

"Although I cannot ſay what uſe the drones are of to a hive (unleſs it be to help away with a great deal of her honey, which they are very good at), yet the beſt hives have them ſooneſt in the year, they generally appearing in ſuch about the latter end of May, and

and the bees put a period to their lives about Lammas, at which time I give them all the assistance I can. The way they kill them is thus: They pull and bite them with their teeth, and sting them also. I have seen great havoc made of them in one day, as appeared by their lying dead before the door of the hive. But their most effectual way of killing them is their banishing them from the honey-combs; upon which the drones betake themselves to the under edges of the hives in great numbers, and to the board the hive stands on; and sometimes, though rare, I have even seen them come to the outside of the hive, and cluster there about the bulk of a man's hand. When they are banished thus, they are very dull and lifeless: and I have lifted up a hive from the board, and there they would have been sitting close on it, with scarcely three or four common bees among them; and I have trod to death 40 or more at a time.

"We may now take a view of the disadvantages attending the old, and also Mr Debraw's principles on bees, were they true; and next see how a hive of bees may be preserved from coming to ruin, according to my sentiments on them.

"1. The old principles on bees say, that without a queen or royal cell be in a hive, it will come to ruin.

"Mr Debraw's principles says, that without little drones be in a hive it will come to ruin.

"3. I say, if a hive have only new laid eggs in her (which may be easily got the greatest part of the year, in case she have none of her own) and common bees, she will find herself a queen, and so thrive.

"According to the old principles, it is easily seen that in case a hive lose her queen when there is no royal cell in her, and no queen can be got to put to her (neither of which can be expected but in June and July), she is entirely ruined.

"According to the Frenchman's scheme, there must be drones in a hive at all times of the year to fecundate the eggs, otherwise the hive is useless. Supposing his sentiments to be true (which however can by no means be admitted, seeing there is no such thing as little drones) how perplexed would the owner be to know when there were little drones in his hives! When he wanted to make an artificial swarm, he might bring off a queen and common bees with her: but how should he come to know whether there were any, or a sufficient quantity, of little drones among them, as they cannot be distinguished from the commons but by immersion and pressure, which would be intolerably troublesome, and next to killing the bees, and not at all practicable? All that could be done would be to hope the best, that there were little drones in her at any time of the year.

"I say, if a queen die in a hive, and that hive have some new-laid eggs in her, or some put to her, in case she have none of her own, she will nourish up some of these eggs to be a queen to herself: and also by taking out a queen and some commons out of a hive (without a single drone, large or small), and putting them in an empty hive, will make a swarm, and the old hive will breed herself, a queen again if she have eggs in her."

Drone-Fly, a two-winged insect, extremely like the common drone-bee, whence also the name.

DROPS, in meteorology, small spherical bodies which the particles of fluids spontaneously form themselves into when let fall from any height. This spherical figure, the Newtonian philosophers demonstrate to be the effect of corpuscular attraction; for considering that the attractive force of one single particle of a fluid is equally exerted to an equal distance, it must follow that other fluid particles are on every side drawn to it, and will therefore take their places at an equal distance from it, and consequently form a round superficies. See the articles ATTRACTION, FLUID, and RAIN.

DROPS, in medicine, a liquid remedy, the dose of which is estimated by a certain number of drops.

English DROPS, *Guttæ Anglicanæ*, a name given to a chemical preparation esteemed of great virtue against vapours and lethargic affections, and purchased at 5000l. by king Charles II. from the inventor Dr Goddard. The medicine appeared to be only a spirit drawn by the retort from raw silk, and afterwards rectified with oil of cinnamon, or any other essential oil; and was in reality no better than the common sal volatile oleosum, or any of the volatile spirits impregnated with an essential oil, except that it was less disagreeable than any of them to the taste.

DROPSY, in medicine, an unnatural collection of water in any part of the body. See (the *Index* subjoined to) MEDICINE.

DROPWORT, in botany. See FILIPENDULA.

Water DROPWORT, in botany. See OENANTHES.

DROSERA, ROS SOLIS, or *Sun-dew*, in botany: A genus of the pentagynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 14th order, *Gruinales*. The calyx is quinquefid, the petals five; the capsule unilocular and quinquevalved at top; the seeds very numerous. There are three species, which grow naturally in boggy places in many parts of Britain. They seem to receive the name of *sun-dew* from a very striking circumstance in their appearance. The leaves, which are circular, are fringed with hairs supporting small drops or globules of a pellucid liquor like dew, which continue even in the hottest part of the day and in the fullest exposure to the sun. The whole plant is acrid, and sufficiently caustic to erode the skin: but some ladies know how to mix the juice with milk, so as to make it an innocent and safe application to remove freckles and sun-burn. The juice that exsudes from it unmixed, will destroy warts and corns. The plant hath the same effect upon milk that the common butterwort hath; and like that too is supposed to occasion the rot in sheep.

DROWNING, signifies the extinction of life by a total immersion in water.

In some respects, there seems to be a great similarity between the death occasioned by immersion in water, and that by strangulation, suffocation by fixed air, apoplexies, epilepsies, sudden faintings, violent shocks of electricity, or even violent falls and bruises. Physicians, however, are not agreed with regard to the nature of the injury done to the animal system in any or all of these accidents. It is indeed certain, that in all the cases abovementioned, particularly in drowning, there is very often such a suspension of the vital powers as to us hath the appearance of a total extinction of them; while yet they may be again set in motion, and the person restored to life, after a much longer sub-

Drowning.

submersion than hath been generally thought capable of producing absolute death. It were to be wished, however, that as it is now universally allowed that drowning is only a suspension of the action of the vital powers, physicians could as unanimously determine the means by which these powers are suspended; because on a knowledge of these means the methods to be used for recovering drowned persons must certainly depend.

Dr de Haen, who hath written a treatise on this subject, ascribes this diversity of opinion among the physicians to their being so ready to draw general conclusions from a few experiments. Some, having never found water in the lungs, have thought that it never was there; and others, from its presence have drawn a contrary conclusion. Some have ascribed the death which happens in cases of drowning, to that species of apoplexy which arises from a great fulness of the stomach. But this opinion our author rejects, because in 13 dogs which he had drowned and afterwards dissected, no signs of such a fulness appeared. Another reason is drawn from the want of the common marks of apoplexy on the dissection of the brain, and from the actual presence of water in the lungs. He is of opinion, that the death of drowned persons happens in consequence of water getting into the lungs, and stopping the blood in the arteries. He then discusses the question how far the blowing of air into the lungs is useful in recovering drowned people. If their death is to be ascribed to the water entering the lungs, this practice, he observes, must be hurtful, as it will increase the pressure on the blood-vessels, or may even force the water into them; which, on the authority of Lewis's experiments, he alleges is possible. But, in spite of this reasoning, he asserts, that from experience it has been found useful. He allows, that the practice of suspending drowned people by the feet must be hurtful, by determining the blood too much to the head; but he observes, that remedies in some respects hurtful may be used when the advantages derived from them preponderate; and is of opinion, that the practice abovementioned may be useful by agitating the viscera against each other, and thus renewing their motions. Cutting the larynx in order to admit air more freely to the lungs, he reckons to be of little or no use; but acknowledges, however, that it may sometimes prove beneficial on account of the irritation occasioned by the operation.

Dr Cullen, in his Letter to Lord Cathcart concerning the recovery of persons drowned and seemingly dead, tells us, that "From the dissection of drowned men, and other animals, it is known, that very often the water does not enter into the cavity of the lungs, nor even into the stomach, in any quantity to do hurt to the system; and, in general, it is known, that, in most cases, no hurt is done to the organization of the vital parts. It is therefore probable, that the death which ensues, or seems to ensue, in drowned persons, is owing to the stoppage of respiration, and to the ceasing, in consequence, of the circulation of the blood, whereby the body loses its heat, and, with that, the activity of the vital principle."

In the Phil. Transf. Vol. LXVI. Mr Hunter gives the following theory. The loss of motion in drowning, seems to arise from the loss of respiration; and the immediate effect this has upon the other vital motions of the animal, at least this privation of breathing, appears to be the first cause of the heart's motion ceasing. It is most probable, therefore, Mr Hunter observes, that the restoration of breathing is all that is necessary to restore the heart's motion; for if a sufficiency of life still remains to produce that effect, we may suppose every part equally ready to move the very instant in which the action of the heart takes place, their actions depending so much upon it. What makes it very probable, that the principal effect depends upon throwing air into the lungs, is, that children in the birth, when too much time has been spent after the loss of that life which is peculiar to the fœtus, lose altogether the disposition for the new life. In such cases there is a total suspension of the actions of life; the child remains to all appearance dead; and would die, if air was not thrown into its lungs, and the first principle of action by that means restored. To put this in a clearer light, Mr. Hunter gives the result of some experiments made on a dog in 1755.—A pair of double bellows were provided, which were so constructed, that by one action air was thrown into the lungs, and by the other the air was sucked out which had been thrown in by the former, without mixing them together. The muzzle of these bellows was fixed into the trachea of a dog, and by working them he was kept perfectly alive. While this artificial breathing was going on, the sternum was taken off, so that the heart and lungs were exposed to view. The heart then continued to act as before, only the frequency of its action was greatly increased. Mr Hunter then stopped the motion of the bellows; and observed that the contraction of the heart became gradually weaker and less frequent, till it left off moving altogether; but by renewing the operation, the motion of the heart also revived, and soon became as strong and frequent as before. This process was repeated upon the same dog ten times; sometimes stopping for five, eight, or ten minutes. Mr Hunter observed, that every time he left off working the bellows, the heart became extremely turgid with blood, and the blood in the left side became as dark as that in the right, which was not the case when the bellows were working. These situations of the animal, he observes, seem to be exactly similar to drowning.

Dr Edmund Goodwyn, in a treatise lately published on this subject, has endeavoured to ascertain the effects of submersion upon living animals in a more accurate manner than had hitherto been done. His first care was to determine the symptoms which took place before death; and to observe these, he procured a large glass bell in which the animals were to be immersed. Having inverted, and filled this with water, he put into it several cats, dogs, rabbits, and smaller animals, confining them among the water till they were apparently dead. In these experiments he observed, that immediately after submersion the pulse became weak and frequent; there was an apparent anxiety about the breast, and struggling to relieve it. In these struggles the animal rose to the top of the water, throwing out a quantity of air from the lungs. After this the anxiety increases, the pulse becomes weaker, and the struggles more violent; he rises again to the surface, throws out more air from the lungs, and in his efforts to

Drowning. to inſpire, a quantity of water commonly paſſes into the mouth. The ſkin about the face and lips then becomes blue, the pulſe ceaſes, the ſphincters are relaxed, and the animal falls down without ſenſe or motion. On diſſecting the bodies of drowned animals, our author met with the following appearances: 1. The external ſurface of the brain was darker, but the veſſels of it were not more turgid than uſual, nor was there any appearance of extravaſation. 2. The pulmonary arteries and veins were filled with black blood, and the lungs themſelves contained ſome frothy liquid. 3. Notwithſtanding theſe ſymptoms, the right auricle and ventricle were ſtill contracting and dilating; the left ſinus venoſus and auricle moving feebly, but the left ventricle at reſt. 4. The right and left auricles of the heart, the right ventricle, and the left ſinus venoſus, were filled with black blood; but the laſt ventricle only half filled with the ſame, and a quantity of the ſame black blood was alſo contained in the ſmaller branches of the arteries proceeding from the left ventricle.

This inveſtigation was followed by a moſt careful and ingenious inquiry concerning the cauſes of the ſymptoms already related. To find out whether or not the entrance of water into the lungs was the cauſe, or whether water really entered the lungs in theſe caſes or not, he drowned ſeveral animals among ink; and by inſpecting their bodies, found, that though water really did enter, it was in ſuch ſmall quantity that it could not be ſuppoſed capable of producing ſuch violent effects. To aſcertain this, however, more exactly than could be done by the ink, he drowned other animals in quickſilver; which, by reaſon of its not being miſcible with the animal fluids, could be more accurately collected. By theſe it appeard that no more than five drachms of the fluid in which a cat was immerſed entered her lungs in the time of drowning; and to determine whether or not this could be the occaſion of the animal's death, he made the following experiment: Having confined a cat in an erect poſture, he made a ſmall opening in the trachea, by cutting one of the cartilaginous rings; and through this opening he introduced two ounces of water into the lungs. The only conſequences were a difficulty of breathing and weak pulſe; but theſe ſoon abated, and it lived ſeveral hours afterwards without any apparent inconvenience. On ſtrangling it he found two ounces and a half of water in the lungs. On repeating the experiment with other fluids, he found the difficulty of breathing and alteration in the pulſe ſomewhat greater: but in theſe inſtances alſo they abated in a few hours; and when the animals were ſtrangled, the lungs were found to contain four ounces of fluid.

From all theſe experiments Dr Goodwyn draws the following concluſions: 1. "A ſmall quantity of fluid uſually paſſes into the lungs in drowning. 2. This water enters the lungs during the efforts to inſpire; and mixing with the pulmonary mucus, occaſions the frothy appearance mentioned by authors. 3. The whole of this fluid in the lungs is not ſufficient to produce the changes that take place in drowning. And hence it follows, that the water produces all the changes that take place in drowning *indirectly*, by excluding the atmoſpheric air from the lungs." This naturally leads to an inveſtigation of the uſes of reſpiration, and the effects of the air upon the blood and lungs in that action, which our author traces with great accuracy and very convincing experiments. He begins with attempting to determine the quantity of air drawn in at each inſpiration, with the proportional quantity left after expiration. The experiments by which he endeavoured to aſcertain theſe quantities ſeem to be more uncertain than the others, as indeed there are not data ſufficient for them. From ſuch as he had an opportunity of making, however, the following concluſions were deduced: 1. "The lungs contain 109 cubic inches of air after a complete expiration; and this quantity receives an additional quantity of 14 cubic inches during each inſpiration. 2. The dilatation of the lungs after exſpiration is to their dilatation after inſpiration as 109 to 123. 3. The blood circulates through the pulmonary veſſels in all the degrees of natural reſpiration. 4. The circulation through them, after expiration, is ſufficiently free to keep up the health of the ſyſtem."

The laſt part of our author's inquiry, *viz.* concerning the chemical changes produced in the air by reſpiration, and the effects of the air upon the blood itſelf, falls naturally to be conſidered under the article RESPIRATION: ſo that here we ſhall only obſerve in general, that his experiments evidently ſhow that the diſeaſe produced by drowning ariſes entirely from the excluſion of the atmoſpheric air or its dephlogiſticated part; for which reaſon he recommends inflating the lungs with that kind of air in preference to any other.

From theſe different views of this matter, phyſicians have differed conſiderably in their account of the methods to be followed in attempting the recovery of drowned perſons. De Haen recommends agitation of all kinds; every kind of ſtimulus applied to the mouth, noſe, and rectum; bleeding; heat, both by warm cloths and warm water; blowing air into the trachea; ſtimulants, ſuch as bliſters, warm aſhes, &c. applied to the head, ankles, thighs, pit of the ſtomach, and other parts.

Doctor Cullen's obſervations on this ſubject are as follow.—"With reſpect to the particular means to be employed for the recovery of drowned perſons, it is to be obſerved, in the firſt place, That ſuch as were recommended and practiſed, upon a ſuppoſition that the ſuffocation was occaſioned by the quantity of water taken into the body, and therefore to be evacuated again, were very unhappily adviſed. The hanging up of perſons by the heels, or ſetting them upon the crown of the head, or rolling the body upon a caſk, were generally practiſed, upon a ſuppoſition altogether falſe; or upon the ſuppoſition of a caſe which, if real, is apprehended to be irrecoverable. At the ſame time, theſe practices were always attended with the danger of burſting ſome veſſels in the brain or lungs, and of rendering thereby ſome caſes incurable that were not ſo from the drowning alone. All ſuch practices, therefore, are now very properly diſapproved of and forbid.

"In thoſe caſes in which the body has not been long in the water, and in which therefore the natural heat is not entirely extinguiſhed, nor the irritability of the moving fibres very greatly impaired, it is poſſible that a good deal of agitation of the body may be the only means neceſſary to reſtore the action of the vital organ;

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gans: but in other cases, where the heat and irritability have ceased to a greater degree, it is to me very doubtful, if much agitation can be safe, and if any degree of it can be useful, till the heat and irritability are in some measure restored. In all cases, any violent concussion cannot be safe, and, I believe, is never necessary. It may be proper here to observe also, that in transporting the body from the place where it is taken out of the water, to the place where it may be necessary for applying the proper means of its recovery, all postures exposing to any improper compression, as that of the body's being carried over a man's shoulder, are to be avoided. The body is to be kept stretched out, with the head and upper parts a little raised; and care is to be taken to avoid the neck's being bent much forward. In this manner, laid upon one side, and upon some straw in a cart, it may be most properly conveyed; and the agitation which a pretty brisk motion of the cart may occasion, will, in most cases, do no harm.

"From the account I have given above of the causes, or of the appearances, of death, in drowned persons, it is evident, that the first step to be taken for their recovery is to restore the heat of the body, which is absolutely necessary to the activity of the moving fibres. For this purpose, the body, as soon as possible, is to be stripped of its wet clothes, to be well dried, and to be wrapped up in dry, and (if possible) warm, coverings: and it is to be wished, in all cases, as soon as the report of a person's being drowned is heard, that blankets should be immediately carried to the water-side; so that, as soon as the body is got out of the water, the change of covering just now mentioned may be instantly made; or, if the body has been naked when drowned, that it may be immediately dried, and defended against the cold of the air. Besides covering the body with blankets, it will be further of advantage, if it can be done without loss of time, to cover the drowned body with a warm shirt or waistcoat immediately taken from a living person.

"When, at the time of a person's being drowned, it happens that the sun shines out very hot, I think there can be no better means of recovering the heat, than by exposing the naked body, in every part, to the heat of the sun; while, at the same time, all other means necessary or useful for the recovery of life are also employed.

"When the heat of the sun cannot be employed, the body should be immediately transported to the nearest house that can be got convenient for the purpose: the fittest will be one that has a tolerably large chamber, in which a fire is ready, or can be made; and if possible, the house should afford another chamber, in which also a fire can be provided.

"When the drowned body is brought into such house, and care is at the same time taken that no more people are admitted than are absolutely necessary to the service of the drowned person, every endeavour must be immediately employed for recovering the heat of the body, and that by different measures, as circummances shall direct.

"If, in the neighbourhood of the place, there be any brewery, distillery, dyery, or fabric which gives an opportunity of immediately obtaining a quantity of warm water and a convenient vessel, there is nothing more proper than immersing the body in a warm bath. Even where a sufficient quantity of warm water cannot be had at once, the bath may be still practised, if the accident has happened in or very near a town or village, when a great many fires may be at once employed in heating small quantities of water; for in this way the necessary quantity may be soon obtained. To encourage this practice, it is to be observed, that one part of boiling water is more than sufficient to give the necessary heat to two parts of spring or sea water, as it is not proper to apply the bath at first very warm, nor even of the ordinary heat of the human body, but somewhat under it; and, by the addition of warm water, to bring it gradually to a heat very little above it.

"If the drowned body be of no great bulk, it may be conveniently warmed by a person's lying down in bed with it, and taking it near to their naked body, changing the position of it frequently, and at the same time chaffing and rubbing with warm cloths the parts which are not immediately applied to their warm body.

"If none of these measures can be conveniently practised, the body is to be laid upon a bed before a moderate fire, and frequently turned, to expose the different parts of it; and thus, by the heat of the fire gradually applied, and by rubbing the body well with coarse towels, or other cloths well warmed, pains are to be taken for restoring its heat. This will be promoted by warm cloths applied and frequently renewed under the hams and arm-pits; and by hot-bricks, or bottles of warm water, laid to the feet.

"In the practice of rubbing, it has been proposed to moisten the cloths applied with camphorated spirits, or other such stimulating substances: but I think this must prove an impediment to the rubbing; and I would not recommend any practice of this kind, except, perhaps, the application of the vinous spirit of sal ammoniac to the wrists and ankles only.

"For recovering the heat of the body, it has been proposed to cover it all over with warm grains, ashes, sand, or salt; and where these, sufficiently warm, are ready at hand, they may be employed; but it is very seldom they can be obtained, and the application might often interfere with other measures that may be necessary. All therefore that I can propose, with respect to the use of these, is to observe, that bags of warm and dry salt may be among the most convenient applications to the feet and hands of drowned persons; and the quantity necessary for this purpose may be got pretty quickly by heating the salt in a frying-pan over a common fire.

"While these measures are taking for recovering the heat, means are at the same time to be employed for restoring the action of the moving fibres. It is well known, that the intestines are the parts of the body which, both from their internal situation and peculiar constitution, retain the longest their irritability; and therefore, that, in drowned persons, stimulants applied may have more effect upon the intestines than upon other parts. The action, therefore, of the intestines is to be supported or renewed as soon as possible; as the restoring and supporting the action of such a considerable

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siderable portion of moving fibres as those of the intestines, must contribute greatly to restore the activity of the whole system.

"For exciting the action of the intestines, the most proper mean is, the application of their ordinary stimulus of dilatation; and this is most effectually applied, by forcing a quantity of the air into them by the fundament. Even the throwing in cold air has been found useful: but it will certainly be better if heated air can be employed; and further, if that air can be impregnated with something, which, by its acrimony also, may be powerful in stimulating the intestines.

"From all these considerations, the smoke of burning tobacco has been most commonly applied, and has upon many occasions proved very effectual. This will be most properly thrown in by a particular apparatus, which, for other purposes as well as this, should be in the hands of every surgeon; or at least should, at the public expence, be at hand in every part of the country where drownings are likely to happen. With regard to the use of it, I have to observe, that till the tobacco is kindled in a considerable quantity, a great deal of cold air is blown through the box and tube; and as that, as hinted above, is not so proper, care should be taken to have the tobacco very well kindled, and to blow through it very gently, till the heated smoke only passes through. If, upon certain occasions, the apparatus referred to should not be at hand, the measure however may be executed by a common tobacco pipe, in the following manner: A common glyster-pipe that has a bag mounted upon it, is to be introduced into the fundament, and the mouth of the bag is to be applied round the small end of a tobacco-pipe. In the bowl of this, tobacco is to be kindled; and, either by a playing card made into a tube and applied round the mouth of the bowl, or by applying upon this the bowl of another pipe that is empty, and blowing through it, the smoke may be thus forced into the intestines, and, in a little time, in a considerable quantity.

"If none of these means for throwing in the smoke can be employed, it may be useful to inject warm water to the quantity of three or four English pints. This may be done by a common glyster-bag and pipe, but better by a large syringe; and it may be useful to dissolve in the water some common salt, in the proportion of half an ounce to an English pint; and also, to add to it some wine or brandy.

"While these measures for recovering the heat of the body and the activity of the moving fibres are employed, and especially after they have been employed for some time, pains are to be taken to complete and finish the business, by restoring the action of the lungs and heart.

"On this subject, I am obliged to my learned and ingenious colleague Dr Monro, who has made some experiments for ascertaining the best manner of inflating the lungs of drowned persons. By these experiments he finds it may be more conveniently done by blowing into one of the nostrils, than by blowing into the mouth. For blowing into the nostril, it is necessary to be provided with a wooden pipe, fitted at one extremity for filling the nostril, and at the other for being blown into by a person's mouth, or for receiving the pipe of a pair of bellows, to be employed for the same purpose. Doctor Monro finds, that a person of ordinary strength can blow into such a pipe, with a sufficient force to inflate the lungs to a considerable degree; and thinks the warm air from the lungs of a living person will be most conveniently employed at first; but when it is not soon effectual in restoring the respiration of the drowned person, and that a longer continuance of the inflation is necessary, it may be proper to employ a pair of bellows, large enough at once to contain the quantity of air necessary to inflate the lungs to a due degree.

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"Whether the blowing-in is done by a person's mouth, or by bellows, Dr Monro observes, that the air is ready to pass by the gullet into the stomach; but that this may be prevented, by pressing the lower part of the larynx backwards upon the gullet. To persons of a little knowledge in anatomy, it is to be observed, that the pressure should be only upon the cricoid cartilage, by which the gullet may be straitened, while the passage through the larynx is not interrupted.

"When, by blowing thus into the nostril, it can be perceived, by the raising of the chest or belly, that the lungs are filled with air, the blowing in should cease; and by pressing the breast and belly, the air received into the lungs should be again expelled; then the blowing and expulsion should be again repeated; and thus the practice is to be continued, so as to imitate, as exactly as possible, the alternate motions of natural respiration.

"It is hardly necessary to observe, that when the blowing into the nostril is practised, the other nostril and the mouth should be accurately closed.

"If it should happen that in this practice the air does not seem to pass readily into the lungs, Doctor Monro informs me it is very practicable to introduce directly into the glottis and trachea a crooked tube, such as the catheter used for a male adult. For this he offers the following directions: The surgeon should place himself on the right side of the patient; and, introducing the forefinger of his left hand at the right corner of the patient's mouth, he should push the point of it behind the epiglottis; and using this as a directory, he may enter the catheter, which he holds in his right hand, at the left corner of the patient's mouth, till the end of it is passed beyond the point of his forefinger; and it is then to be let fall, rather than pushed into the glottis; and through this tube, by a proper syringe applied to it, air may be with certainty blown into the lungs. I observe, that some such measure had been proposed by Monf. le Cat in France; but I have not learned that it has ever been put in practice, and I am afraid it may be attended with several difficulties, and must be left to the discretion of surgeons, who may be properly provided and instructed for this purpose.

"For throwing air with more certainty into the lungs, it has been proposed to open the windpipe in the same manner as is done in the operation which the surgeons call *bronchotomy*, and by this opening to blow into the lungs; and when the blowing into the nostril does not seem to succeed, and a skilful operator is at hand, I allow that the measure may be tried; but I can hardly suppose, that it will be of any advantage when the blowing in by the nostril has entirely failed.

"It is to be hoped, that by blowing into the lungs one way or other, even a quantity of water which had been

been taken into the lungs may be again washed out; and the same seems to be the only effectual means of washing out that frosty matter which is found to fill the lungs of drowned persons, and which proves, if I mistake not, the most common cause of their mortal suffocation. This practice, therefore, is to be immediately entered upon, and very assiduously continued for an hour or two together.

"I have now mentioned the measures chiefly to be pursued and depended upon for the recovery of drowned persons; but must still mention some others that may prove considerable helps to it.

"One of these is, the opening the jugular veins to relieve the congestion, which almost constantly occurs in the veins of the head, and is probably a frequent cause of the death of drowned persons. For relieving this congestion, the drawing some blood from the jugulars, very early, may certainly be of service; and it will be particularly indicated by the livid and purple colour of the face. It may even be repeated, according to the effect it seems to have in taking off that suffusion; but when the drowned person is in some measure recovered, and some motion of the blood is restored, it will be proper to be very cautious in making this evacuation, and at least to take care not to push it so far as to weaken too much the recovering, but still weak, powers of life.

"Another measure for recovering the activity of the vital principle, is the application of certain stimulants to the more sensible parts of the body, such as holding the quick-lime spirit of sal ammoniac to the nose, or putting a little of it upon a rag into the nostrils. It has been usual to pour some liquors into the mouth; but it is dangerous to pour in any quantity of liquid, till it appear that the power of swallowing is in some measure restored.

"When a surgeon is at hand, and is provided with proper apparatus, a crooked pipe may be introduced into the gullet; and by this a gill or two of warm wine may be poured down into the stomach, and probably with advantage. But when no such apparatus is at hand, or surgeon to employ it, and the power of swallowing is still doubtful, the trial of pouring liquids into the mouth should be made by a small quantity of warm water alone; and when, from such trial, the power of swallowing shall appear to be recovered, it may then be allowable to favour the further recovery of the person, by pouring in some wine or brandy.—In short, till some marks of the recovery of swallowing and respiration appear, it will not be safe to apply any stimulants to the mouth; excepting that of a few drops of some acrid substance to the tongue, and which are not of bulk enough to slide back upon the glottis: I can think of no stimulant more conveniently and safely to be applied to the mouth and nostrils, than a moderate quantity of tobacco-smoke blown into them.

"Though I do not imagine that drowned persons are ever hurt by the quantity of water taken into their stomach, yet, as a stimulus applied to the stomach, and particularly as the action of vomiting proves a stimulus to the whole system, I can have no objection to the French practice of throwing in an emetic as soon as any swallowing is restored. For this purpose, I would successively throw in some tea-spoonfuls of the ipecacuanha wine; and when it does not interfere with other necessary measures, the fauces may be gently irritated by an oiled feather thrust into them.

"With regard to the stimulants, I must conclude with observing, That when a body has lain but for a short time in the water, and that therefore its heat and irritability are but little impaired, the application of stimulants alone has been often found effectual for the recovery: but, on the contrary, when the body has lain long in the water, and the heat of it is very much extinguished, the application of any other stimulants than that of tobacco-smoke to the intestines can be of very little service; and the application of others ought never to interfere with the measures for recovering heat and the motion of respiration.

"With respect to the whole of these practices, I expect, from the principles upon which they are in general recommended, it will be understood, that they are not to be soon discontinued, though their effects do not immediately appear. It is obvious, that in many cases, it may be long before the heat of the body, and the activity of the vital principle, can be restored, and though, in a longer time, it may very possibly be accomplished. In fact, it has often happened, that tho' means employed for one hour have not succeeded, the same continued for two or more hours, have at length had the wished for effects. It should therefore be a constant rule, in this business, that the proper means should be employed for several hours together; unless it happen, that, while no symptoms of returning life appear, the symptoms of death shall, at the same time, go on constantly increasing.

"In the whole of the above I have kept in view chiefly the case of drowned persons: but it will be obvious, that many of the measures proposed will be equally proper and applicable in other cases of suffocation; as those from strangling, the damps of mines, the fumes of charcoal, &c.; and a little attention to the difference of circumstances will lead to the measures most proper to be employed."

Mr Hunter, in the before-mentioned paper, differs pretty considerably from De Haen and Dr Cullen. He observes, that when assistance is soon called in after immersion, blowing air into the lungs will in some cases effect a recovery; but when any considerable time has been lost, he advises stimulant medicines, such as the vapour of volatile alkali, to be mixed with the air; which may easily be done, by holding spirits of harshorn in a cup under the receiver of the bellows. And, as applications of this kind to the olfactory nerves tend greatly to rouse the living principle, and put the muscles of respiration into action, it may probably therefore, be most proper to have air impregnated in that manner thrown in by the nose. To prevent the stomach and intestines from being too much distended by the air so injected, the larynx is directed to be gently pressed against the œsophagus and spine.

While this business is going on, an assistant should prepare bed-cloaths, carefully brought to a proper degree of heat. Heat our author considers as congenial with the living principle; increasing the necessity of action, it increases action; cold, on the other hand, lessens the necessity, and of course the action is diminished: to a due degree of heat, therefore, the living principle,

principle, he thinks, owes its vigour. From experiments, he ſays, it appears to be a law in animal bodies, that the degree of heat ſhould bear a proportion to the quantity of life; as life is weakened, this proportion requires great accuracy, while greater powers of life allow it greater latitudes.

After theſe and ſeveral other obſervations on the ſame ſubject, our author proceeds to more particular directions for the management of drowned people.

If bed-cloaths are put over the perſon, ſo as ſcarce to touch him, ſteams of volatile alkali, or of warm balſams, may be thrown in, ſo as to come in contact with many parts of the body. And it might probably be advantageous, Mr Hunter obſerves, to have ſteams of the ſame kind conveyed into the ſtomach. This, we are told, may be done by a hollow bougie and a ſyringe; but the operation ſhould be very ſpeedily performed, as the inſtrument, by continuing long in the mouth, might produce ſickneſs, which our author ſays he would always wiſh to avoid.

Some of the warm ſtimulating ſubſtances, ſuch as juice of horſe-radiſh, peppermint water, and ſpirits of hartſhorn, are directed to be thrown into the ſtomach in a fluid ſtate, as alſo to be injected by the anus. Motion poſſibly may be of ſervice; it may at leaſt be tried: but as it hath leſs effect than any other of the uſually preſcribed ſtimuli, it is directed to be the laſt part of the proceſs.

The ſame care in the operator, in regulating the proportion of every one of theſe means, is here directed, as was formerly given for the application of heat. For every one of them, our author obſerves, may poſſibly have the ſame property of deſtroying entirely the feeble action which they have excited, if adminiſtered in too great a quantity: inſtead, therefore, of increaſing and haſtening the operations on the firſt ſigns of returning life being obſerved, as is uſually done, he deſires they may be leſſened; and adviſes their increaſe to be afterwards proportioned, as nearly as poſſible, to the quantity of powers as they ariſe.

When the heart begins to move, the application of air to the lungs ſhould be leſſened, that, when the muſcles of reſpiration begin to act, a good deal may be left for them to do.

Mr Hunter abſolutely forbids blood-letting in all ſuch caſes; for, as it not only weakens the animal principle, but leſſens life itſelf, it muſt conſequently, he obſerves, leſſen both the powers and diſpoſitions to action. For the ſame reaſon, he is againſt introducing any thing into the ſtomach that might produce ſickneſs or vomiting; and, on the ſame principle, he ſays, we ſhould avoid throwing tobacco fumes, or any other ſuch articles, up by the anus, as might tend to an evacuation that way.

The following is a deſcription of inſtruments recommended for ſuch operations by our author.

Firſt, A pair of bellows, ſo contrived, with two ſeparate cavities, that, by opening them when applied to the noſtrils or mouth of a patient, one cavity will be filled with common air, and the other with air ſucked out from the lungs, and by ſhutting them again, the common air will be thrown into the lungs, and that ſucked out of the lungs diſcharged into the room. The pipe of theſe ſhould be flexible; in length a foot, or a foot and an half; and, at leaſt, three-eighths of an inch in width. By this the artificial breathing may be continued, while the other operations, the application of the ſtimuli to the ſtomach excepted, are going on, which could not be conveniently done if the muzzle of the bellows were introduced into the noſe. The end next the noſe ſhould be double, and applied to both noſtrils. *Secondly*, A ſyringe, with a hollow bougie, or flexible catheter, of ſufficient length to go into the ſtomach, and convey any ſtimulating matter into it, without affecting the lungs. *Thirdly*, A pair of ſmall bellows, ſuch as are commonly uſed in throwing fumes of tobacco up by the anus.

Notwithſtanding the differences in theory, however, between the phyſicians abovementioned, it is certain, that within theſe few years great numbers of drowned people have been reſtored to life by a proper uſe of the remedies we have enumerated, and ſocieties for the recovery of drowned perſons have been inſtituted in different places. The firſt ſociety of this kind was inſtituted in Holland, where, from the great abundance of canals and inland ſeas, the inhabitants are particularly expoſed to accidents by water. In a very few years 150 perſons were ſaved from death by this ſociety; and many of theſe had continued upwards of an hour without any ſigns of life, after they had been taken out of the water. The ſociety was inſtituted at Amſterdam in 1767: and, by an advertiſement, informed the inhabitants of the United Provinces of the methods proper to be uſed on ſuch occaſions; offering rewards at the ſame time to thoſe who ſhould, with or without ſucceſs, uſe thoſe methods for recovering perſons drowned and ſeemingly dead. The laudable and humane example of the Dutch was followed in the year 1768 by the magiſtrates of health in Milan and Venice; afterwards by the magiſtrates of Hamburg in the year 1771, by thoſe of Paris in the year 1772, and by the magiſtrates of London in 1774.

The following directions are given for the recovery of drowned perſons by the ſociety at London.

I. As ſoon as the patient is taken out of the water, the wet cloaths, if the perſon is not naked at the time of the accident, ſhould be taken off with all poſſible expedition on the ſpot (unleſs ſome convenient houſe be very near), and a great-coat or two, or ſome blankets if convenient, ſhould be wrapped round the body.

II. The patient is to be thus carefully conveyed in the arms of three or four men, or on a bier, to the neareſt public or other houſe, where a good fire, if in the winter ſeaſon, and a warm bed, can be made ready for its reception. As the body is conveying to this place, great attention is to be paid to the poſition of the head; it muſt be kept ſupported in a natural and eaſy poſture, and not ſuffered to hang down.

III. In cold or moiſt weather, the patient is to be laid on a matraſs or bed before the fire, but not too near, or in a moderately heated room: in warm and ſultry weather, on a bed only. The body is then to be wrapped as expeditiouſly as poſſible with a blanket, and thoroughly dried with warm coarſe cloths or flannels.

IV. In ſummer or ſultry weather too much air cannot be admitted. For this reaſon it will be neceſſary to ſet open the windows and doors, as cool refreſhing air is of the greateſt importance in the proceſs of reſuſcitation.

V. Not

V. Not more than ſix perſons are to be preſent to apply the proper means ; a greater number will be uſeleſs, and may retard, or totally prevent, the reſtoration of life, by rendering the air of the appartment unwholeſome. It will be neceſſary, therefore, to requeſt the abſence of thoſe who attend merely from motives of curioſity.

VI. It will be proper for one of the aſſiſtants, with a pair of bellows of the common ſize, applying the pipe a little way up one noſtril, to blow with ſome force, in order to introduce air into the lungs ; at the ſame time the other noſtril and the mouth are to be cloſed by another aſſiſtant, whilſt a third perſon gently preſſes the cheſt with his hands, after the lungs are obſerved to be inflated. By purſuing this proceſs, the noxious and ſtagnant vapours will be expelled, and natural breathing imitated. If the pipe of the bellows be too large, the air may be blown in at the mouth, the noſtrils at the ſame time being cloſed, ſo that it may not eſcape that way : but the lungs are more eaſily filled, and natural breathing better imitated, by blowing up the noſtril.

VII. Let the body be gently rubbed with common ſalt, or with flannels, ſprinkled with ſpirits, as rum or geneva (A). A warming-pan heated (the body being ſurrounded with flannel) may be lightly moved up and down the back. Fomentations of hot brandy are to be applied to the pit of the ſtomach, loins, &c. and often renewed. Bottles filled with hot water, heated tiles covered with flannel, or hot bricks, may be efficaciouſly applied to the ſoles of the feet, palms of the hands, and other parts of the body. The temples may be rubbed with ſpirits of hartſhorn, and the noſtrils now and then tickled with a feather ; and ſnuff, or *eau de luce*, ſhould be occaſionally applied.

VIII. Tobacco fumes ſhould be thrown up the fundament ; if a fumigator be not at hand, the common pipe may anſwer the purpoſe. The operation ſhould be frequently performed, as it is of importance ; for the good effects of this proceſs have been experienced in a variety of inſtances of ſuſpended animation. But ſhould the application of tobacco-ſmoke in this way not be immediately convenient, or other impediments ariſe, clyſters of this herb, or other acrid infuſions with ſalt, &c. may be thrown up with advantage.

IX. When theſe means have been employed a conſiderable time without ſucceſs, and any brewhouſe or warm bath can be readily obtained, the body ſhould be carefully conveyed to ſuch a place, and remain in the bath, or ſurrounded with warm grains, for three or four hours.

If a child has been drowned, its body ſhould be wiped perfectly dry, and immediately placed in bed between two healthy perſons. The ſalutary effects of the natural vital warmth, conveyed in this manner, have been proved in a variety of ſucceſsful caſes.

X. While the various methods of treatment are employed, the body is to be well ſhaken every ten minutes, in order to render the proceſs of animation more certainly ſucceſsful ; and children, in particular, are to be much agitated, by taking hold of their legs and arms frequently and for a continuance of time. In various inſtances agitation has forwarded the recovery of boys who have been drowned, and continued for a conſiderable time apparently dead.

XI. If there be any ſigns of returning life, ſuch as ſighing, gaſping, or convulſive motions, a ſpoonful of any warm liquid may be adminiſtered ; and if the act of ſwallowing is returned, then a cordial of warm brandy or wine may be given in ſmall quantities and frequently repeated.

XII. Electricity may be tried by the judicious and ſkilful, as its application neither prevents nor retards the various modes of recovery alread recommended ; but, on the other hand, will moſt probably tend to render the other means employed more certainly and more expeditiouſly efficacious. This ſtimulus bids fair to prove an important auxiliary in caſes of ſuſpended animations ; and therefore deſerves the ſerious regard and attention of the Faculty.

The methods which have been fully deſcribed, are to be employed with vigour for three hours or upwards, although no favourable circumſtances ſhould ariſe ; for it is a vulgar and dangerous opinion to ſuppoſe that perſons are irrecoverable, becauſe life does not ſoon make its appearance ; an opinion that has conſigned to the grave an immenſe number of the ſeemingly dead, who might have been reſtored to life by reſolution and perſeverance.

Bleeding is never to be employed in ſuch caſes, unleſs by the direction of one of the medical aſſiſtants, or ſome other gentleman of the faculty who has paid attention to the reſuſcitating art.

DRUG, a general term for goods of the druggiſt and grocery kinds, eſpecially thoſe uſed in medicine and dyeing. See MATERIA MEDICA, PHARMACY, and DYEING.

DRUGGET, in commerce, a ſtuff ſometimes all wool, and ſometimes half wool half thread, ſometimes corded, but uſually plain. Thoſe that have the woof of wool, and the warp of thread, are called *threaded druggets* ; and thoſe wrought with the ſhuttle on a loom of four marches, as the ſerges of Moui, Beauvois, and other like ſtuffs corded, are called *corded druggets*. As to the plain, they are wrought on a loom of two marches, with the ſhuttle, in the ſame manner as cloth, camblets, and other like ſtuffs not corded.

DRUIDÆ, or DROIUM (anc. geog.), a very ancient town, the principal place of the Druides or Druidæ in Gaul, as they are called (Cæſar, Cicero). Now *Dreux* in the Orleannois. Here they met every year in a conſecrated grove, according to Cæſar. The town was alſo called *Durocaſes*. W. Long. 1. 21. Lat. 48. 45.

DRUIDS, DRUIDES, or DRUIDÆ, the prieſts or miniſters of religion among the ancient Celtæ or Gauls, Britons, and Germans.

Some authors derive the word from the Hebrew דרושים *deruſſim*, or *druſſim*, which they tranſlate *contemplatores*. Picard, Celtopæd. lib. ii. p. 58. believes the druids to have been thus called from *Druis*, or *Dryius*, their leader, the fourth or fifth king of the Gauls ;

(A) Dr Fothergill of Bath, in a letter to the Regiſter, adviſes as a potent and active ſtimulus the patent muſtard moiſtened with ſpirits.

Druids. Gauls, and father of Saron or Naumes. Pliny, Salmasius, Vigenere, &c. derive the name from δρυς, *oak*; on account of their inhabiting, or at least frequenting, and teaching in forests; or perhaps because, as Pliny says, they never sacrificed but under the oak. But it is hard to imagine how the druids should come to speak Greek. Menage derives the word from the old British *drus*, "dæmon, magician." Borel, from the Saxon *dry*, "magician:" or rather from the old British *dru*, or *derw*, "oak," whence he takes δρυς to be derived; which is the most probable supposition. Gorop. Becanus, lib. i. takes *druis* to be an old Celtic and German word, formed from *trowis* or *truwis*, "a doctor of the truth and the faith;" which etymology Vossius acquiesces in.

1 General account of the druids.

The druids were the first and most distinguished order among the Gauls and Britons; they were chosen out of the best families; and the honours of their birth, joined with those of their function, procured them the highest veneration among the people. They were versed in astrology, geometry, natural philosophy, politics, and geography; they were the interpreters of religion, and the judges of all affairs indifferently. Whoever refused obedience to them was declared impious and accursed. We know but little as to their peculiar doctrines; only that they believed the immortality of the soul; and, as is generally also supposed, the metempsychosis; though a late author makes it appear highly probable they did not believe this last, at least not in the sense of the Pythagoreans.

The chief settlement of the druids in Britain was in the isle of Anglesey, the ancient *Mona*, which they might choose for this purpose, as it is well stored with spacious groves of their favourite oak. They were divided into several classes or branches, viz. the *vacerri*, *bardi*, *eubages*, *semnothii* or *semnothei*, and *saronidæ*. The *vacerri* are held to have been the priests; the *bardi*, the poets; the *eubages*, the augurs; and the *saronidæ*, the civil judges and instructors of youth. As to the *semnothei*, who are said to have been immediately devoted to the service of religion, it is probable they were the same with the *vacerri*. Strabo, however, (lib. iv. p. 197.) and Picard after him in his Celtopædia, do not comprehend all these different orders under the denomination of druids, as species under their genus, or parts under the whole; but make them quite different conditions or orders. Strabo, in effect, only distinguishes three kinds; *bardi*, *vates*, and *druids*. The *bardi* were the poets; the *vates*, ουατεις (apparently the same with the *vacerri*), were the priests and naturalists; and the *druids*, beside the study of nature, applied likewise themselves to morality.

Diogenes Laertius assures us, in his Prologue, that the druids were the same among the ancient Britons with the sophi or philosophers among the Greeks; the magi among the Persians; the gymnosophists among the Indians; and the Chaldeans among the Assyrians.

Their garments were remarkably long; and, when employed in religious ceremonies, they always wore a white surplice. They generally carried a wand in their hands; and wore a kind of ornament enchased in gold about their necks, called the *druid's egg*. Their necks were likewise decorated with gold chains, and their hands and arms with bracelets: they wore their hair very short, and their beards remarkably long.

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The druids had one chief, or arch-druid, in every nation, who acted as high-priest, or *pontifex maximus*. He had absolute authority over the rest: and commanded, decreed, punished, &c. at pleasure. At his death he was succeeded by the most considerable among his survivors; and, if there were several pretenders, the matter was ended by an election, or else put to decision of arms.

The druids, we have observed, were in the highest esteem. They presided at sacrifices, and other ceremonies: and had the direction of every thing relating to religion. The British and Gaulish youth flocked to them in crowds, to be instructed by them. The children of the nobility, Mela tells us, they retired with into caves, or the most desolate parts of forests, and kept them there sometimes for twenty years under their discipline. Beside the immortality and metempsychosis, they were here instructed in the motion of the heavens, and the course of the stars; the magnitude of the heavens and the earth; the nature of things; the power and wisdom of the gods, &c. They preserved the memory and actions of great men in their verses, which they never allowed to be wrote down, but made their pupils get them by heart. In their common course of learning, they are said to have taught them twenty-four thousand such verses. By this means their doctrines appeared more mysterious by being unknown to all but themselves; and having no books to recur to, they were the more careful to fix them in their memory.

They worshipped the supreme Being under the name of *Esus*, or *Hesus*, and the symbol of the oak; and had no other temple than a wood or a grove, where all their religious rites were performed. Nor was any person admitted to enter that sacred recess, unless he carried with him a chain, in token of his absolute dependence on the Deity. Indeed, their whole religion originally consisted in acknowledging, that the Supreme Being, who made his abode in these sacred groves, governed the universe; and that every creature ought to obey his laws, and pay him divine homage.

They considered the oak as the emblem, or rather the peculiar residence, of the Almighty; and accordingly chaplets of it were worn both by the druids and people in their religious ceremonies, the altars were strewed with its leaves and encircled with its branches. The fruit of it, especially the misletoe, was thought to contain a divine virtue, and to be the peculiar gift of heaven. It was therefore sought for on the sixth day of the moon with the greatest earnestness and anxiety; and when found was hailed with such raptures of joy, as almost exceeds imagination to conceive. As soon as the druids were informed of this fortunate discovery, they prepared every thing ready for the sacrifice under the oak, to which they fastened two white bulls by the horns; then the arch-druid, attended by a prodigious number of people, ascended the tree, dressed in white; and with a consecrated golden knife, or pruning hook, cropped the misletoe, which he received in his sagum or robe, amidst the rapturous exclamations of the people. Having secured

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cured this sacred plant, he descended the tree; the bulls were sacrificed; and the Deity invoked to bless his own gift, and render it efficacious in those distempers in which it should be administered.

The consecrated groves, in which they performed their religious rites, were fenced round with stones, to prevent any person's entering between the trees, except through the passages left open for that purpose, and which were guarded by some inferior druids, to prevent any stranger from intruding into their mysteries. These groves were of different forms; some quite circular, others oblong, and more or less capacious as the votaries in the districts to which they belonged were more or less numerous. The area in the centre of the grove was encompassed with several rows of large oaks set very close together. Within this large circle were several smaller ones surrounded with large stones; and near the centre of these smaller circles, were stones of a prodigious size and convenient height, on which the victims were slain and offered. Each of these being a kind of altar, was surrounded with another row of stones, the use of which cannot now be known, unless they were intended as cinctures to keep the people at a convenient distance from the officiating priest.

Suetonius, in his life of Claudius, assures us the druids sacrificed men; and Mercury is said to be the god to whom they offered these victims. Diod. Siculus, lib. vi. observes it was only upon extraordinary occasions they made such offerings; as, to consult what measures to take, to learn what should befal them, &c. by the fall of the victim, the tearing of his members, and the manner of his blood gushing out. Augustus condemned the custom, and Tiberius and Claudius punished and abolished it.

We learn from Cæsar, that the druids were the judges and arbiters of all differences and disputes, both public and private; they took cognizances of murders, inheritances, boundaries, and limits; and decreed rewards and punishments. Such as disobeyed their decisions they excommunicated, which was their principal punishment; the criminal being hereby excluded from all public assemblies, and avoided by all the world, so that nobody durst speak to him for fear of being polluted. Strabo observes, they had sometimes interest and authority enough to stop armies upon the point of engaging, and accommodate their differences.

2 Their opinions and philosophy, whence derived.

It hath been disputed, whether the druids were themselves the inventors of their opinions and systems of religion and philosophy, or received them from others. Some have imagined, that the colony of Phocians which left Greece and built Marseilles in Gaul about the 57th Olympiad, imported the first principles of learning and philosophy, and communicated them to the Gauls and other nations in the west of Europe. It appears, indeed, that this famous colony contributed not a little to the improvement of that part of Gaul where it settled, and to the civilization of its inhabitants. "The Greek colony of Marseilles, (says Justin) civilized the Gauls, and taught them to live under laws; to build cities and inclose them with walls; to raise corn; to cultivate the vine and olive; and, in a word, made so great a change both in the face of the country and the manners of its inhabitants, that Gaul seemed to be translated into Greece, rather than a few Greeks transplanted into Gaul." But though we may allow that the druids of Gaul and Britain borrowed some hints and embellishments of their philosophy from this Greek colony, and perhaps from other quarters, we have reason to believe that the substance of it was their own. Others have suggested, that the druids derived their philosophy from Pythagoras, who published his doctrines at Crotona in Italy; where he lived in the higest reputation for his virtue, wisdom, and learning, above 20 years. This conjecture is very much confirmed by this remarkable expression of Ammianus Marcellinus, "That the druids were formed into fraternities, as the authority of Pythagoras decreed." It hath been also observed, that the philosophy of the druids bore a much greater resemblance to that of Pythagoras than to that of any of the other sages of antiquity. But it seems probable, that Ammianus meant no more by the above expression than to illustrate the nature of the druidical fraternities, by comparing them to those of the Pythagoreans, which were well known to the Romans; and the resemblance between the Pythagorean and druidical philosophy may perhaps be best accounted for by supposing, that Pythagoras learned and adopted some of the opinions of the druids, as well as imparted to them some of his discoveries. It is well known, that this philosopher, animated by the most ardent love of knowledge, travelled into many countries in pursuit of it, and got himself admitted into every society that was famous for its learning. It is therefore highly probable in itself, as well as directly asserted by several authors, that Pythagoras heard the druids of Gaul, and was initiated into their philosophy.

3 More particular account of the learning of the druids

From the concurring testimonies of several authors, it appears that physiology, or natural philosophy, was the favourite study of the druids of Gaul and Britain. Cicero tells us that he was personally acquainted with one of the Gaulish druids, Divitiacus the Æduan, a man of quality in his country, who professed to have a thorough knowledge of the laws of nature, or that science which the Greeks call *physics* or *physiology*. According to Diodorus Siculus, Strabo, Cæsar, Mela, Ammianus Marcellinus, and others, they entered into many disquisitions and disputations in their schools, concerning the form and magnitude of the universe in general, and of this earth in particular, and even concerning the most sublime and hidden secrets of nature. On these and the like subjects they formed a variety of systems and hypotheses; which they delivered to their disciples in verse, that they might the more easily retain them in their memories, since they were not allowed to commit them to writing. Strabo hath preserved one of the physiological opinions of the druids concerning the universe; *viz.* that it was never to be entirely destroyed or annihilated; but was to undergo a succession of great changes and revolutions, which were to be produced sometimes by the power and predominancy of water, and sometimes by that of fire. This opinion, he intimates, was not peculiar to them, but was entertained also by the philosophers of other nations; and Cicero speaks of it as a truth universally acknowledged and undeniable. "It is impossible for us (says he) to attain a glory that is eternal, or even of very long duration, on account of those deluges and conflagrations of the earth

4 Physics, or natural philosophy.

earth which muſt neceſſarily happen at certain periods." This opinion, which was entertained by the moſt ancient philoſophers of many different and very diſtant nations, was probably neither the reſult of rational enquiry in all theſe nations, nor communicated from one of them to others; but deſcended to them all from their common anceſtors of the family of Noah by tradition, but corrupted and miſunderſtood through length of time. The agreement of the druids with the philoſophers of ſo many other nations in this opinion about the alternate diſſolution and renovation of the world, gives us reaſon to believe, that they agreed with them alſo in their opinion of its origin from two diſtinct principles; the one intelligent and omnipotent, which was God; the other inanimate and inactive, which was matter. We are told by Cæſar, that they had many diſquiſitions about the power of God; and, no doubt, amongſt other particulars, about his creating power. But whether they believed with ſome that matter was eternal, or with others that it was created; and in what manner they endeavoured to account for the diſpoſition of it into the preſent form of the univerſe, we are entirely ignorant, though they certainly had their ſpeculations on theſe ſubjects. We are only informed, that they did not expreſs their ſentiments on theſe and the like heads in a plain and natural, but in a dark, figurative, and enigmatical manner. This might incline us to ſuſpect, that Pythagoras had borrowed from them his doctrine about numbers, to whoſe myſtical energy he aſcribes the formation of all things; for nothing can be more dark and enigmatical than that doctrine. The druids diſputed likewiſe about the magnitude and form of the world in general, and of the earth in particular, of which things they pretended to have a perfect knowledge. We know not what their opinions were about the dimenſions of the univerſe or of the earth, but we have ſeveral reaſons to make us imagine that they believed both to be of a ſpherical form. This is viſibly the ſhape and form of the ſun, moon, and ſtars, the moſt conſpicuous parts of the univerſe; from whence it was natural and eaſy to infer, that this was the form of the world and of the earth. Accordingly this ſeems to have been the opinion of the philoſophers of all nations; and the circle was the favourite figure of the druids, as appears from the form both of their houſes and places of worſhip. Beſides theſe general ſpeculations about the origin, diſſolution, magnitude, and form of the world and of the earth, the druids engaged in particular inquiries into the natures and properties of the different kinds of ſubſtances. But all their diſcoveries in this moſt uſeful and extenſive branch of natural philoſophy, whatever they were, are entirely loſt.

5
Aſtronomy

Aſtronomy alſo appears to have been one of the chief ſtudies of the druids of Gaul and Britain. "The druids (ſays Cæſar) have many diſquiſitions concerning the heavenly bodies and their motions, in which they inſtruct their diſciples." Mela, ſpeaking of the ſame philoſophers, obſerves, "That they profeſs to have great knowledge of the motions of the heavens and of the ſtars." Some knowledge of this ſcience indeed was not only neceſſary for meaſuring time in general, marking the duration of the different ſeaſons, regulating the operations of the huſbandman, directing the courſe of the mariner, and for many other purpoſes in civil life; but it was eſpecially neceſſary for fixing the times and regular returns of their religious ſolemnities, of which the druids had the ſole direction. Some of theſe ſolemnities were monthly, and others annual. It was therefore neceſſary for them to know, with ſome tolerable degree of exactneſs, the number of days in which the ſun and moon performed their revolutions, that theſe ſolemnities might be obſerved at their proper ſeaſons. This was the more neceſſary, as ſome of theſe ſolemnities were attended by perſons from different and very diſtant countries, who were all to meet at one place on one day; who muſt have had ſome rule to diſcover the annual return of that day.

6
Their method of computing time.

The moſt perceptible diviſion of time by the two great luminaries is into day and night; the former occaſioned by the preſence of the ſun above the horizon, the latter by his abſence, which is in ſome meaſure ſupplied by the moon and ſtars. The druids computed their time by nights, and not by days; a cuſtom which they had received from their moſt remote anceſtors by tradition, and in which they were confirmed by their meaſuring their time very much by the moon, the miſtreſs and queen of night. As the changes in the aſpect of that luminary are moſt conſpicuous, they engaged the attention of the moſt ancient aſtronomers of all countries, and particularly of the druids, who regulated all their great ſolemnities, both ſacred and civil, by the age and aſpect of the moon. "When no unexpected accident prevents it, they aſſemble upon ſtated days, either at the time of the new or full moon; for they believe theſe to be the moſt auſpicious times for tranſacting all affairs of importance." Their moſt auguſt ceremony of cutting the miſletoe from the oak by the archdruid, was always performed on the ſixth day of the moon. Nay, they even regulated their military operations very much by this luminary, and avoided as much as poſſible, to engage in battle while the moon was on the wane. As the attention of the druids was ſo much fixed on this planet, it could not be very long before they diſcovered that ſhe paſſed through all her various aſpects in about thirty days; and by degrees, and more accurate obſervations, they would find, that the real time of her performing an entire revolution was very nearly 29½ days. This furniſhed them with the diviſion of their time into months, or revolutions of the moon; of which we know with certainty they were poſſeſſed. But this period, though of great uſe, was evidently too ſhort for many purpoſes, and particularly for meaſuring the ſeaſons; which they could not fail to perceive depended on the influences of the ſun. By continued obſervation they diſcovered, that about 12 revolutions of the moon included all the variety of ſeaſons, which begun again, and revolved every 12 months. This ſuggeſted to them that larger diviſion of time called a year, conſiſting of 12 lunations, or 354 days, which was the moſt ancient meaſure of the year in almoſt all nations. That this was for ſome time at leaſt the form of the druidical year, is both probable in itſelf, and from the following expreſſion of Pliny: "That they begun both their months and years, not from the change, but from the ſixth day of the moon." This is even a demonſtration that their years conſiſted of a certain number of lunar revolutions, as they always commenced on the ſame day of

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of the moon. But as this year of 12 lunar months falls 11 days and nearly one-fourth of a day ſhort of a real revolution of the ſun, this error would ſoon be perceived, and call for reformations; though we are not informed of the particular manner in which it was rectified. Various arguments might be collected to make it very probable that the Britons were acquainted with a year exact enough for every purpoſe of life, when they were firſt invaded by the Romans; but it will be ſufficient to mention one, which is taken from the time and circumſtances of that invaſion. The learned Dr Halley hath demonſtrated that Cæſar arrived in Britain, in his firſt year's expedition, on the 26th day of Auguſt: and Cæſar himſelf informs us, that at his arrival the harveſt was finiſhed, except in one field, which by ſome means or other was more backward than the reſt of the country. This is a proof that the Bririſh huſbandmen knew and uſed the moſt proper ſeaſons for ploughing, ſowing, and reaping. The druids, as we are told by Pliny, had alſo a cycle or period of 30 years, which they called an age, and which commenced likewiſe on the ſixth day of the moon; but that author hath not acquainted us on what principles this cycle was formed, nor to what purpoſes it was applied. We can hardly ſuppoſe that this was the cycle of the ſun, which conſiſts of 28 years, and regulates the dominical letters. It is more probable, that while the druids made uſe of the year of 12 lunar months, and had not invented a method of adjuſting it to the real revolution of the ſun, they obſerved that the beginning of this year had paſſed through all the ſeaſons, and returned to the point from whence it ſet out, in a courſe of about 33 years; which they might therefore call an age. Others may perhaps be of opinion, that this 30 years cycle of the druids is the ſame with the great year of the Pythagoreans, or a revolution of Saturn. Some have imagined that the druids were alſo acquainted with the cycle of 19 years, which is commonly called the cycle of the moon. But the evidence of this depends entirely on the truth of that ſuppoſition, that the Hyperborean iſland, which is deſcribed by Diodorus Siculus, was Britain, or ſome of the Britiſh iſles. Among many other ſurpriſing things, that author ſays, concerning this Hyperborean iſland "That its inhabitants believed that Apollo deſcended into their iſland at the end of every 19 years; in which period of time the ſun and moon, having performed their various revolutions, return to the ſame point, and begin to repeat the ſame revolutions. This is called by the Greeks the great year, or the cycle of Meton."

7
Their knowledge of the ſtars.

We are told both by Cæſar and Mela, that the druids ſtudied the ſtars as well as the ſun and moon; and that they profeſſed to know, and taught their diſciples, many things concerning the motions of theſe heavenly bodies. From theſe teſtimonies we may conclude that the druids were acquainted with the planets, diſtinguiſhed them from the fixed ſtars, and carefully obſerved their motions and revolutions. If this diſcovery was the reſult of their own obſervations, it would be gradual, and it would be a long time before they found out all the planets. They might perhaps have received ſome aſſiſtance and information from Pythagoras, or from ſome other quarter. But whether this diſcovery of the planets was their own, or communicated to them by others, it is highly probable that they were acquainted with the preciſe number of theſe wandering ſtars. Dio Caſſius ſays, that the cuſtom of giving the name of one of the planets to each of the ſeven days of the week was an invention of the Egyptians, and from them was gradually communicated to all the other nations of the world; and that in his time this cuſtom was ſo firmly eſtabliſhed, not only among the Romans, but among all the reſt of mankind, that in every country it appeared to be a native inſtitution. The knowledge of the planets, and perhaps the cuſtom of giving their names to the days of the week, was brought out of Egypt into Italy by Pythagoras, more than 500 years before the beginning of the Chriſtian era; and from thence it could not be very long before it reached Gaul and Britain. But though we have little or no reaſon to doubt that the druids knew the number and obſerved the motion of the planets, yet it may be queſtioned whether they had diſcovered the times in which they performed their ſeveral revolutions. Some of theſe ſtars, as Jupiter and Saturn, take ſo great a number of years in revolving, that it required a very extraordinary degree of patience and attention to diſcover the preciſe periods of their revolutions. If we could be certain that the iſland in which the ancients imagined Saturn lay aſleep, was one of the Britiſh iſles, as Plutarch intimates it was, we might be inclined to think that the Britiſh druids were not ignorant of the length of the period in which the planet Saturn performs a revolution. For that ſame author, in another treatiſe, tells us, "That the inhabitants of that iſland kept every thirtieth year a ſolemn feſtival in honour of Saturn, when his ſtar entered into the ſign of Taurus."

If we could depend upon the above teſtimony of Plutarch, we ſhould have one poſitive proof that the druids of the Britiſh iſles were acquainted with the conſtellations, and even with the ſigns of the zodiac; and that they meaſured the revolutions of the ſun and planets, by obſerving the length of time between their departure from and return to one of theſe ſigns. But we have no direct evidence of this remaining in hiſtory.

The druids of Gaul and Britain, as well as the ancient philoſophers of other countries, had a general plan or ſyſtem of the univerſe, and of the diſpoſition and arrangement of its various parts, in which they inſtructed their diſciples. This is both probable in itſelf, and is plainly intimated by ſeveral authors of the greateſt authority. But we cannot be certain whether this druidical ſyſtem of the world was of their own invention, or was borrowed from others. If it was borrowed, it was moſt probably from the Pythagoreans, to whom they were the neareſt neighbours, and with whom they had the greateſt intercourſe.

It hath been imagined, that the druids had inſtruments of ſome kind or other, which anſwered the ſame purpoſes with our teleſcopes, in making obſervations on the heavenly bodies. The only foundation of this very improbable conjecture is an expreſſion of Diodorus Siculus, in his deſcription of the famous Hyperborean iſland. They ſay further, that the moon is ſeen from that iſland, as if ſhe was but at a little diſtance from the earth, and having hills or mountains like ours on her ſurface. But no ſuch inference can be reaſonably drawn from this expreſſion, which in reality merits little more regard than what Strabo re-

 ports

Druids.

ports was ſaid of ſome of the inhabitants of Spain: "That they heard the hiſſing noiſe of the ſun every evening when he fell into the weſtern ocean."

The application of the druids to the ſtudy of philoſophy and aſtronomy amounts almoſt to a demonſtration that they applied alſo to the ſtudy of arithmetic and geometry. For ſome knowledge of both theſe ſciences is indiſpenſably neceſſary to the phyſiologiſt and aſtronomer, as well as of great and daily uſe in the common affairs of life.

8
Arithmetic.

If we were certain that ABARIS, the famous Hyperborean philoſopher, the friend and ſcholar of Pythagoras, was really a Britiſh druid, as ſome have imagined, we ſhould be able to produce direct hiſtorical evidence of their arithmetic knowledge. For Iamblicus, in the life of Pythagoras, ſays, "that he taught Abaris to find out all truth by the ſcience of arithmetic." It may be thought improbable that the druids had made any conſiderable progreſs in arithmetic, as this may ſeem to be impoſſible by the mere ſtrength of memory without the aſſiſtance of figures and of written rules. But it is very difficult to aſcertain what may be done by memory alone, when it hath been long exerciſed in this way. We have had an example in our own age, of a perſon * who could perform ſome of the moſt tedious and difficult operations in arithmetic by the mere ſtrength of his memory. The want of written rules could be no great diſadvantage to the druids, as the precepts of this, as well as of the other ſciences, were couched in verſe, which would be eaſily got by heart and long remembered. Though the druids were unacquainted with the Arabic characters which are now in uſe, we have no reaſon to ſuppoſe that they were deſtitute of marks or characters of ſome other kind, which, in ſome meaſure, anſwered the ſame purpoſes, both in making and recording their calculations. In particular, we have reaſon to think, that they made uſe of the letters of the Greek alphabet for both theſe purpoſes. This ſeems to be plainly intimated by Cæſar in the following expreſſion concerning the druids of Gaul: "In almoſt all other public tranſactions, and private accounts or computations, they make uſe of the Greek letters." This is further confirmed by what the ſame author ſays of the Helvetii; a people of the ſame origin, language, and manners, with the Gauls and Britons. "Tables were found in the camp of the Helvetii written in Greek letters, containing an account of all the men capable of bearing arms, who had left their native country, and alſo ſeparate accounts of the boys, old men, and women." There is hiſtorical evidence of the druids being alſo well acquainted with geometry. "When any diſputes ariſe (ſays Cæſar) about their inheritances, or any controverſies about the limits of their fields, they are entirely referred to the deciſion of their druids." But beſides the knowledge of menſuration which this implies, both Cæſar and Mela plainly intimate that the druids were converſant in the moſt ſublime ſpeculations of geometry; "in meaſuring the magnitude of the earth, and even of the world."

* See BUXTON (*Jedediah*).

9
Skill in mechanics.

There are ſtill many monuments remaining in Britain and the adjacent iſles, which cannot ſo reaſonably be aſcribed to any as to the ancient Britons, and which give us cauſe to think, that they had made great progreſs in this uſeful part of learning, and could apply the mechanical powers ſo as to produce very aſtoniſhing effects. As theſe monuments appear to have been deſigned for religious purpoſes, we may be certain that they were erected under the direction of the druids. How many obeliſks or pillars, of one rough unpoliſhed ſtone each, are ſtill to be ſeen in Britain and its iſles? Some of theſe pillars are both very thick and lofty, erected on the ſummits of barrows and of mountains; and ſome of them (as at Stonehenge) have ponderous blocks of ſtone raiſed aloft, and reſting on the tops of the upright pillars. We can hardly ſuppoſe that it was poſſible to cut theſe prodigious maſſes of ſtone (ſome of them above forty tons in weight) without wedges, or to raiſe them out of the quarry without levers. But it certainly required ſtill greater knowledge of the mechanical powers, and of the method of applying them, to tranſport thoſe huge ſtones from the quarry to the places of their deſtination; to erect the perpendicular pillars, and to elevate the impoſts to the tops of theſe pillars. If that prodigious ſtone in the pariſh of Conſtantine, Cornwal, was really removed by art from its original place, and fixed where it now ſtands (as one of the moſt learned and diligent antiquaries thinks it was†), it is a demonſtration, that the druids could perform the moſt aſtoniſhing feats by their ſkill in mechanics. That the Britiſh druids were acquainted with the principles and uſe of the balance, we have good reaſon to believe, not only from the great antiquity of that diſcovery in other parts of the world, but alſo from ſome druidical monuments which are ſtill remaining in that iſland. Theſe monuments are called *Lagan ſtones*, or rocking ſtones; and each of them conſiſts of one prodigious block of ſtone, reſting upon an upright ſtone or rock, and ſo equally balanced, that a very ſmall force, ſometimes even a child, can move it up and down, though hardly any force is ſufficient to remove it from its ſtation. Some of theſe ſtones may have fallen into this poſition by accident, but others of them evidently appear to have been placed in it by art. That the ancient Britons underſtood the conſtitution and uſe of wheels, the great number of their war-chariots and other wheel-carriages is a ſufficient proof; and that they knew how to combine them together and with the other mechanical powers, ſo as to form machines capable of raiſing and tranſporting very heavy weights, we have good reaſon to believe. In a word, if the Britiſh druids were wholly ignorant of the principles and uſe of any of the mechanical powers, it was moſt probably of the ſcrew, though even of this we cannot be certain.

† Dr Borlas's *Antiq. Cornwal*, p. 174, 175.

10
Medicine.

In Germany and in the northern nations of Europe the healing art was chiefly committed to the old women of every ſtate; but in Gaul and Britain it was intruſted to the druids, who were the phyſicians as well as the prieſts of theſe countries. Pliny ſays expreſsly, "That Tiberius Cæſar deſtroyed the druids of the Gauls, who were the poets and phyſicians of that nation;" and he might have added of the Britons. The people of Gaul and Britain were probably induced to devolve the care of their health on the druids, and to apply to theſe prieſts for the cure of their diſeaſes, not only by the high eſteem they had of their wiſdom and learning, but alſo by the opinion which they entertained, Druids. tertained, that a very intimate connection subsisted between the arts of healing and the rites of religion, and that the former were most effectual when they were accompanied by the latter. It appears indeed to have been the prevailing opinion of all the nations of antiquity, that all internal diseases proceeded immediately from the anger of the gods; and that the only way of obtaining relief from these diseases was by applying to their priests to appease their anger by religious rites and sacrifices. This was evidently the opinion and practice of the Gauls and Britons, who in some dangerous cases sacrificed one man as the most effectual means of curing another. "They are much addicted (says Cæsar) to superstition; and for this cause, those who are afflicted with a dangerous disease sacrifice a man, or promise that they will sacrifice one, for their recovery. For this purpose they make use of the ministry of the druids; because they have declared, that the anger of the immortal gods cannot be appeased, so as to spare the life of one man but by the life of another." This way of thinking gave rise also to that great number of magical rites and incantations with which the medical practices of the druids, and indeed of all the physicians of antiquity, were attended. "No body doubts (says Pliny) that magic derived its origin from medicine, and that by its flattering but delusive promises, it came to be esteemed the most sublime and sacred part of the art of healing."

11 Botany.

That the druids made great use of herbs for medicinal purposes, we have sufficient evidence. They not only had a most superstitious veneration for the misletoe of the oak, on a religious account, but they also entertained a very high opinion of its medical virtues, and esteemed it a kind of panacea or remedy for all diseases. "They call it (says Pliny) by a name which in their language signifies *Alheal*, because they have an opinion that it cureth all diseases." They believed it to be in particular a specific against barrenness, and a sovereign antidote against the fatal effects of poisons of all kinds. It was esteemed also an excellent emollient and discutient for softening and discussing hard tumors; good for drying up scrophulous sores; for curing ulcers and wounds; and (provided it was not suffered to touch the earth after it was cut) it was thought to be a very efficacious medicine in the epilepsy or falling-sickness. It hath been thought useful in this last calamitous disease by some modern physicians. The pompous ceremonies with which the misletoe was gathered by the druids have been already described. The selago, a kind of hedge hyssop resembling savin, was another plant much admired by the druids of Gaul and Britain for its suppposed medicinal virtues, particularly in all diseases of the eyes. But its efficacy, according to them, depended very much upon its being gathered exactly in the following manner: The person who gathered it was to be clothed in a white robe, to have his feet bare, and washed in pure water; to offer a sacrifice of bread and wine before he proceeded to cut it; which he was to do with his right hand covered with the skirt of his garment, and with a hook of some more precious metal than iron. When it was cut, it was to be received into, and kept in a new and very clean cloth. When it was gathered exactly according to this whimsical ritual, they affirmed that it was not only an excellent medicine, but also a powerful charm and preservative from misfortunes and unhappy accidents of all kinds. They entertained a high opinion also of the herb Samolus or marshwort, for its sanative qualities; and gave many directions for the gathering it, no less fanciful than those abovementioned. The person who was to perform that office was to do it fasting, and with his left hand; he was on no account to look behind him, nor to turn his face from the herbs he was gathering. It would be tedious to relate the extravagant notions they entertained of the many virtues of the vervain, and to recount the ridiculous mummeries which they practised in gathering and preparing it, both for the purposes of divination and physic. These things may be seen in Plin. Hist. Nat. l. 25. c. 9. from whence we have received all these anecdotes of the botany of the druids. It is easy to see that his information was very imperfect; and that, like many other of the Greek and Roman writers, he designedly represents the philosophers of Gaul and Britain in an unfavourable light. The herb which was called *Britannica* by the ancients, which some think was the great water-dock, and others the cochlearea or scurvy grass, was probably much used in this island for medical purposes; as it derived its name from hence, and was from hence exported to Rome and other parts. Though these few imperfect hints are all that we can now collect of the botany of the British druids, yet we have some reason to think that they were not contemptible botanists. Their circumstances were peculiarly favourable for the acquisition of this kind of knowledge. For as they spent most of their time in the recesses of mountains, groves, and woods, the spontaneous vegetable productions of the earth constantly presented themselves to their view, and courted their attention.

The opinions which, it is said, the druids of Gaul and Britain entertained of their anguinum or serpents egg, both as a charm and as a medicine, are romantic and extravagant in a very high degree. This extraordinary egg was formed, as they pretended, by a great number of serpents interwoven and twined together; and when it was formed, it was raised up in the air by the hissing of these serpents, and was to be catched in a clean white cloth, before it fell to the ground. The person who catched it was obliged to mount a swift horse, and to ride away at full speed to escape from the serpents, who pursued him with great rage, until they were stopped by some river. The way of making trial of the genuineness of the egg was no less extraordinary. It was to be enchased in gold, and thrown into a river, and if it was genuine it would swim against the stream. "I have seen (says Pliny) that egg; it is about the bigness of a moderate apple, its shell is a cartilaginous incrustation, full of little cavities, such as are on the legs of the polypus; it is the insignia, or badge of distinction of the druids." The virtues which they ascribed to this egg were many and wonderful. It was particularly efficacious to render those who carried it about with them superior to their adversaries in all disputes, and to procure them the favour and friendship of great men. Some have thought that this whole affair of the serpents egg was a mere fraud, contrived by the druids, to excite the admiration and pick the pockets of credulous people, who purchased these wonder-working eggs from them at

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at a high price. Others have imagined that this story of the anguinum (of which there is an ancient monument in the cathedral at Paris) was an emblematical representation of the doctrine of the druids concerning the creation of the world. The serpents, say they, represent the Divine Wisdom forming the universe, and the egg is the emblem of the world formed by that Wisdom. It may be added, that the virtue ascribed to the anguinum, of giving those who possessed it a superiority over others, and endearing them to great men, may perhaps be intended to represent the natural effects of learning and philosophy. But in so doubtful a matter every one is at full liberty to form what judgment he thinks proper.

12 Rhetoric.

As the influence and authority of the druids in their country depended very much upon the reputation of their superior wisdom and learning, they wisely applied to the study of those sciences which most directly contributed to the support and advancement of that reputation. In this number, besides those already mentioned, we may justly reckon rhetoric, which was diligently studied and taught by the druids of Gaul and Britain; who to the charms of their eloquence were indebted for much of the admiration and authority which they enjoyed. They had indeed many calls and opportunities to display their eloquence, and to discover its great power and efficacy; as, when they were teaching their pupils in their schools, when they discoursed in public to the people on religious and moral subjects, when they pleaded causes in the courts of justice, and when they harangued in the great councils of the nation, and at the heads of armies ready to engage in battle; sometimes with a view to inflame their courage, and at other times with a design to allay their fury, and dispose them to make peace. Though this last was certainly a very difficult task among fierce and warlike nations, yet such was the authority and eloquence of the druids that they frequently succeeded in it. "They pay a great regard (says Diodorus Siculus) to their exhortations, not only in the affairs of peace, but even of war, and these are respected both by their friends and enemies. They sometimes step in between two hostile armies, who are standing with their swords drawn and their spears extended ready to engage; and by their eloquence, as by an irresistible enchantment, they prevent the effusion of blood, and prevail upon them to sheath their swords. So great are the charms of eloquence and the power of wisdom, even among the most fierce barbarians." The British kings and chieftains, who were educated by the druids, were famous for their eloquence. This is evident from the many noble speeches which are ascribed to them by the Greek and Roman writers. For though these speeches may not be genuine, yet they are a proof that it was a well known fact that these princes were accustomed to make harangues on these and the like occasions. This we are expressly told by Tacitus. "The British chieftains, before a battle, fly from rank to rank, and address their men with animating speeches, tending to inflame their courage, increase their hopes, and dispel their fears." These harangues were called, in the ancient language of Britain, *Brosnichiy Kah*, which is literally translated by Tacitus *Incitamenta Belli*, "incentives to war." The genuine posterity of the ancient Britons long retained their taste for eloquence, and their high esteem for those who excelled in that art. "Orators (says Mr Martin) were in high esteem both in these islands (the Æbude) and the continent, until within these forty years. They sat always among the nobles or chiefs of families in the streah or circle. Their houses and little villages were sanctuaries, as well as churches, and they took place before doctors of physic. The orators, after the druids were extinct, were brought in to preserve the genealogy of families, and to repeat the same at every succession of a chief; and upon the occasion of marriages and births, they made epithalamiums and panegyrics, which the poet or bard pronounced. The orators, by the force of their eloquence, had a powerful ascendant over the greatest men in their time. For if any orator did but ask the habit, arms, horse, or any other thing belonging to the greatest man in these islands, it was readily granted him; sometimes out of respect, and sometimes for fear of being exclaimed against by a satyr, which in those days was reckoned a great dishonour."

13 Magic and divination.

If the British druids, considering the times in which they lived, had made no contemptible proficiency in several parts of real and useful learning; it cannot be denied that they were also great pretenders to superior knowledge in certain vain fallacious sciences, by which they excited the admiration, and took advantage of the ignorance and credulity of mankind. These were the sciences (if they may be so called) of magic and divination; by which they pretended to work a kind of miracles, and exhibit astonishing appearances in nature: to penetrate into the counsels of heaven; to foretel future events, and to discover the success or miscarriage of public or private undertakings. Their own countrymen not only believed that the druids of Gaul and Britain were possessed of these powers, but they were celebrated on this account by the philosophers of Greece and Rome. "In Britain (says Pliny) the magic arts are cultivated with such astonishing success, and so many ceremonies at this day, that the Britons seem to be capable of instructing even the Persians themselves in these arts. They pretend to discover the designs and purposes of the gods. The Eubates or Vates in particular investigate and display the most sublime secrets of nature; and, by auspices and sacrifices, they foretel future events." They were so famous for the supposed veracity of their predictions, that they were not only consulted on all important occasions by their own princes and great men, but even sometimes by the Roman emperors. Nor is it very difficult to account for all this. The druids finding that the reputation of their magical and prophetical powers contributed not a little to the advancement of their wealth and influence, they endeavoured, no doubt, to strengthen and establish it by all their art and cunning. Their knowledge of natural philosophy and mechanics enabled them to execute such works, and to exhibit such appearances, or to make the world believe that they did exhibit them, as were sufficient to gain them the character of great magicians. The truth is, that nothing is more easy than to acquire this character in a dark age, and among an unenlightened people. When the minds of men are haunted with dreams of charms and enchantments, they are apt to fancy that the most common accurrences in nature are the effects of magical arts. The following strange story, which we meet with in Plutarch's Treatise of the Cessation of Oracles, was probably occasioned by something of this kind. "There are many islands which lie scattered about the isle of Britain, after the manner of our Sporades. They are generally unpeopled, and some of them are called the *Islands of the Heroes*. One Demetrius was sent by the emperor (perhaps Claudius) to discover those parts. He arrived at one of these islands (supposed by some to be Anglesey, but more probably one of Æbudæ) next adjoining to the isle of Britain before mentioned, which was inhabited by a few Britons, who were esteemed sacred and inviolable by their countrymen. Immediately after his arrival the air grew black and troubled, and strange apparitions were seen; the winds rose to a tempest, and fiery spouts and whirlwinds appeared dancing towards the earth." This was probably no more than a storm of wind, accompanied with rain and lightning; a thing neither unnatural nor uncommon: but Demetrius and his companions having heard that the British druids, by whom this isle was chiefly inhabited, were great magicians, they imagined that it was raised by them; and fancied that they saw many strange unnatural sights. The druids did not think proper to undeceive them; for when they enquired at them about the cause of this storm, they told them it was occasioned by the death of one of those invisible beings or genii who frequented their isle. A wonderful and artful tale, very well calculated to encrease the superstitious terrors of Demetrius and his crew; and to determine them to abandon this enchanted isle, with a resolution never to return. Stonehenge, and several other works of the druids, were believed to have been executed by the arts of magic and enchantment, for many ages after the destruction of their whole order: nor is it improbable that they persuaded the vulgar in their own times to entertain the same opinion of these works, by concealing from them the real arts by which they were performed. The natural and acquired sagacity of the druids, their long experience, and great concern in the conduct of affairs, enabled them to form very probable conjectures about the events of enterprises. These conjectures they pronounced as oracles, when they were consulted; and they pretended to derive them from the inspection of the entrails of victims, the observation of the flight and feeding of certain birds, and many other mummeries. By these, and the like arts, they obtained and preserved the reputation of prophetic foresight among an ignorant and credulous people. But these pretensions of the druids to magic and divination, which contributed so much to the advancement of their fame and fortune in their own times, have brought very heavy reproaches upon their memory, and have made some learned moderns declare that they ought to be expunged out of the catalogue of philosophers, and esteemed no better than mere cheats and jugglers. This censure is evidently too severe, and might have been pronounced with equal justice upon all the ancient philosophers of Egypt, Assyria, Persia, Greece, and Rome; who were great pretenders to magic and divination, as well as the druids. "I know of no nation in the world (says Cicero) either so polite and learned, or so savage and barbarous, as not to believe that future events are presignified to us, and may by some men be discovered and foretold." The only conclusion therefore that can be fairly drawn, from the successful pretensions of the British druids to the arts of magic and divination, is this—That they had more knowledge than their countrymen and contemporaries; but had not so much virtue to resist the temptation of imposing upon their ignorance, to their own advantage.

DRUM, is a martial musical instrument in form of a cylinder, hollow within, and covered at the two ends with vellum, which is stretched or slackened at pleasure by the means of small chords or sliding knots. It is beat upon with sticks. Drums are sometimes made of brass, but most commonly they are of wood.—The drum is by Le Clerc said to have been an oriental invention, and to have been brought by the Arabians, or perhaps rather the Moors, into Spain,

Kettle DRUMS, are two sorts of large basons of copper or brass, rounded in the bottom, and covered with vellum or goat skin, which is kept fast by a circle of iron round the body of the drum, with a number of screws to screw up and down. They are much used among the horse; as also in operas, oratorios, concerts, &c.

DRUM, or *Drummer*, he that beats the drum; of whom each company of foot has one, and sometimes two. Every regiment has a drum-major, who has the command over the other drums. They are distinguished from the soldiers by cloaths of a different fashion: their post, when a battalion is drawn up, is on the flanks, and on a march it is betwixt the divisions.

DRUM of the Ear, the same with the *tympanum*. See ANATOMY, n° 141.

DRUMMOND (William), a polite writer, born in Scotland in 1585, was the son of Sir John Drummond, who for ten or twelve years was usher and afterwards knight of the black rod to James VI. His family became first distinguished by the marriage of Robert III. whose queen was sister to William Drummond of Carnock their ancestor; as appears by the patents of that king and James I. the one calling him "our brother," the other "our uncle."

Drummond was educated at Edinburgh, where he took the degree of A. M. In 1606 he was sent by his father to study civil law at Bourges in France: but having no taste for the profession of a lawyer, he returned to Scotland, and retired to his agreeable seat at Hawthornden; where he applied himself with great assiduity to classical learning and poetry, and obliged the world with several fine productions. Here he wrote his Cypress Grove, a piece of excellent prose, after a dangerous fit of sickness; and about the same time, his Flowers of Sion, in verse. But an accident befel him, which obliged him to quit his retirement: and that was the death of an amiable lady to whom he was just going to be married. This affected him so deeply, that he went to Paris and Rome, between which two places he resided eight years. He travelled also thro' Germany, France, and Italy, where he visited universities; conversed with learned men; and made a choice collection of the ancient Greek, and of the modern Spanish, French, and Italian books. He then returned to his native country; and some time thereafter

Drummond.

married Margaret Logan, a grand-daughter of Sir Robert Logan. Upon the appearence of a civil war, he retired again; and in this retirement is supposed to have written the history of the Five James's, successively kings of Scotland, which was not published till after his death. Having been grafted as it were on the royal family of Scotland, and upheld by them, he was steadily attached to Charles I.; but does not appear ever to have armed for him. As he had always been a laborious student, and had applied himself equally to history and politics as to classical learning, his services were better rendered by occasional publications, in which he several times distinguished himself. In a piece called *Irene*, he harangues the king, nobility, and clergy, about their mutual mistakes, fears, and jealousies; and lays before them the consequences of a civil war, from indisputable arguments and the histories of past times. The great Marquis of Montrose wrote a letter to him, desiring him to print this Irene, as the best means to quiet the minds of a distracted people: he likewise sent him a protection dated August 1645, immediately after the battle of Kilsyth, with a letter, in which he commends Mr Drummond's learning and loyalty. Mr Drummond wrote other things also with the same view of promoting peace and union, of calming the disturbed minds of the people, of reasoning the better sort into moderation, and checking the growing evils which would be the consequence of their obstinacy. But his efforts were fruitless; and his attachment to the king and his cause were so strong, that when he heard of the sentence being executed on him, he was overwhelmed with grief, and lifted his head no more. He died in the year 1649, leaving behind him several children: the eldest of whom, William, was knighted by Charles II. He had a great intimacy and correspondence with the two famous English poets, Michael Drayton and Ben Johnson; the latter of whom, at the age of 45, travelled from London on foot, to visit him at Hawthornden. An edition of his works, with his life perfixed, was printed in folio at Edinburgh, 1711.

Among all the writers, at the beginning of the last century, who flourished after the death of Shakespeare, an ingenious critic † observes, there is not one whom a general reader of the English poetry of that age will regard with so much and so deserved attention as William Drummond. In a survey of his poetry, two considerations must be had, *viz.* the nation of which he was, and the time when he wrote. Yet will these be found not offered to extenuate faults, but to increase admiration. His thoughts are often, nay generally, bold and highly poetical: he follows nature, and his verses are delicately harmonious. As his poems are not easily met with, and have perhaps by many readers never been heard of, a few extracts may be excused.

† *Cursory Remarks on some of the English Poets*, 8vo, 1789.

On the death of Henry prince of Wales in 1612, Drummond wrote an elegy intitled Tears on the Death of Moeliades; a name which that prince had used in all his challenges of martial sport, as the anagram of *Miles a Deo*. In this poem are lines, according to Denham's terms, as strong, as deep, as gentle, and as full, as any of his or Waller's. The poet laments the fate of the prince, that he died not in some glorious cause of war: "against the Turk (he says) thou hadst ended thy life and the Christian war together;"

> Or, as brave Bourbon, thou hadst made old Rome,
> Queen of the world, thy triumph and thy tombe.

Of the lamentation of the river Forth:

> And as she rush'd her Cyclades among,
> She seem'd to plain that Heaven had done her wrong.

Further:

> Tagus did court his love with golden streams,
> Rhine with her towns, fair Seine with all she claims:
> But ah, poor lovers! death did them betray;
> And, unsuspected, made their hopes his prey.

And concludes:

> The virgins to thy tomb will garlands bear
> Of flow'rs, and with each flow'r let fall a tear.
> Moeliades sweet courtly nymphs deplore,
> From Thule to Hydaspes' pearly shore.

Perhaps there are no lines of Pope of which the easy flow may be more justly admired than of those in his third pastoral:

> Not bubbling fountains to the thirsty swain,
> Not balmy sleep to lab'rers faint with pain,
> Not show'rs to larks, or sun-shine to the bee,
> Are half so charming as thy sight to me.

When King James I. after his accession to the English throne, returned to Scotland in 1617, his arrival was celebrated by every effort of poetical congratulation. Upon this occasion Drummond composed a panegyric intitled The Wandering Muses, or the River Forth feasting; in which are found four lines apparently imitated by Pope in the above passage, and which do not in point of harmony fall much short of that imitation. He says,

> To virgins, flow'rs; to sun-burnt earth, the rain;
> To mariners, fair winds amidst the main;
> Cool shades, to pilgrims whom hot glances burn;
> Are not so pleasing as thy blest return.

Of these two poems of Drummond, it is observable, that the first was written in 1612, the last in 1617. The earliest piece of Waller is that to the king on his navy in 1625. The piece in which Sir John Denham's greatest force lies, Cooper's Hill, was not written till 1640. The harmony of Drummond, therefore, at a time when those who are usually called the first introducers of a smooth and polished versification had not yet begun to write, is an honour to him that should never be forgotten. Nor is his excellence half enough praised or acknowledged.

Drummond and Petrarch had this in common, that each lamented, first the cruelty, and then the loss of his mistress; so that their sonnets are alike naturally divided into two parts, those before and those after their several mistresses deaths. It may justly be doubted, that among all the sonneteers in the English language any one is to be preferred to Drummond. He has shown in some of these compositions nearly the spirit of Petrarch himself. Of each period one is here inserted; the first, before the death of his mistress:

> Ah me, and am I now the man, whose muse
> In happier times was wont to laugh at love,
> In those who suffered that blind boy abuse
> The noble gifts were giv'n them from above!
>
> What metamorphose strange is this I prove?
> Myself I scarce now find myself to be;
> And think no fable Circe's tyrannie,
> And all the tales are told of changed Jove.

Virtue

Drunkenness.

Virtue hath taught, with her philosophy,
My mind unto a better course to move;
Reason may chide her full, and oft reprove
Affection's pow'r; but what is that to me,
Who ever think, and never think on aught
But that bright cherubim which thralls my thought!

From Part II. after her death, (Sonnet I.)

Of mortal glory, O soon dark'ned ray!
O winged joys of man, more swift than wind!
O fond desires which in our fancies stray!
O traiterous hopes which do our judgments blind!
Lo, in a flash that light is gone away,
Which dazzle did each eye, delight each mind;
And with that sun from whence it came combin'd,
Now makes more radiant heav'n's eternal day.
Let beauty now bedew her cheeks with tears;
Let widow'd Music only roar and groan;
Poor Virtue, get thee wings and mount the spheres,
For dwelling-place on earth for thee is none:
Death hath thy temple raz'd, Love's empire foil'd,
The world of honour, worth, and sweetness spoil'd.

The seventh sonnet of the first part has much resemblance to Sir Henry Wotton's elegant little poem on the Queen of Bohemia, "Ye meaner beauties," &c. Among Drummond's Flowers of Sion, the poem which begins "Amidst the azure clear—of Jordan's sacred streams," eminently distinguishes him, whether he be considered as a philosopher or a poet.

DRUNKENNESS, a well known disorder in the brain, occasioned by drinking too freely of spirituous liquors. Drunkenness appears in different shapes in different constitutions: some it makes gay, some sullen, and some furious. The mischief of drunkenness consists in the following bad effects: 1. It betrays most constitutions either into extravagancies of anger, or sins of lewdness. 2. It disqualifies men for the duties of their station, both by the temporary disorder of their faculties, and at length by a constant incapacity and stupefaction. 3. It is attended with expences, which can often be ill spared. 4. It is sure to occasion uneasiness to the family of the drunkard. 5. It shortens life. To these consequences of drunkenness must be added the peculiar danger and mischief of the example. "Drunkenness (Mr Paley observes) is a social festive vice. The drinker collects his circle; the circle naturally spreads; of those who are drawn within it, many become the corruptors and centres of sets and circles of their own; every one countenancing, and perhaps emulating the rest, till a whole neighbourhood be infected from the contagion of a single example. With this observation upon the spreading quality of drunkenness, may be connected a remark which belongs to the several evil effects above recited. The consequences of a vice, like the symptoms of a disease, though they be all enumerated in the description, seldom all meet in the same subject. In the instance under consideration, the age and temperature of one drunkard may have little to fear from inflammations of lust or anger; the fortune of a second may not be injured by the expence; a third may have no family to be disquieted by his irregularities; and a fourth may possess a constitution fortified against the poison of strong liquors. But if, as we always ought to do, we comprehend within the consequences of our conduct the mischief and tendency of the example, the above circumstances, however fortunate for the individual, will be found to vary the guilt of his intemperance less, probably, than he supposes. Although the waste of time and money may be of small importance to you, it may be of the utmost to some one or other whom your society corrupts. Repeated, or long continued excesses, which hurt not your health, may be fatal to your companion. Although you have neither wife nor child, nor parent, to lament your absence from home, or expect your return to it with terror; other families, whose husbands and fathers have been invited to share in your ebriety, or encouraged to imitate it, may justly lay their misery or ruin at your door. This will hold good, whether the person seduced be seduced immediately by you, or the vice be propagated from you to him, through several intermediate examples."

The ancient Lacedemonians used to make their slaves frequently drunk, to give their children an aversion and horror for the same. The Indians hold drunkenness to be a species of madness; and in their language, the same term *(ramgam)*, that signifies "drunkard," signifies also a "phrenetick."

Drunkenness is repeatedly forbidden by St Paul: "Be not drunk with wine, wherein is excess." "Let us walk honestly as in the day, not in rioting and drunkenness." "Be not deceived: neither fornicators, nor drunkards, nor revilers, nor extortioners, shall inherit the kingdom of God." Eph. v. 18. Rom. xiii. 13. 1. Cor. vi. 9, 10. The same apostle likewise condemns drunkenness, as peculiarly inconsistent with the Christian profession: "They that be drunken, are drunken in the night; but let us, who are of the day, be sober." 1 Thess. v. 7, 8.

Drunkenness, by the English laws, is looked upon as an aggravation rather than an excuse for any criminal behaviour. A drunkard, says Sir Edward Coke, who is *voluntarius dæmon*, hath no privilege thereby; but what hurt or ill soever he doth, his drunkenness doth aggravate it: *nam omne crimen ebrietas, et incendit, et detergit.* It hath been observed that the real use of strong liquors, and the abuse of them by drinking to excess, depend much upon the temperature of the climate in which we live. The same indulgence which may be necessary to make the blood move in Norway, would make an Italian mad. A German, therefore, says the president Montesquieu, drinks through custom founded upon constitutional necessity; a Spaniard drinks through choice, or out of the mere wantonness of luxury; and drunkenness, he adds, ought to be more severely punished where it makes men mischievous and mad, as in Spain and Italy, than where it only renders them stupid and heavy, as in Germany and more northern countries. And accordingly, in the warmer climate of Greece, a law of Pittacus enacted, "that he who committed a crime when drunk, should receive a double punishment;" one for the crime itself, and the other for the ebriety which prompted him to commit it. The Roman law indeed made great allowances for this vice: *per vinum delapsis capitalis pœna remittitur*. But the law of England considering how easy it is to counterfeit this excuse, and how weak an excuse it is (though real) will not suffer any man thus to privilege one crime by another.

For the offence of drunkenness a man may be punished in the ecclesiastical court, as well as by justices of peace by statute. And by 4 *Jac.* I. *c.* 5. and 21 *Jac.* I. *c.* 7. if any person shall be convicted of drunkenness

Drunkenness.

drunkenneſs by the view of a juſtice, oath of one witneſs, &c. he ſhall forfeit 5s. for the firſt offence, to be levied by diſtreſs and ſale of his goods; and for want of a diſtreſs, ſhall ſit in the ſtocks ſix hours: and, for the ſecond offence, he is to be bound with two ſureties in 10l. each, to be of good behaviour, or to be committed. And he who is guilty of any crime thro' his own voluntary drunkenneſs, ſhall be puniſhed for it as if he had been ſober. It has been held that drunkenneſs is a ſufficient cauſe to remove a magiſtrate: and the proſecution for this offence by the ſtatute of 4 *Jac.* I. *c.* 5. was to be, and ſtill may be, before juſtices of peace in their ſeſſions by way of indictment, &c. Equity will not relieve againſt a bond, &c. given by a man when drunk, unleſs the drunkenneſs is occaſioned through the management or contrivance of him to whom the bond is given.

The appetite for intoxicating liquors appears to be almoſt always acquired. One proof of which is, that it is apt to return only at particular times and places; as after dinner, in the evening, on the market day, at the market town, in ſuch a company, at ſuch a tavern. And this may be the reaſon, that if a habit of drunkenneſs be ever overcome, it is upon ſome change of place, ſituation, company, or profeſſion. A man ſunk deep in a habit of drunkenneſs, will upon ſuch occaſions as theſe, when he finds himſelf looſened from the aſſociations which held him faſt, ſometimes make a plunge, and get out. In a matter of ſuch great importance, it is well worth while, where it is tolerably convenient, to change our habitation and ſociety, for the ſake of the experiment.

Habits of drunkenneſs commonly take their riſe either from a fondneſs for and connection with ſome company, or ſome companion, already addicted to this practice; which affords an almoſt irreſiſtible invitation to take a ſhare in the indulgencies which thoſe about us are enjoying with ſo much apparent reliſh and delight; or from want of regular employment, which is ſure to let in many ſuperfluous cravings and cuſtoms, and often this amongſt the reſt; or, laſtly, from grief or fatigue, both which ſtrongly ſolicit that relief which inebriating liquors adminiſter for the preſent, and furniſh a ſpecious excuſe for complying with the inclination. But the habit, when once ſet in, is continued by different motives from thoſe to which it owes it origin. Perſons addicted to exceſſive drinking, ſuffer, in the intervals of ſobriety, and near the return of their accuſtomed indulgence, a faintneſs and oppreſſion about the *præcordia* which it exceeds the ordinary patience of human nature to endure. This is uſually relieved for a ſhort time time by a repetition of the ſame exceſs: and to this relief, as to the removal of every long continued pain, they who have once experienced it are urged almoſt beyond the power of reſiſtance. This is not all: as the liquor loſes its ſtimulus, the doſe muſt be increaſed, to reach the ſame pitch of elevation or eaſe; which increaſe proportionably accelerates the progreſs of all the maladies that drunkenneſs brings on. Whoever reflects, therefore, upon the violence of the craving in advanced ſtages of the habit, and the fatal termination to which the gratification of it leads, will, the moment he perceives the leaſt tendency in himſelf of a growing inclination to intemperance, collect his reſolution to this point; or (what perhaps he will find his beſt ſecurity) arm himſelf with ſome peremptory rule, as to the times and quantity of his indulgencies.

Drupa, Druſes.

DRUPA, or DRUPPA, in botany, a ſpecies of *pericarpium* or ſeed-veſſel, which is ſucculent or pulpy, has no valve or external opening like the capſule and pod, and contains within its ſubſtance a ſtone or nut. The cherry, plum, peach, apricot, and all other ſtone-fruit are of this kind.

The term, which is of great antiquity, is ſynonimous to Tournefort's *fructus mollis oſſiculo*, "ſoft fruit with a ſtone;" and to the *prunus* of other botaniſts.

The ſtone or nut, which in this ſpecies of fruit is ſurrounded by the ſoft pulpy fleſh, is a kind of ligneous or woody cup, which contains a ſingle kernel or ſeed.

This definition, however, will not apply to every ſeed-veſſel denominated *drupa* in the *Genera Plantarum.* The almond is a *drupa*, ſo is the ſeed-veſſel of the elm-tree and the genus *rumphia*, though far from being pulpy or ſucculent; the firſt and third are of a ſubſtance like leather, the ſecond like parchment. The ſame may be ſaid of the walnut, piſtachia-nut, *guettarda*, *quiſqualis*, jack-in-a-box, and ſome others.

Again, the ſeeds of the elm, *ſchrebera*, *flagellaria*, and the mango-tree, are not contained in a ſtone. The ſeed-veſſel of burr-reed is dry, ſhaped like a top, and contains two angular ſtones.

This ſpecies of fruit, or more properly ſeed-veſſel, is commonly roundiſh, and when ſeated below the calyx or receptacle of the flower, is furniſhed, like the apple, at the end oppoſite to the foot-ſtalk, with a ſmall umbilicus or cavity, which is produced by the ſwelling of the fruit before the falling off of the flower-cup.

DRUSES, or DRUZES, a remarkable nation in Paleſtine, inhabiting the environs of Mount Lebanon, of whoſe origin and hiſtory we have the following detail by M. Volney.

Twenty-three years after the death of Mahomet, the diſputes between Ali his ſon-in-law and Moaouia governor of Syria, occaſioned the firſt ſchiſm in the empire of the Arabs, and the two ſects ſubſiſt to this day: but, in reality, this difference related only to power; and the Mahometans, however divided in opinion reſpecting the rightful ſucceſſor of the prophet, were agreed with reſpect to their dogmas. It was not until the following century that the peruſal of Greek books introduced among the Arabs a ſpirit of diſcuſſion and controverſy, to which till then they were utter ſtrangers. The conſequence was, as might be expected, by reaſoning on matters not ſuſceptible of demonſtration, and guided by the abſtract principles of an unintelligible logic, they divided into a multitude of ſects and opinions. At this period, too, the civil power loſt its authority; and religion, which from that derives the means of preſerving its unity, ſhared the ſame fate, and the Mahometans now experienced what had before befallen the Chriſtians. The nations which had received the religion of Mahomet, mixed with it their former abſurd notions: and the errors which had anciently prevailed over Aſia again made their appearance, though altered in their forms. The metempſychoſis, the doctrine of a good and evil principle, and the renovation after ſix thouſand years, as it had been taught by Zoroaſter, were again revived among the Mahometans.

Druses. Mahometans. In this political and religious confusion, every enthusiast became an apostle, and every apostle the head of a sect. No less than sixty of these were reckoned, remarkable for the number of their followers, all differing in some points of faith, and all disavowing heresy and error. Such was the state of these countries when at the commencement of the 11th century Egypt became the theatre of one of the most extravagant scenes of enthusiasm and absurdity ever recorded in history. The following account is extracted from the eastern writers.

In the year of the Hejira 386 (A. D. 996), the third caliph of the race of the Fatemites, called *Hakem-b'amr-ellah*, succeeded to the throne of Egypt at the age of 11 years. He was one of the most extraordinary princes of whom history has preserved the memory. He caused the first caliphs, the companions of Mahomet, to be cursed in the mosques, and afterwards revoked the anathema: He compelled the Jews and Christians to abjure their religion, and then permitted them to resume it. He prohibited the making slippers for women, to prevent them from coming out of their houses. He burnt one half of the city of Cairo for his diversion, while his soldiers pillaged the other. Not contented with these extravagant actions, he forbid the pilgrimage to Mecca, fasting, and the five prayers; and at length carried his madness so far as to desire to pass for God himself. He ordered a register of those who acknowledged him to be so, and the number amounted to sixteen thousand. This impious pretension was supported by a false prophet, who came from Persia into Egypt; which impostor, named *Mohammed-ben-Ismael* taught that it was not necessary to fast or pray, to practise circumcision, to make the pilgrimage to Mecca, or observe festivals; that the prohibition of pork and wine was absurd; and that marriage between brothers and sisters, fathers and children, was lawful. To ingratiate himself with Hackem, he maintained that this caliph was God himself incarnate; and instead of his name *Hakem-b'amr-ellah*, which signifies *governing by the order of God*, he called him *Hakem-b'amr-eh governing by his own order*. Unluckily for the prophet, his new god had not the power to protect him from the fury of his enemies, who slew him in a tumult almost in the arms of the caliph, who was himself massacred soon after on mount Mokattam, where he, as he said, had held conversation with angels.

The death of these two chiefs did not stop the progress of their opinions: a disciple of Mohammed-ben-Ismael, named *Hamza-ben Ahmud*, propogated them with an indefatigable zeal in Egypt, in Palestine, and along the coast of Syria, as far as Sidon and Bergtus. His proselytes being persecuted by the sect in power, they took refuge in the mountains of Lebanon, where they were better able to defend themselves; at least it is certain, that shortly after this era, we find them established there, and forming an independent society.

The difference of their opinions disposes them to be enemies; but the urgent interest of their common safety forces them to allow mutual toleration, and they have always appeared united, and have jointly opposed, at different times, the Crusaders, the sultans of Aleppo, the Mamlouks, and the Ottomans. The conquest of Syria by the latter, made no change in their situation. Selim I. on his return from Egypt, meditating no less than the conquest of Europe, disdained to waste his time before the rocks of Lebanon. Soliman II. his successor, incessantly engaged in important wars, either with the knights of Rhodes, the Persians, the kingdom of Yemen, the Hungarians, the Germans, or the emperor Charles V. had no time to think of the Druzes. Emboldened by this inattention, and not content with their independence, they frequently descended from their mountains to pillage the Turks. The pachas in vain attempted to repel their inroads; their troops were invariably routed or repulsed. And it was not till the year 1588 that Amurath III. wearied with the complaints made to him, resolved, at all events, to reduce these rebels, and had the good fortune to succeed. His general Ibrahim Pacha marched from Cairo, and attacked the Druzes and Maronites with so much address and vigour as to force them into their strong holds, the mountains. Dissension took place among their chiefs, of which he availed himself to exact a contribution of upwards of one million of piasters, and to impose a tribute which has continued to the present time.

It appears that this expedition was the epocha of a considerable change in the constitution of the Druzes. Till then they had lived in a sort of anarchy, under the command of different shaiks or lords. The nation was likewise divided into two factions, such as is to be found in all the Arab tribes, and which are distinguished into the party Kaisi and the party Yamani. To simplify the administration, Ibrahim, permitted them only one chief who should be responsible for the tribute, and execute the office of civil magistrate; and the governor, from the nature of his situation, acquiring great authority, became almost the king of the republic; but as he was always chosen from among the Druzes, a consequence followed which the Turks had not foreseen, and which was nearly fatal to their power. For the chief thus chosen, having at his disposal the whole strength of the nation, was able to give it unanimity and energy, and it naturally turned against the Turks; since the Druzes, by becoming their subjects, had not ceased to be their enemies. They took care, however, that their attacks should be indirect, so as to save appearances, and only engaged in secret hostilities, more dangerous, perhaps, than open war.

About this time, that is, the beginning of the 17th century, the power of the Druzes attained its greatest height; which it owed to the talents and ambition of the celebrated Faker-el-din, commonly called *Fakardin*. No sooner was this prince advanced to be the chief of that people, than he turned his whole attention to humble the Ottoman power, and aggrandize himself at its expence. In this enterprize he displayed an address seldom seen among the Turks. He first gained the confidence of the Porte, by every demonstration of loyalty and fidelity; and as the Arabs at that time infested the plain of Balbek and the countries of Sour and Acre, he made war upon them, freed the inhabitants from their depredations, and thus rendered them desirous of living under his government.

The city of Bairout was situated advantageously for his designs, as it opened a communication with foreign countries, and, among others, with the Venetians, the natural enemies of the Turks. Faker-el-din availed

availed himſelf of the miſconduct of the Aga, expelled him, ſeized on the city, and even had the art to make a merit of this act of hoſtility with the Divan, by paying a more conſiderable tribute. He proceeded in the ſame manner at Saide Balbek and Sour; and at length, about the year 1613, ſaw himſelf maſter of all the country as far as Adjaloun and Safad. The pachas of Tripoli and Damaſcus could not ſee theſe encroachments with indifference; ſometimes, they oppoſed him with open force, though ineffectually, and ſometimes endeavoured to ruin him at the Porte by ſecret inſinuations; but the Emir, who maintained there his ſpies and defenders, defeated every attempt.

At length, however, the Divan began to be alarmed at the progreſs of the Druzes, and made preparations for an expedition capable of cruſhing them. Whether from policy or fear, Faker-el-din did not think proper to wait this ſtorm. He had formed connections in Italy, on which he built great hopes, and determined to go in perſon to ſolicit the ſuccours they had promiſed him; perſuaded that his preſence would encreaſe the zeal of his friends, while his abſence might appeaſe the reſentment of his enemies. He therefore embarked at Bairout; and after reſigning the adminiſtration to his ſon Ali, repaired to the court of the Medici at Florence. The arrival of an Oriental prince in Italy did not fail to attract the public attention. Enquiry was made into his nation, and the origin of theſe Druzes became popular topics of reſearch. Their hiſtory and religion were found to be ſo little known as to leave it a matter of doubt whether they ſhould be claſſed with the Mahometans or Chriſtians. The Cruſades were called to mind; and it was ſoon ſuggeſted, that a people who had taken refuge in the mountains, and were enemies to the natives, could be no other than the offspring of the Cruſaders.

This idle conceit was too favourable to Faker-el-din for him to endeavour to diſprove it: he was artful enough, on the contrary, to pretend he was related to the houſe of Lorraine; and the miſſionaries and merchants, who promiſed themſelves a new opening for converſion and commerce, encouraged his pretenſions. When an opinion is in vogue, every one diſcovers new proofs of its certainty. The learned in etymology, ſtruck with the reſemblance of the names, inſiſted, that Druzes and Dreux muſt be the ſame word; and on this foundation formed the ſyſtem of a pretended colony of French Cruſaders, who, under the conduct of a comte de Dreux, had formed a ſettlement in Lebanon. This hypotheſis, however, was completely overthrown by the remark, that the name of the Druzes is to be found in the itinerary of Benjamin of Tudela, who travelled before the time of the Cruſades. Indeed the futility of it ought to have been ſufficiently apparent at firſt, from the ſingle conſideration, that had they been deſcended from any nation of the Franks, they muſt have retained at leaſt the traces of ſome European language; for a people, retired into a ſeparate diſtrict, and living diſtinct from the natives of the country, do not loſe their language. That of the Druzes, however, is very pure Arabic, without a ſingle word of European origin. The real derivation of the name of this people has been long in our poſſeſſion without our knowing it. It originates from the founder of the ſect of Mohammad-ben-Iſmael, who was ſurnamed *El-Dorzi*, and not *El-Darari*, as it is uſually printed: the confuſion of theſe two words, ſo different in our writing, ariſes from the figure of the two Arabic letters *r* and *z*, which have only this difference, that the *z* has a point over it, frequently omitted or effaced in the manuſcripts.

After a ſtay of nine years in Italy, Faker-el-din returned to reſume the government of his country. During his abſence, his ſon Ali had repulſed the Turks, appeaſed diſcontents, and maintained affairs in tolerable good order. Nothing remained for the Emir, but to employ the knowledge he could not but have acquired, in perfecting the internal adminiſtration of government, and promoting the welfare of the nation; but inſtead of the uſeful and valuable arts, he wholly abandoned himſelf to the frivolous and expenſive, for which he had imbibed a paſſion while in Italy. He built numerous villas; conſtructed baths, and planted gardens; he even preſumed, without reſpect to the prejudices of his country, to employ the ornaments of painting and ſculpture, notwithſtanding theſe are prohibited by the Koran.

The conſequences of this conduct ſoon manifeſted themſelves: the Druzes, who paid the ſame tribute as in time of war, became diſſatisfied. The Yamani faction were rouſed; the people murmured at the expences of the prince; and the luxury he diſplayed renewed the jealouſy of the pachas. They attempted to levy greater tribute: hoſtilities again commenced, and Faker-el-din repulſed the forces of the pachas; who took occaſion from this reſiſtance, to render him ſuſpected by the ſultan himſelf. Amurath III. incenſed that one of his ſubjects ſhould dare to enter into a competition with him, reſolved on his deſtruction; and the pacha of Damaſcus received orders to march, with all his forces, againſt Bairout, the uſual reſidence of Faker-el-din; while 40 galleys inveſted it by ſea, and cut off all communication.

The Emir, who depended on his good fortune and ſuccours from Italy, determined at firſt to brave the ſtorm. His ſon Ali, who commanded at Safad, was ordered to oppoſe the progreſs of the Turkiſh army; and in fact he bravely reſiſted them, nothwithſtanding the great diſparity of his forces: but after two engagements, in which he had the advantage, being ſlain in a third attack, the face of affairs were greatly changed, and every thing went to ruin. Faker-el-din, terrified at the loſs of his troops, afflicted at the death of his ſon, and enfeebled by age and a voluptuous life, loſt both courage and preſence of mind. He no longer ſaw any reſource but in a peace, which he ſent his ſecond ſon to ſolicit of the Turkiſh admiral, whom he attempted to ſeduce by preſents; but the admiral, detaining both the preſents and envoy, declared he would have the prince himſelf. Faker-el-din, intimidated, took to flight, and was purſued by the Turks, now maſters of the country. He took refuge on the ſteep eminence of Niha, where they beſieged him ineffectually for a whole year, when they left him at liberty: but ſhortly after, the companions of his adverſity, wearied with their ſufferings, betrayed and delivered

delivered him up to the Turks. Faker-el-din, though in the hands of his enemies, conceived hopes of pardon, and suffered himself to be carried to Constantinople; where Amurath, pleased to behold at his feet a prince so celebrated, at first treated him with that benevolence which arises from the pride of superiority; but soon returning to his former jealousies, yielded to the instigations of his courtiers, and, in one of his violent fits of passion, ordered him to be strangled, about the year 1631.

After the death of Faker-el-din, the posterity of that prince still continued in possession of the government, though at the pleasure, and as vassals, of the Turks. This family failing in the male line at the beginning of the present century, the authority devolved, by the election of the shaiks, on the house of Shelah, in which it still continues. The only emir of that house, whose name deserves to be preserved, is the emir Melhem, who reigned from 1740 to 1759; in which interval he retrieved the losses of the Druzes, and restored them to that consequence which they had lost by the defeat of Faker-el-din. Towards the end of his life, about the year 1754, Melhem, wearied with the cares of government, abdicated his authority, to live in religious retirement, after the manner of the Okkals; but the troubles that succeeded occasioned him once more to resume the reins of government, which he held till 1759, when he died, universally regretted.

He left three sons, minors: the eldest of whom ought, according to the custom of the country, to have succeeded him; but being only 11 years of age, the authority devolved on his uncle Mansour, agreeable to a law very general in Asia, which wills the people to be governed by a sovereign who has arrived at years of maturity. The young prince was but little fitted to maintain his pretensions; but a Maronite, named Sad-el-Kouri, to whom Melhem had entrusted his education, took this upon himself. Aspiring to see his pupil a powerful prince, that he might himself become a powerful visir, he made every exertion to advance his fortune. He first retired with him to Djebail, in the Kesraouan, where the emir Yousef possessed large domains, and there undertook to conciliate the Maronites, by embracing every opportunity to serve both individuals and the nation. The great revenues of his pupil, and the moderation of his expenditure, amply furnished him with the means. The farm of the Kesraouan was divided between several shaiks, with whom the Porte was not very well satisfied. Sad treated for the whole with the pacha of Tripoli, and got himself appointed sole receiver. The Motoualis of the valley of Balbek had for some years before made several encroachments on Lebanon, and the Maronites began to be alarmed at the near approach of these intolerant Mahometans. Sad purchased of the pacha of Damascus a permission to make war upon them; in 1763 drove them out of the country. The Druzes were at that time divided into two factions: Sad united his interest with those who opposed Mansour, and secretly prepared the plot which was to raise the nephew on the ruin of the uncle.

At this period the Arab Daher, who had made himself master of Galilee, and fixed his residence at Acre, disquieted the Porte by his progress and pretensions: to oppose him, the Divan had just united the pachalics of Damascus, Saide, and Tripoli, in the hands of Osman and his children; and it was evident, that an open war was not very remote. Mansour, who dreaded the Turks too much to resist them, made use of the policy usual on such occasions, pretending a zeal for their service, while he secretly favoured their enemy. This was a sufficient motive for Sad to pursue measures directly opposite. He supported the Turks against the faction of Mansour, and manoeuvered with so much good fortune or address as to depose that emir in 1770, and place Yousef in his government.

In the following year Ali Bey declared war and attacked Damascus. Yousef, called on by the Turks, took part in the quarrel, but without being able to draw the Druzes from their mountains to enter into the army of the Ottomans. Besides their natural repugnance, at all times, to make war out of their country, they were on this occasion too much divided at home to quit their habitations, and they had reason to congratulate themselves on the event. The battle of Damascus ensued; and the Turks, as we have already seen, were completely routed. The pacha of Saide escaping from this defeat, and not thinking himself in safety in that town, sought an asylum even in the house of the emir Yousef. The moment was unfavourable; but the face of affairs soon changed by the flight of Mohammed Bey. The emir, concluding that Ali Bey was dead, and not imagining that Daher was powerful enough singly to mantain the quarrel, declared openly against him. Saide was threatened with a siege, and he detached 1500 men of his faction to its defence; while himself in person, prevailing on the Druzes and Maronites to follow him, made an incursion with 25,000 peasants into the valley of Bekaa; and in the absence of the Motoualis, who had joined the army of Daher, laid the whole country waste with fire and sword from Balbek to Tyre.

While the Druzes, proud of this exploit, were marching in disorder towards the latter city, 500 Motoualis, informed of what had happened, flew from Acre inflamed with rage and despair, and fell with such impetuosity on their army as to give them a complete overthrow. Such was the surprise and confusion of the Druzes, that, imagining themselves attacked by Daher himself and betrayed by their companions, they turned their swords on each other as they fled. The steep declivities of Djezin, and the pine-woods which were in the route of the fugitives, were strewed with dead, but few of whom perished by the hands of the Motoualis.

The emir Yousef, ashamed of this defeat, escaped to Dair-el-Kamar, and shortly after attempted to take revenge; but being again defeated in the plain between Saide and Sour (Tyre), he was constrained to resign to his uncle Mansour the ring, which among the Druzes is the symbol of command. In 1773 he was restored by a new revolution; but he could not support his power but at the expence of a civil war. In order, therefore, to prevent Bairout falling into the hands of the adverse faction, he requested the assistance of the Turks, and demanded of the pacha of Damascus a man of sufficient abilities to defend that city. The

choice

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This man, named Ahmad, is a native of Bosnia, and speaks the Sclavonian as his mother tongue, as the Ragusan captains, with whom he converses in preference to those of every other nation, assert. It is said, that flying from his country at the age of 16, to escape the consequences of an attempt to violate his sister-in-law, he repaired to Constantinople, where, destitute of the means of procuring a subsistence, he sold himself to the slave-merchants to be conveyed to Egypt; and, on his arrival at Cairo, was purchased by Ali Bey, who placed him among his Mamlouks.

Ahmad was not long in distinguishing himself by his courage and address. His patron employed him on several occasions in dangerous *coups de main*, such as the assassination of such beys and cachefs as he suspected: of which commissions he acquitted himself so well as to acquire the name of *Djezzar*, which signifies *Cut-throat*. With this claim to his friendship, he enjoyed the favour of Ali until it was disturbed by an accident.

This jealous Bey having proscribed one of his benefactors called Saleh Bey, commanded Djezzar to cut off his head. Either from humanity or some secret friendship for the devoted victim, Djezzar hesitated, and even remonstrated against the order. But learning the next day that Mohammed Bey had executed the commission, and that Ali had spoken of him not very favourably, he thought himself a lost man, and, to avoid the fate of Saleh Bey, escaped unobserved, and reached Constantinople. He there solicited employments suitable to his former rank; but meeting, as is usual in capitals, with a great number of rivals, he pursued another plan, and went to seek his fortune in Syria as a private soldier. Chance conducted him among the Druzes, where he was hospitably entertained, even in the house of the kiaya of the emir Yousef. From thence he repaired to Damascus, where he soon obtained the title of *Aga*, with command of five pair of colours, that is to say, of 50 men; and he was thus situated when fortune destined him to the government of Bairout.

Djezzar was no sooner established there than he took possession of it for the Turks. Yousef was confounded at this proceeding. He demanded justice at Damascus; but finding his complaints treated with contempt, entered into a treaty with Daher, and concluded an offensive and defensive alliance with him at Ras-el-aen, near to Sour. No sooner was Daher united with the Druzes than he laid siege to Bairout by land, whilst two Russian frigates, whose service was purchased by 600 purses, cannonaded it by Sea. Djezzar was compelled to submit to force, and, after a vigorous resistance, gave up the city and surrendered himself prisoner. Shaik Daher charmed with his courage, and flattered with the preference he had given him in the surrender, conducted him to Acre, and showed him every mark of kindness. He even ventured to trust him with a small expedition into Palestine; but Djezzar, on approaching Jerusalem, went over to the Turks and returned to Damascus.

The war of Mohammed Bey breaking out, Djezzar offered his service to the captain Pacha, and gained his confidence. He accompanied him to the siege of Acre; and that admiral having destroyed Daher, and finding no person more proper than Djezzar to accomplish the designs of the Porte in that country, named him pacha of Saide.

Being now, in consequence of this revolution, superior lord to the emir Yousef, Djezzar is mindful of injuries in proportion as he has reason to accuse himself of ingratitude. By a conduct truly Turkish, feigning alternately gratitude and resentment, he is alternately on terms of dispute and reconciliation with him, continually exacting money as the price of peace, or as indemnity for war. His artifices have succeeded so well, that within the space of five years he has extorted from the emir four millions of French money (above L. 160,000), a sum the more astonishing, as the farm of the country of the Druzes did not them amount to 100,000 livres (L.4000).

In 1784 he made war on him, deposed him, and bestowed the government on the emir of the country of Hasbeya, named Ismael. Yousef, having once more purchased his favour, returned towards the end of the same year to Dair-el-Kamar, and even courted his confidence so far as to wait on him at Acre, from whence nobody expected him to return; but Djezzar is too cunning to shed blood while there are any hopes of getting money: he released the prince, and sent him back with every mark of friendship. Since that period the Porte has named him pacha of Damascus, while he also retained the sovereignty of the pachalic of Acre, and of the Druzes.

As to the religion of the Druzes: What has been already said of the opinions of Mohammed-ben-Ismael may be regarded as the substance of it. They practise neither circumcision, nor prayers, nor fasting; they observe neither festivals nor prohibitions. They drink wine, eat pork, and allow marriage between brothers and sisters, though not between fathers and children. From this we may conclude, with reason, that the Druzes have no religion; yet one class of them must be excepted, whose religious customs are very peculiar. Those who compose it are to the rest of the nation what the initiated were to the profane; they assume the name of *Okkals*, which means spiritualists, and bestow on the vulgar the epithet of *Djahel* or ignorant; they have various degrees of initiation, the highest orders of which require celibacy. These are distinguishable by the white turban they affect to wear, as a symbol of their purity; and so proud are they of this supposed purity, that they think themselves sullied by even touching a profane person. If you eat out of their plate, or drink out of their cup, they break them; and hence the custom, so general in this country, of using vases with a sort of cock, which may be drank out of without touching them with the lips. All their practices are enveloped in mysteries: their oratories always stand alone, and are constantly situated on eminences: in these they hold their secret assemblies, to which women are admitted. It is pretended they perform ceremonies there in presence of a small statue resembling an ox or a calf; whence some have pretended to prove that they are descended from the Samaritans. But besides that the fact is not well ascertained, the worship of the ox may be deduced from other sources.

They have one or two books which they conceal with

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with the greateſt care: but chance has deceived their jealouſy: for in a civil war which happened 9 or 10 years ago, the emir Youſef, who is *Djahel* or ignorant, found one among the pillage of one of their oratories. M. Volney was aſſured, by perſons who had read it, that it contains only a myſtic jargon, the obſcurity of which doubtleſs renders it valuable to adepts. Hakem Bamr-ellah is there ſpoken of, by whom they mean God incarnated in the perſon of the caliph. It likewiſe treats of another life, of a place of puniſhment, and a place of happineſs where the Okkals ſhall of courſe be moſt diſtinguiſhed. Several degrees of perfection are mentioned, to which they arrive by ſucceſſive trials. In other reſpects, theſe ſectaries have all the inſolence and all the fears of ſuperſtition: they are not communicative, becauſe they are weak; but it is probable that, were they powerful, they would be promulgators and intolerant.

The reſt of the Druzes, ſtrangers to this ſpirit, are wholly indifferent about religious matters. The Chriſtians who live in their country pretend that ſeveral of them believe in the metempſychoſis; that others worſhip the ſun, moon, and ſtars: all which is poſſible; for, as among the Anſaria, every one, left to his own fancy, follows the opinion that pleaſes him moſt; and theſe opinions are thoſe which preſent themſelves moſt naturally to unenlightened minds. When among the Turks, they affect the exterior of Mahometans, frequent the moſques, and perform their ablutions and prayers. Among the Maronites, they accompany them to church, and, like them, make uſe of holy water. Many of them, importuned by the miſſionaries, ſuffer themſelves to be baptized; and if ſolicited by the Turks, receive circumciſion, and conclude by dying neither Chriſtians nor Mahometans; but they are not ſo indifferent in matters of civil policy.

The Druzes may be divided into two claſſes: the common people; and the people of eminence and property, diſtinguiſhed by the title of ſhaiks and emirs, or deſcendants of princes. The greater part are cultivators, either as farmers or proprietors; every man lives on his inheritance, improving his mulberry-trees and vineyards: in ſome diſtricts they grow tobacco, cotton, and ſome grain, but the quantity of theſe is inconſiderable. It appears that at firſt all the lands were, as formerly in Europe, in the hands of a ſmall number of families. But to render them productive, the great proprietors were forced to ſell part of them, and let leaſes; which ſubdiviſion is become the chief ſource of the power of the ſtate, by multiplying the number of perſons intereſted in the public weal: there ſtill exiſts, however, ſome traces of the original inequality, which even at this day produces pernicious effects. The great property poſſeſſed by ſome families gives them too much influence in all the meaſures of the nation; and their private intereſts have too great weight in every public tranſaction. Their hiſtory, for ſome years back, affords ſufficient proofs of this; ſince all the civil or foreign wars in which they have been engaged have originated in the ambition and perſonal views of ſome of the principal families, ſuch as the Leſbeks, the Djambelats, the Iſmaels of Solyma, &c. The ſhaiks of theſe houſes, who alone poſſeſs one-tenth part of the country, procured creatures by their money, and at laſt involved all the Druzes in their diſſenſions. It muſt be owned, however, that poſſibly to this conflict between contending parties the whole nation owes the good fortune of never having been enſlaved by its chief.

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The chief, called *Hakem* or governor, alſo *Emir* or prince, is a ſort of king or general, who unites in his own perſon the civil and military powers. His dignity is ſometimes tranſmitted from father to ſon, ſometimes from one brother to another; and the ſucceſſion is determined rather by force than any certain laws. Females can in no caſe pretend to this inheritance. They are already excluded from ſucceſſion in civil affairs, and conſequently can ſtill leſs expect it in political: in general, the Aſiatic governments are too turbulent, and their adminiſtration renders military talents too neceſſary, to admit of the ſovereignty of women. Among the Druzes, the male line of any family being extinguiſhed, the government devolves to him who is in poſſeſſion of the greateſt number of ſuffrages and reſources. But the firſt ſtep is to obtain the approbation of the Turks, of whom he becomes the vaſſal and tributary. It even happens, that, not unfrequently to aſſert their ſupremacy, they name the Hakem, contrary to the wiſhes of the nation, as in the caſe of Iſmael Haſbeya, raiſed to that dignity by Djezzar; but this conſtraint laſts no longer than it is maintained by that violence which gave it birth. The office of the governor is to watch over the good order of the ſtate, and to prevent the Emirs, Shaiks, and villages, from making war on each other: in caſe of diſobedience, he may employ force. He is alſo at the head of the civil power, and names the Cadis, only always reſerving to himſelf the power of life and death. He collects the tribute, from which he annually pays to the pacha a ſtated ſum. This tribute varies in proportion as the nation renders itſelf more or leſs formidable: at the beginning of this century, it amounted to 160 purſes, L. 8330; but Melhem forced the Turks to reduce it to 60. In 1784, Emir Youſef paid 80 and promiſed 90. This tribute, which is called *Miri*, is impoſed on the mulberry-trees, vineyards, cotton, and grain. All ſown land pays in proportion to its extent; every foot of mulberries is taxed at three medins, or three ſols nine deniers (not quite two-pence). A hundred feet of vineyard pays a piaſter or 40 medins; and freſh meaſurements are often made to preſerve a juſt proportion. The ſhaiks and emirs have no exemption in this reſpect: and it may be truly ſaid they contribute to the public ſtock in proportion to their fortune. The collection is made almoſt without expence. Each man pays his contingent at Dair-el-Kamar, if he pleaſes, or to the collectors of the prince, who make a circuit round the country after the crop of ſilks. The ſurplus of this tribute is for the prince: ſo that it is his intereſt to reduce the demands of the Turks, as it would be likewiſe to augment the impoſt: but this meaſure requires the ſanction of the ſhaiks, who have the privilege of oppoſing it. Their conſent is neceſſary, likewiſe, for peace and war. In theſe caſes, the emir muſt convoke general aſſemblies, and lay before them the ſtate of his affairs. There every ſhaik, and every peaſant who has any reputation for courage or underſtanding, is intitled to give his ſuffrage; ſo that this government may be conſidered as a well-proportioned mixture of monarchy, ariſtocracy and democracy. Every thing depends on circumſtances;

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ces: if the governor be a man of ability, he is absolute; if weak, a cypher. This proceeds from the want of fixed laws; a want common to all Asia, and the radical cause of all the disorders in the governments of the Asiatic nations.

Neither the chief nor the individual emirs maintain troops; they have only persons attached to the domestic service of their houses, and a few black slaves. When the nation makes war, every man, whether shaik or peasant, able to bear arms, is called upon to march. He takes with him a little bag of flour, a musket, some bullets, a small quantity of powder, made in his village, and repairs to the rendezvous appointed by the governor. If it be a civil war, as sometimes happens, the servants, the farmers, and their friends, take up arms for their patron, or the chief of their family, and repair to his standard. In such cases, the parties irritated frequently seem on the point of proceeding to the last extremities; but they seldom have recourse to acts of violence, or attempt the death of each other; mediators always interpose, and the quarrel is appeased the more readily as each patron is obliged to provide his followers with provisions and ammunition. This system, which produces happy effects in civil troubles, is attended with great inconvenience in foreign wars, as sufficiently appeared in that of 1784. Djezzar, who knew that the whole army lived at the expence of the emir Yousef, aimed at nothing but delay, and the Druzes, who were not displeased at being fed for doing nothing, prolonged the operations; but the emir, wearied of paying, concluded a treaty, the terms of which were not a little rigorous for him, and eventually for the whole nation, since nothing is more certain than that the interests of a prince and his subjects are always inseparable.

"The ceremonies to which I have been a witness on these occasions (says M. Volney), bear a striking resemblance to the customs of ancient times. When the emir and the shaiks had determined on war at Daer-el-Kamar, cryers, in the evening, ascended the summits of the mountain; and there began to cry with a loud voice: 'To war, to war; take your guns, take your pistols: noble shaiks, mount your horses; arm yourselves with the lance and sabre; rendezvous to morrow at Dair-el-Kamar. Zeal of God! zeal of combats!' This summons, heard from the neighbouring villages, was repeated there; and as the whole country is nothing but a chain of lofty mountains and deep valleys, the proclamation passed in a few hours to the frontiers. These voices, from the stillness of the night, the long resounding echoes, and the nature of the subject, had something awful and terrible in their effect. Three days after 15,000 armed men rendezvoused at Dair-el-Kamar, and operations might have been immediately commenced.

"We may easily imagine that troops of this kind no way resemble the European soldiers; they have neither uniforms, nor discipline, nor order. They are a crowd of peasants with short coats, naked legs, and muskets in their hands; differing from the Turks and Mamlouks in that they are all foot; the shaiks and emirs alone having horses, which are of little use from the rugged nature of the country. War there can only be a war of posts. The Druzes never risk themselves in the plain; and with reason: for they would be unable to stand the shock of cavalry, having no bayonets to their muskets. Their whole art consists in climbing rocks, creeping among the bushes and blocks of stone; from whence their fire is the more dangerous, as they are covered, fire at their ease, and by hunting and military sports have acquired the habit of hitting a mark with great dexterity. They are accustomed to sudden inroads, attacks by night, ambuscades, and all those *coups de main* which require to fall suddenly on, and come to close fight with the enemy. Ardent in improving their success, easily dispirited, and prompt to resume their courage; daring, even to temerity, and sometimes ferocious, they possess above all two qualities essential to the excellency of any troops; they strictly obey their leaders, and are endowed with a temperance and vigour of health at this day unknown to most civilized nations. In the campaign of 1784, they passed three months in the open air without tents, or any other covering than a sheep-skin; yet were there not more deaths or maladies than if they had remained in their houses. Their provisions consisted, as at other times, of small loaves baked on the ashes or on a brick, raw onions, cheese, olives, fruits, and a little wine. The table of their chiefs was almost as frugal; and we may affirm, that they subsisted 100 days, on what the same number of Englishmen or Frenchmen would not have lived ten. They have no knowledge of the science of fortification, the management of artillery or encampments, nor, in a word, any thing which constitutes the art of war. But had they among them a few persons versed in military science, they would readily acquire its principles, and become a formidable soldiery. This would be the more easily effected, as their mulberry plantations and vineyards do not occupy them all the year, and they could afford much time for military exercises."

By the last estimates, according to M. Volney's information, the number of men able to bear arms was 40,000, which supposes a total population of 120,000: no addition is to be made to this calculation, since there are no Druzes in the cities or on the coast. As the whole country contains only 110 square leagues, there results for every league 1090 persons; which is equal to the population of our richest provinces. To render this more remarkable, it must be observed that the soil is not fertile, that a great many eminences remain uncultivated, that they do not grow corn enough to support themselves three months in the year, that they have no manufactures, and that all their exportations are confined to silks and cottons, the balance of which exceeds very little the importation of corn from the Hauran, the oils of Palestine, and the rice and coffee they procure from Bairout. Whence arises then such a number of inhabitants within so small a space? "I can discover no other cause (says our author), than that ray of liberty which glimmers in this country. Unlike the Turks, every man lives in a perfect security of his life and property. The peasant is not richer than in other countries; but he is free. 'He fears not,' as I have often heard them say, 'that the Aga, the Kaimmakam, or the Pacha, should send their Djendis to pillage his house, carry off his family, or give him the bastinado.' Such oppressions are unknown among these mountains. Security, therefore, has been the original cause of population, from that inherent desire which all men have to multiply themselves wherever they find an easy subsistence. The frugality of the nation which is content with little, has been a secondary, and not less powerful reason; and a third is the emigration

Druses. emigration of a number of Christian families, who daily desert the Turkish provinces to settle in Mount Lebanon, where they are received with open arms by the Maronites from similarity of religion, and by the Druzes from principles of toleration, and a conviction how much it is the interest of every country to multiply the number of its cultivators, consumers, and allies.

" The comparison which the Druzes often have an opportunity of making between their situation and that of other subjects of the Turkish government, has given them an advantageous opinion, of their superiority, which, by a natural effect, has an influence on their personal character. Exempt from the violence and insults of despotism, they consider themselves as more perfect than their neighbours, because they have the good fortune not to be equally debased. Hence they acquire a character more elevated, energetic, and active; in short, a genuine republican spirit. They are considered throughout the Levant as restless, enterprising, hardy, and brave even to temerity. Only 300 of them have been seen to enter Damascus in open day, and spread around them terror and carnage. No people are more nice then they with respect to the point of honour: Any offence of that kind, or open insult, is instantly punished by blows of the kandjur or the musket; while among the inhabitants of the towns, it only excites injurious retorts. This delicacy has occasioned in their manners and discourse a reserve, or, if you will, a politeness which one is astonished to discover among peasants. It is carried even to dissimulation and falsehood, especially among the chiefs, whose greater interests demand greater attentions. Circumspection is necessary to all, from the formidable consequences of that retaliation of which I have spoken. These customs may appear barbarous to us; but they have the merit of supplying the deficiency of regular justice, which is necessarily tedious and uncertain in these disorderly and almost anarchical governments.

" The Druzes have another point of honour, that of hospitality. Whoever presents himself at their door in the quality of a suppliant or passenger, is sure of being entertained with lodging and food in the most generous and unaffected manner. M. Volney often saw the lowest peasants give the last morsel of bread they had in their houses to the hungry traveller; and when it was observed to them that they wanted prudence, their answer was, ' God is liberal and great, and all men are brethren.' There are, therefore, no inns in their country any more than in the rest of Turkey. When they have once contracted with their guest the sacred engagement of bread and salt, no subsequent event can make them violate it. Various instances of this are related, which do honour to their character. A few years ago, an aga of the janissaries having been engaged in a rebellion, fled from Damascus and retired among the Druzes. The pacha was informed of this, and demanded him of the emir, threatening to make war on him in case of refusal. The emir demanded him of the shaik Talhouk, who had received him; but the indignant shaik replied, 'When have you known the Druzes deliver up their guests? Tell the emir, that as long as Talhouk shall preserve his beard, not a hair of the head of his suppliant shall fall! The emir threatened him with force; Talhouk armed his family. The emir, dreading a revolt, adopted a method practised as juridical in that country. He declared to the shaik, that he would cut down 50 mulberry-trees a-day until he should give up the aga. He proceeded as far as a thousand, and Talhouk still remained inflexible. At length the other shaiks, enraged, took up the quarrel; and the commotion was about to become general, when the aga, reproaching himself with being the cause of so much mischief, made his escape without the knowledge even of Talhouk.

" The Druzes have also the prejudices of the Bedouins respecting birth; like them they pay great respect to the antiquity of families; but this produces no essential inconveniences. The nobility of the emirs and shaiks does not exempt them from paying tribute in proportion to their revenues. It confers on them no prerogatives, either in the attainment of landed property or public employments. In this country, no more than in all Turkey, are they acquainted with game-laws, or glebes, or seigniorial or ecclesiastical tithes, franc fiefs or alienation fines; every thing is held in freehold: Every man, after paying his miri and his rent, is master of his property. In short, by a particular privilege, the Druzes pay no fine for their succession; nor does the emir, like the sultan, arrogate to himself original and universal property: there exists nevertheless, in the law of inheritance, an imperfection which produces disagreeable effects. Fathers have, as in the Roman law, the power of preferring such of their children as they think proper: hence it has happened in several families of the shaiks, that the whole property has centered in the same person, who has perverted it to the purpose of intriguing and caballing, while his relations remain, as they will express it, *princes of olives and cheese*; that is to say, poor as peasants.

" In consequence of their prejudices, the Druzes do not choose to make alliances out of their own families. They invariably prefer their relation, though poor, to a rich stranger; and poor peasants have been known to refuse their daughters to merchants of Saide and Bairout, who possessed from twelve to fifteen thousand piasters. They observe also, to a certain degree, the custom of the Hebrews, which directed that a brother should espouse his brother's widow; but this is not peculiar to them, for they retain that as well as several other customs of that ancient people, in common with other inhabitants of Syria and all the Arab tribes.

" In short, the proper and distinctive character of the Druzes is a sort of republican spirit, which gives them more energy than any other subjects of the Turkish government, and an indifference for religion, which forms a striking contrast with the zeal of the Mahometans and Christians. In other respects, their private life, their customs, and prejudices, are the same with other orientals. They may marry several wives, and repudiate them when they choose; but, except by the emir and a few men of eminence, that is rarely practised. Occupied with their rural labours, they experience neither artificial wants, nor those inordinate passions, which are produced by the idleness of the inhabitants of cities and towns. The veil, worn by their women, is of itself a preservative against those desires which are the occasion of so many evils in society.

ciety. No man knows the face of any other woman than his wife, his mother, his fifter, and fifters-in-law. Every man lives in the bofom of his own family, and goes little abroad. The women, thofe even of the fhaiks, make the bread, roaft the coffee, wafh the linen, cook the victuals, and perform all domeftic offices. The men cultivate their lands and vineyards, and dig canals for watering them. In the evening they fometimes affemble in the court, the area, or houfe of the chief of the village or family. There, feated in a circle, with legs croffed, pipes in their mouths, and poniards at their belts, they difcourfe of their various labours, the fcarcity or plenty of their harvefts, peace or war, the conduct of the emir, or the amount of the taxes; they relate paft tranfactions, difcufs prefent interefts, and form conjectures on the future. Their children tired with play, come frequently to liften; and a ftranger is furprifed to hear them, at ten or twelve years old, recounting, with a ferious air, why Djezzar declared war againft the emir Youfef, how many purfes it coft that prince, what augmentation there will be of the miri, how many mufkets there were in the camp, and who had the beft mare. This is their only education. They are neither taught to read the pfalms as among the Maronites, nor the koran like the Mahometans; hardly do the fhaiks know how to write a letter. But if their mind be deftitute of ufeful or agreeable information, at leaft it is not preoccupied by falfe and hurtful ideas; and, without doubt, fuch natural ignorance is well worth all our artificial folly. This advantage refults from it, that their underftandings being nearly on a level, the inequality of conditions is lefs perceptible. For, in fact, we do not perceive among the Druzes that great diftance which, in moft other focieties, degrades the inferior, without contributing to the advantage of the great. All, whether fhaiks or peafants, treat each other with that rational familiarity, which is equally remote from rudenefs and fervility. The grand emir himfelf is not a different man from the reft: he is a good country gentleman, who does not difdain admitting to his table the meaneft farmer. In a word, their manners are thofe of ancient times, and of that ruftic life which marks the origin of every nation; and prove that the people among whom they are ftill found are as yet only in the infancy of the focial ftate."

DRUSIUS (John), a Proteftant writer of great learning, born at Oudenarde in Flanders in 1555. He was defigned for the ftudy of divinity; but his father being outlawed, and deprived of his eftate, they both retired to England, where the fon became profeffor of the oriental languages at Oxford; but upon the pacification of Ghent, they returned to their own country, where Drufius was alfo appointed profeffor of the oriental languages. From thence he removed to Friefland, where he was admitted Hebrew profeffor in the univerfity of Franeker; the functions of which he difcharged with great honour till his death in 1616. His works fhow him to have been well fkilled in Hebrew; and the States General employed him in 1600 to write notes on the moft difficult paffages in the Old Teftament, with a penfion of 400 florins a-year: but being frequently difturbed in this undertaking, it was not publifhed till after his death. He held a vaft correfpondence with the learned; for befides letters in Hebrew, Greek, and other languages, there were found 2300 Latin letters among his papers. He had a fon John, who died in England at 21, and was a prodigy for his early acquifition of learning; he wrote Notes on the Proverbs of Solomon, with many letters and verfes in Hebrew.

DRYADS, in the heathen theology, a fort of deities, or nymphs, which the ancients thought inhabited groves and woods. They differed from the Hamadryades; thefe latter being attached to fome particular tree, with which they were born, and with which they died; whereas the Dryades were goddeffes of trees and woods in general. See HAMADRYADES.

DRYAS, in botany: A genus of the polygynia order, belonging to the icofandria clafs of plants; and in the natural method ranking under the 35th order, *Senticofæ*. The calyx is octofid the petals eight; the feeds long and hairy with a train.

DRYDEN (John), one of the moft eminent Englifh poets of the 17th century, defcended of a genteel family in Huntingdonfhire, was born in that county at Oldwincle 1631, and educated at Weftminfter fchool under Dr Bufhby. From thence he was removed to Cambridge in 1650, being elected fcholar of Trinity-college, of which it appears, by his *Epithalamia Cantabrigienf.* 4to, 1662, to have been afterwards a fellow. Yet in his earlier days he gave no extraordinary indication of genius; for even the year before he quitted the univerfity, he wrote a poem on the death of Lord Haftings, which was by no means a prefage of that amazing perfection in poetical powers which he afterwards poffeffed.

On the death of Oliver Cromwell he wrote fome heroic ftanzas to his memory; but on the Reftoration, being defirous of ingratiating himfelf with the new court, he wrote firft a poem intitled *Aftræa Redux*, and afterwards a panegyric to the king on his coronation. In 1662, he addreffed a poem to the lord chancellor Hyde, prefented on New Year's day; and in the fame year a fatire on the Dutch. In 1668 appeared his *Annus Mirabilis*, which was an hiftorical poem in celebration of the duke of York's victory over the Dutch. Thefe pieces at length obtained him the favour of the crown; and Sir William Davenant dying the fame year, Mr Dryden was appointed to fucceed him as poet laureat. About this time alfo his inclination to write for the ftage feems firft to have fhown itfelf. For befides his concern with Sir William Davenant in the alteration of Shakefpeare's Tempeft, in 1669 he produced his Wild Gallants, a comedy. This met with very indifferent fuccefs; yet the author, not being difcouraged by its failure, foon publifhed his Indian Emperor. This finding a more favourable reception, encouraged him to proceed; and that with fuch rapidity, that in the key to the Duke of Buckingham's Rehearfal he is recorded to have engaged himfelf by contract for the writing of four plays per year; and, indeed, in the years 1679 and 1680 he appears to have fulfilled that contract. To this unhappy neceffity that our author lay under, are to be attributed all thofe irregularities, thofe bombaftic flights, and fometimes even puerile exuberances, for which he has been fo feverely criticifed; and which, in the unavoidable hurry in which he wrote, it was impoffible he fhould find time either for lopping way or correcting.

Dryden.

In 1675, the Earl of Rochester, whose envious and malevolent disposition would not permit him to see growing merit meet with its due reward, and was therefore sincerely chagrined at the very first applause with which Mr Dryden's dramatic pieces had been received, was determined if possible to shake his interest at court; and succeeded so far as to recommend Mr Crowne, an author by no means of equal merit, and at that time of an obscure reputation, to write a mask for the court, which certainly belonged to Mr Dryden's office as poet laureat.—Nor was this the only attack, nor indeed the most potent one, that Mr Dryden's justly acquired fame drew on him. For some years before the Duke of Buckingham, a man of not much better character than Lord Rochester, had most severely ridiculed several of our author's plays in his admired piece called the *Rehearsal.* But though the intrinsic wit which run through that performance cannot even to this hour fail of exciting our laughter, yet at the same time it ought not to be the standard on which we should fix Mr Dryden's poetical reputation, if we consider, that the pieces there ridiculed are not any of those looked on as the *chef d'œuvres* of this author; that the very passages burlesqued are frequently, in their original places, much less ridiculous than when thus detached, like a rotten limb, from the body of the work; and exposed to view with additional distortions, and divested of that connection with the other parts, which, while preserved, gave it not only symmetry but beauty; and lasty, that the various inimitable beauties, which the critic has sunk in oblivion, are infinitely more numerous than the deformities which he has thus industriously brought forth to our more immediate inspection.

Mr Dryden, however, did not suffer these attacks to pass with impunity; for in 1679 there came out an Essay on Satire, said to be written jointly by that gentleman and the Earl of Mulgrave, containing some very severe reflections on the Earl of Rochester and the Dutchess of Portsmouth, who, it is not improbable, might be a joint instrument in the abovementioned affront shown to Mr Dryden; and in 1681 he published his Absalom and Achitophel, in which the well-known character of Zimri, drawn for the Duke of Buckingham, is certainly severe enough to repay all the ridicule thrown on him by that nobleman in the character of Bays.—The resentment shown by the different peers was very different. Lord Rochester, who was a coward as well as a man of the most depraved morals, basely hired three ruffians to cudgel Dryden in a coffee-house: but the Duke of Buckingham, as we are told, in a more open manner, took the task upon himself: and at the same time presented him with a purse containing no very trifling sum of money; telling him, that he gave him the beating as a punishment for his impudence, but bestowed that gold on him as a reward for his wit.

In 1680 was published a translation of Ovid's Epistles in English verse by several hands, two of which, together with the preface, were by Mr Dryden; and in 1682 came out his *Religio Laici,* designed as a defence of revealed religion, against Deists, Papists, &c. Soon after the accession of King James II. our author changed his religion for that of the church of Rome, and wrote two pieces in vindication of the Romish tenets; *viz.* A Defence of the Papers written by the late King, found in his strong box; and the celebrated poem, afterwards answered by Lord Halifax, intitled the Hind and the Panther.—By this extraordinary step he not only engaged himself in controversy, and incurred much censure and ridicule from his cotemporary wits; but on the completion of the Revolution, being, on account of his newly-chosen religion, disqualified from bearing any office under the government, he was stripped of the laurel, which, to his still greater mortification, was bestowed on Richard Flecknoe, a man to whom he had a most settled aversion. This circumstance occasioned his writing the very severe poem called *Mac Flecknoe.*

Mr Dryden's circumstances had never been affluent; but now being deprived of this little support, he found himself reduced to the necessity of writing for mere bread. We consequently find him from this period engaged in works of labour as well as genius, *viz.* in translating the works of others; and to this necessity the British nation stands indebted for some of the best translations extant. In the year he lost the laurel, he published the life of St Francis Xavier, from the French. In 1693 came out a translation of Juvenal and Persius; in the first of which he had a considerable hand, and of the latter the entire execution. In 1695 was published his prose version of Fresnoy's art of Painting; and the year 1697 gave the world that translation of Virgil's works entire, which still does, and perhaps ever will, stand foremost among the attempts made on that author. The petite pieces of this eminent writer, such as prologues, epilogues, epitaphs, elegies, songs, &c. are too numerous to specify here, and too much dispersed to direct the reader to. The greatest part of them, however, are to be found in a collection of miscellanies in 6 vols 12mo. His last work is what is called his *Fables,* which consists of many of the most interesting stories in Homer, Ovid, Boccace, and Chaucer, translated or modernized in the most elegant and poetical manner; together with some original pieces, among which is that amazing ode on St Cecilia's day, which, though written in the very decline of the author's life, and at a period when old age and distress conspired as it were to damp his poetic ardor and clip the wings of fancy, yet possess so much of both, as would be sufficient to have rendered him immortal had he never written a single line besides.

Dryden married the lady Elizabeth Howard, sister to the Earl of Berkshire, who survived him eight years; though for the last four of them she was a lunatic, having been deprived of her senses by a nervous fever.—By this lady he had three sons; Charles, John, and Henry. Of the eldest of these there is a circumstance related by Charles Wilson, Esq; in his Life of Congreve, which seems so well attested, and is itself of so very extraordinary a nature, that we cannot avoid giving it a place here.—Dryden, with all his understanding, was weak enough to be fond of judicial astrology, and used to calculate the nativity of his children. When his lady was in labour with his son Charles, he being told it was decent to withdraw, laid his watch on the table, begging one of the ladies then present, in a most solemn manner, to take exact notice of the very minute that the child was born; which she did, and acquainted him with it. About a week after, when his lady was pretty well recovered, Mr Dryden took

Dryden. occasion to tell her that he had been calculating the child's nativity; and observed, with grief, that he was born in an evil hour: for Jupiter, Venus, and the Sun, were all under the earth, and the lord of his ascendant afflicted with a hateful square of Mars and Saturn. "If he lives to arrive at the 8th year," says he, "he will go near to die a violent death on his very birth-day; but if he should escape, as I see but small hopes, he will in the 23d year be under the very same evil direction; and if he should escape that also, the 33d or 34th year is, I fear"——Here he was interrupted by the immoderate grief of his lady, who could no longer hear calamity prophesied to befal her son. The time at last came, and August was the inauspicious month in which young Dryden was to enter into the eighth year of his age. The court being in progress, and Mr Dryden at leisure, he was invited to the country-seat of the Earl of Berkshire his brother-in-law, to keep the long vacation with him in Charleton in Wilts; his lady was invited to her uncle Mordaunt's to pass the remainder of the summer. When they came to divide the children, lady Elizabeth would have him take John, and suffer her to take Charles: but Mr Dryden was too absolute, and they parted in anger; he took Charles with him, and she was obliged to be content with John. When the fatal day came, the anxiety of the lady's spirits occasioned such an effervescence of blood, as threw her into so violent a fever, that her life was despaired of, till a letter came from Mr Dryden, reproving her for her womanish credulity, and assuring her that her child was well; which recovered her spirits, and in six weeks after she received an eclaircissement of the whole affair. Mr Dryden, either through fear of being reckoned superstitious, or thinking it a science beneath his study, was extremely cautious of letting any one know that he was a dealer in astrology; therefore could not excuse his absence on his son's anniversary, from a general hunting-match which lord Berkshire had made, to which all the adjacent gentlemen were invited. When he went out, he took care to set the boy a double exercise in the Latin tongue, which he taught his children himself, with a strict charge not to stir out of the room till his return; well knowing the task he had set him would take up longer time. Charles was performing his duty in obedience to his father; but, as ill fate would have it, the stag made towards the house; and the noise alarming the servants, they hasted out to see the sport. One of them took young Dryden by the hand, and let him out to see it also; when, just as they came to the gate, the stag being at bay with the dogs, made a bold push, and leaped over the court-wall, which was very low and very old; and the dogs following, threw down a part of the wall 10 yards in length, under which Charles Dryden lay buried. He was immediately dug out; and after six weeks languishing in a dangerous way, he recovered. So far Dryden's prediction was fulfilled. In the 23d year of his age, Charles fell from the top of an old tower belonging to the Vatican at Rome, occasioned by a swimming in his head with which he was seized, the heat of the day being excessive. He again recovered, but was ever after in a languishing sickly state. In the 33d year of his age, being returned to England, he was unhappily drowned at Windsor. He had with another gentleman swam twice over the Thames; but returning a third time, it was supposed he was taken with the cramp, because he called out for help, though too late. Thus the father's calculation proved but too prophetical.

At last, after a long life, harassed with the most laborious of all fatigues, *viz.* that of the mind, and continually made anxious by distress and difficulty, our author departed this life on the first of May 1701.—The day after Mr Dryden's death, the dean of Westminster sent word to Mr Dryden's widow, that he would make a present of the ground and all other abbey-fees for the funeral: the Lord Halifax likewise sent to the lady Elizabeth, and to Mr Charles Dryden, offering to defray the expences of our poet's funeral, and afterwards to bestow 500l. on a monument in the abbey; which general offer was accepted. Accordingly, on Sunday following, the company being assembled, the corpse was put into a velvet hearse, attended by 18 mourning coaches. When they were just ready to move, Lord Jefferys, son of Lord Chancellor Jefferys, a name dedicated to infamy, with some of his rakish companions, riding by, asked whose funeral it was; and being told it was Mr Dryden's, he protested he should not be buried in that private manner; that he would himself, with the lady Elizabeth's leave, have the honour of the interment, and would bestow 1000l. on a monument in the abbey for him. This put a stop to their procession; and the Lord Jefferys, with several of the gentlemen who had alighted from their coaches, went up stairs to the lady, who was sick in bed. His lordship repeated the purport of what he had said below; but the lady Elizabeth refusing her consent, he fell on his knees, vowing never to rise till his request was granted. The lady under a sullen surprise fainted away; and Lord Jefferys, pretending to have obtained her consent, ordered the body to be carried to Mr Russel's an undertaker in Cheapside, and to be left there till further orders. In the mean time the abbey was lighted up, the ground opened, the choir attending, and the bishop waiting for some hours to no purpose for the corpse. The next day Mr Charles Dryden waited on the Lord Halifax and the bishop; and endeavoured to excuse his mother, by relating the truth. Three days after, the undertaker having received no orders, waited on the Lord Jefferys; who pretended that it was a drunken frolic, that he remembered nothing of the matter, and he might do what he pleased with the body. Upon this the undertaker waited upon the lady Elizabeth, who desired a day's respite, which was granted. Mr Charles Dryden immediately wrote to the Lord Jefferys, who returned for answer that he knew nothing of the matter, and would be troubled no more about it. Mr Dryden hereupon applied again to Lord Halifax and the Bishop of Rochester, who absolutely refused to do any thing in the affair.

In this distress, Dr Garth, who had been Mr Dryden's intimate friend, sent for the corpse to the college of physicians, and proposed a subscription; which succeeding, about three weeks after Mr Dryden's decease, Dr Garth pronounced a fine Latin oration over the body, which was conveyed from the college, attended by a numerous train of coaches to Westminster-abbey, but in very great disorder. At last the corpse arrived at the abbey, which was all unlighted. No organ played, Dryden.

ed, no anthem sung; only two of the singing boys preceding the corpse, who sung an ode of Horace, with each a small candle in their hand. When the funeral was over, Mr Charles Dryden sent a challenge to Lord Jefferys; who refusing to answer it, he sent several others, and went often himself; but could neither get a letter delivered, nor admittance to speak to him: which so incensed him, that finding his Lordship refused to answer him like a gentleman, he resolved to watch an opportunity, and brave him to fight, though with all the rules of honour; which his Lordship hearing, quitted the town, and Mr Charles never had an opportunity to meet him, though he sought it to his death with the utmost application.

Mr Dryden had no monument erected to him for several years; to which Mr Pope alludes in his epitaph intended for Mr Rowe, in this line,

> Beneath a rude and nameless stone he lies.

In a note upon which we are informed that the tomb of Mr Dryden was erected upon this hint by Sheffield duke of Buckingham, to which was originally intended this epitaph:

> This *Sheffield* rais'd.—The sacred dust below
> Was *Dryden* once; the rest, who does not know?

Which was since changed into the plain inscription now upon it, *viz.*

J. DRYDEN,
Natus Aug. 9. 1631.
Mortuus Maii. 1. 1701.
Johannes Sheffield, dux Buckinghamiensis fecit.

My Dryden's character has been very differently drawn by different hands, some of which have exalted it to the highest degree of commendation, and others debased it by the severest censure.—The latter, however, we must charge to that strong spirit of party which prevailed during great part of Dryden's time, and ought therefore to be taken with great allowances. Were we indeed to form a judgment of the author from some of his dramatic writings, we should perhaps be apt to conclude him a man of the most licentious morals; many of his comedies containing a great share of looseness, even extending to obscenity: But if we consider, that, as the poet tells us,

> Those who live to please, must please to live;

if we then look back to the scandalous licence of the age he lived in, the indigence which at times he underwent, and the necessity he consequently lay under of complying with the public taste however depraved; we shall surely not refuse our pardon to the compelled writer, nor our credit to those of his contemporaries who were intimately acquainted with him, and who have assured us there was nothing remarkably vicious in his personal character.

From some parts of his history he appears unsteady, and to have too readily temporized with the several revolutions in church and state. This however might in some measure have been owing to that natural timidity and diffidence in his disposition, which almost all the writers seem to agree in his possessing. Congreve, whose authority cannot be suspected, has given us such an account of him, as makes him appear no less amiable in his private character as a man, than he was illustrious in his public one as a poet. In the former light, according to that gentleman, he was humane, compassionate, forgiving, and sincerely friendly: of an extensive reading, a tenacious memory, and a ready communication: gentle in the correction of the writings of others, and patient under the reprehension of his own deficiencies: easy of access himself, but slow and difficult in his advances to others; and of all men the most modest and the most easy to be discountenanced in his approaches either to his superiors or his equals. As to his writings, he is perhaps the happiest in the harmony of his numbers, of any poet who ever lived either before or since his time, not even Mr Pope himself excepted. His imagination is ever warm, his images noble, his descriptions beautiful, and his sentiments just and becoming. In his prose he is poetical without bombast, concise without pedantry, and clear without prolixity. His dramatic have, perhaps, the least merit of all his writings. Yet there are many of them which are truly excellent; though he himself tells us that he never wrote any thing in that way to please himself but his *All for Love*. This last, indeed, and his *Spanish Friar*, may be reckoned two of the best plays our language has been honoured with.

Drypis, Dublin.

DRYPIS, in botany: A genus of the trigynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 22d order, *Caryophyllei*. The calyx is quinquedentated; the petals five; the opening at the capsule as if cut round horizontally, monospermous.

DUBLIN, the metropolis of Ireland, the second city in the British dominions, and esteemed the fifth for magnitude in Europe, is situated in the province of Leinster, in the county of Dublin, at the bottom of a large bay. The river Liffey, which here disembogues itself into the ocean, divides the town into nearly two equal parts. Formerly the city of Dublin was confined to the south side of the river: it was a place of great antiquity. Ptolemy, who flourished in the reign of Antoninus Pius, about the year 140, says, it was anciently called *Aschcled*. In 155, Alpinus, whose daughter Auliana was drowned in the Liffey, changed the name from *Aschcled* to *Auliana*. It was afterwards named *Dublana*, and Ptolemy calls it *Eblana*. *Dublana*, whence comes *Dublinum* and *Dublin*, is evidently derived from *Dub-leana*, "the place of the black harbour or lake," or rather "the lake of the sea," the bay of Dublin being frequently so called. This city has had a variety of names. The Irish call it *Drom-choll-coil*, "the brow of a hazle wood;" and in 181, Eogan king of Munster being on a royal tour, paid a visit to this place, which was then called *Atha Cliath-Dubh-Line*, "the passage of the ford of hurdles over the black pool:" the harbour of Dublin was likewise known by the name of *Lean-Cliath*, or *Leam-Cliath*, from *Lean* or *Leam*, "a harbour;" and from *Cliath* or *Cliabb*, which literally signifies "a hurdle or anything made of wicker-work;" it also signified certain wires formed with hurdles, and placed in rivers and bays by the ancient Irish for the purpose of taking fish: whence any river or bay wherein these wires were fixed had the name of *Cliath* or *Cliabb* annexed to it, to signify the establishment of a fishery. Dublin, therefore, being originally built on or near one of these harbours, was anciently called *Baly-lean-Cliath*, that is, the town on the fishing harbour. It is described at the present day in the Irish language by the appellation of *Ath-Cliath*, "the ford of hurdles," and *Bally-ath-Cliath*, "the town of the ford

Dublin. ford of hurdles," the inhabitants having formerly had access to the river by hurdles laid on the low marshy grounds adjoining the water: and this name was also extended to the north side of the river, from a temporary bridge of hurdles thrown over the Anna Liffey, a corruption of *Auin Louiffa*, or "the swift river," so termed from the rapidity of the mountain floods. This side was enlarged by Mac Turkill the Danish prince, who, notwithstanding, fixed his habitation on the south side, and abandoned the northern town; which, from the original country of the invaders, was called *Eastmantown*, since corrupted to *Oxmantown*. King Edgar, in the preface to his charter dated 964, mentions Ireland with its most noble city (*nobilissima civitas*) of *Dublin*. By the Fingallians it is called *Divelin*, and by the Welch *Dinas-Dulin*, or *the city of Dublin*.

In 448, Alpin Mac Eachard, king of Dublin and all his subjects, were converted to Christianity by St Patrick.

In the year 498, the Ostmen or Danes, having entered the Liffey with a fleet of 60 sail, made themselves masters of Dublin and the adjacent country, and soon after environed the city with walls. About 1170 Dermot Mac Murrough, king of Leinster, having quarrelled with the other princes of the kingdom, a confederacy was formed against him by Roderick O'Conor, monarch of Ireland. Dermot applied to Henry II. king of England, who sent over a number of English adventurers, by whose assistance he was reinstated in his dominions; and in the year 1171, the descendants of the Danes still continuing to hold possession of Dublin, it was besieged and taken by a powerful party of the English under Raymond le Gross. Mac Turkill the Danish king escaped to his shipping: he returned, however, soon after with a strong fleet to recover the city, but was killed in the attempt, and in him ended the race of easterling princes in Ireland.

In 1172, Henry II. landed at Waterford, and obtained from Richard earl of Strongbow (who married the daughter of Dermot Mac Murrough, and by compact was his successor) a surrender of the city of Dublin, where he built a pavilion of wicker work near St Andrew's church, then situated where Castlemarket lately stood, and there entertained several Irish princes, who voluntarily submitted to him, on condition of being governed by the same laws as the people of England. Henry also held a parliament here. In 1173 he granted his first charter to Dublin, and by divers privileges encouraged a colony from Bristol to settle here.

In 1210, upwards of 20 Irish princes swore allegiance to king John at Dublin; engaging to establish the English laws and customs in the kingdom; and in the same year courts of judicature were instituted. In 1216, magna charta was granted to the Irish by Henry III. an entry of which was made in the red book of the exchequer at Dublin. In 1217, the city was granted to the citizens in fee farm at 200 marks *per annum*; and in 1227 the above monarch ordained that the charter granted by king John should be kept inviolably. In 1404, the statutes of Kilkenny and Dublin were confirmed in a parliament held at this city under the earl of Ormond. The charter of the city of Dublin was renewed in 1609 by James I.

The civil government of the city was anciently under the management of a provost and bailiffs; in 1308, John le Decer was appointed the first provost, and Richard de St Olave and John Stakebold bailiffs. In 1409, the title of the chief magistrate was changed to that of mayor, when Thomas Cusack was appointed to the office, Richard Bove and Thomas Shortall being bailiffs; the office of bailiffs was changed to sheriffs in 1547. In 1660, Charles II. gave a collar of SS. and a company of foot guards to the mayor; and in 1665, this monarch conferred the title of lord mayor on the chief magistrate, to whom he also granted 500l. *per annum* in lieu of the foot company. Sir Daniel Bellingham was the first lord mayor of Dublin; Charles Lovet and John Quelsh were sheriffs the same year. In 1672, Arthur earl of Essex introduced new rules for the better government of the city; and in 1683 the Tholsel was built, for the purpose of the magistrates meeting to hold their courts, assemblies, &c.

In the 10th century, after the fortifications of Dublin were repaired by the Ostmen, the walls of the city, including those of the castle, did not occupy more than an Irish mile; they extended from Winetavern-gate to Audeon's-arch, and were continued from thence to where Newgate formerly stood; and from a plan published by John Speed in 1610, it appears that they were continued to Ormond's-gate, or, as it has been since called, *Wormwood-gate*, from thence to the Old-bridge, and along the banks of the river to a very large portal called *Newman's tower*, nearly in the present site of the south entrance of Essex-bridge; and from Newman's tower in an angular direction to Dame's-gate, at the west end of Dame-street. From the gate at the southwest angle of the castle the wall ran to Nicholas-gate, and was continued from thence to Newgate. The principal streets without the walls were, on the west, New-row, Francis-street, Thomas-street, and James's-street; on the south were Patrick-street, Bride-street, and Ship-street; and on the east Dame-street, George's-lane, and Stephen-street. That space of ground now occupied by Crane-lane, Temple-bar, Fleet-street, Lazar's-hill, or, as it is now called *south Townsend-street*, Crampton, Aston's, George's, and Sir John Rogerson's quays, &c. was then overflowed by the Liffey. On the north side of the river there were only Church-street, Mary's-lane, Hammond-lane, and Pill-lane, then built but on one side as far as Mary's-abbey, which terminated the extent of that part of the town to the eastward; Grange-Gorman, Stoney-batter, now called *Manor-street*, and Glassmanogue, were then villages at some distance from the city; and at the latter the sheriffs have held their courts in times of the plague, as being remote from the stage of infection. In 1664, the inhabitants being numbered amounted to 2565 men and 2986 women, protestants; and 1202 men and 1406 women, Roman catholics, making in the whole 8152.

By comparing this account of the ancient state and boundaries of the metropolis with the following description of its present extent, population, and magnificence, an idea will be readily formed of the amazing increase and improvement it hath experienced within the present century.

Dublin is seated in view of the sea on the east, and a fine country which swells into gently rising eminences

Dublin.

nences on the north and west, while it towers boldly up in lofty mountains that bound the horizon on the south. The city itself cannot be seen to full advantage on entering the harbour: but the approach to it from thence exhibits a fine prospect of the country for improvement and cultivation, interspersed with numerous villas, that have a most agreeable effect to enliven this delightful scene, which, beginning at the water's edge, is continued all over the coast to the northward of the bay as far as the eye can reach, and is finely contrasted by a distant view of the Wicklow mountains to the south, where the conical hills, called the *Sugar-loaves*, contribute not a little, by the singularity of their appearance, to embellish the landscape, so extensive and picturesque as not to be equalled by any natural scenery in Europe, but the entrance of the bay of Naples, to which it bears a very striking resemblance.

The form of Dublin is nearly a square, a figure that includes the largest area proportioned to its circumference. From the royal hospital at Kilmainham, at the western extremity of the town, to the east end of Townsend-street, the length is two miles and an half, and its greatest breadth is computed to be of the same extent: hence the city is about 10 miles in circumference. Its increase within the last twenty years has been amazing: it now contains about 22,000 houses, whose inhabitants are estimated at 156,000.

Dublin, with respect to its streets, bears a near resemblance to London. Some of the old streets were formerly narrow: but this defect is now in a great measure remedied by an act of parliament, passed in 1774, for opening the public avenues, taking down sign-posts, palisades, pent-houses, &c. new paving the streets, and flagging the foot passages; and, in 1785, another act passed for the better paving, cleansing, and lighting the city; in consequence of which an additional number of globes with double burners were put up at the distance of 36 feet from each other. These necessary improvements contribute exceedingly to the beauty and convenience of the metropolis: the new streets are wide and commodious, the houses lofty, uniform, and elegant; nor are several of the old streets totally deficient in these respects: Sackville-street, or the Mall, which, though built upwards of 40 years ago, has been included in the number of new streets by all the late geographers (a self-evident proof that these writers had not even seen the city), is a noble avenue, with a gravel walk in the centre, enclosed by a wall of about three feet high; this walk is 36 feet and a half broad, and the distance between it and the palisades fronting the houses, on either side, is 42 feet and a half: when the new custom-house is completed, this street will be then a most desirable situation for wholesale merchants, not only on account of its proximity to that building, but its great depth in the rere. Some years ago, it was esteemed one of the finest public avenues in Europe: many of the new streets, however, in this city are now much superior to it in the magnificence and uniformity of the houses. Among these, on the north side of the river, in the same quarter with Sackville-street, are Gardiner's-row, north Great George's-street, Cranby-row, Cavendish-row, and Palace-row: the last three form a superb square, having the garden of the lying-in-hospital in the centre: the old wall that encompassed the garden has been lately taken down; there is now a full view of this delightful spot sourrounded with iron palisades, and upward of 100 globes with double burners disposed at equal distances, which, added to the globes from the surrounding houses, have a most brilliant effect. This square, which, for its size, is not perhaps to be equalled, has lately received the name of Rutland-square, in compliment to his grace the present duke of Rutland, who contributed munificently towards the improvements in the enclosure of the new garden, and the erecting an elegant edifice for a ball and supper rooms, now nearly finished, situated to the east of the hospital.

Among the new streets and buildings on the south side of the river, those wherein persons of distinction reside, lie chiefly to the eastward of the college and Stephen's-green; which last, though it does not rank with the new buildings, possesses much grandeur and elegance, being one of the largest squares in Europe: it is an English mile in circumference, surrounded by a gravel walk, planted on each side with trees; within this walk is a smooth level meadow, having in the centre an equestrian statue of the late king: there are several fine edifices, though almost all differing in the stile of their architecture; this variety, however, is esteemed by many rather a beauty than a defect: but, besides the other streets and buildings in this quarter, there is a new square which will be nearly as extensive as Stephen's-green, called *Merion-square;* it was laid out some years ago, by the late lord Fitzwilliam; the buildings are now considerably advanced, and great encouragement has been given by the present noble proprietor: the houses on the north side, which is quite finished, are uniform and lofty; most of them, being carried up with hewn stone to the first story, gives the whole an air of strength, beauty, and magnificence. At the south west angle of Stephen's-green, a new street has been also opened, called *Harcourt-street*, in which are several elegant structures that deserve notice, particularly the town residence of the right honourable lord Earlsford.

The principal entrance to the walks of Stephen's-green is on the west side opposite the end of York-street (which may be properly classed among the new streets), as all the old houses have been pulled down and modern buildings erected in their room. Those parts of the city inhabited by merchants and traders begin to wear a new face; and amongst this number the new buildings of Dame-street on the south side, exhibit an extensive, uniform, and beautiful range of houses all of an equal height: the shop doors and windows are formed by arches, exactly similar in their construction and ornaments, which are simply elegant: when the other side of this street shall be rebuilt, it may be justly pronounced one of the first trading streets in Europe; and Parliament-street, which was built some years ago, is now nearly equal to any trading street in London.

The river Liffey, being banked in through the whole length of the town, exhibits spacious and beautiful quays, where vessels below the bridge load and unload before the merchants doors and warehouses: it is navigable as far as Essex-bridge. This bridge was first built in 1681, and took its name from the unfor-

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tunate earl of Effex, then viceroy of Ireland. It was taken down in 1753, and rebuilt in an elegant form, after the model of Weftminfter bridge, but much better proportioned, and on a more fecure foundation. It has five arches, the buttreffes between which fupport femicircular niches that project from the parapet; there are balluftrades between thefe niches, and continued to the ends of the bridge, which is commodioufly flagged for foot paffages; the whole conftructed with hewn ftone in a very fine tafte. There are four bridges befides this over the river; three of which have nothing to recommend them, further than the antiquity of the Old-Bridge, which was erected in this city at a very early period, when it had the name of *Dublin-Bridge*; it was rebuilt in 1428, fince which time it received its prefent title. Bloody-bridge, built in 1671, was originally conftructed with wood, and derives its prefent harfh appellation from an attempt to break it down, wherein four perfons were killed. Ormond-bridge was built in 1684, during the Ormond adminiftration. Arran-bridge, now called *Queen's-bridge*, was erected in the fame year; but, being deftroyed by the floods in 1763, was rebuilt of hewn ftone, and finifhed in 1768. It confifts of three arches, with flagged foot paffages, ftone balluftrades and ornamental decorations, in a handfome light ftyle, admired by every amateur of the arts.

This city has 2 cathedrals, 18 parifh churches, 2 chapels of eafe, 15 Roman-catholic chapels, 6 meeting-houfes for prefbyterians, 1 for anabaptifts, 4 for methodifts, 2 for quakers, a church for French Calvinifts, a Danifh and a Dutch church, and a Jewifh fynagogue.

Chrift-church, or the Holy Trinity, built in 1038 by Donat bifhop of Dublin, to whom Sitricus the fon of Amlave king of the Oftmen of Dublin granted the fite for that purpofe, ftands on the fummit of the rifing ground at the head of Winetavern-ftreet. It is a venerable Gothic pile; and its prefent appearance evinces its antiquity. St Patrick's cathedral, firft built by archbifhop Comyn in 1190, and decorated by archbifhop Minot in 1370, with a fteeple on which a lofty fpire was erected in 1750, is alfo a fine Gothic ftructure: it ftands on the eaft fide of Patrick-ftreet; the monuments here are more numerous than in Chrift-church; and the fteeple is the higheft in the city.

St Werburgh's church was originally built in a very early age. In 1301, when a great part of the city was confumed by an accidental fire, this church fuffered in the conflagration: it was burnt a fecond time in 1754, and repaired in its prefent beautiful form in 1759. The front and fteeple are admired for their elegance, lightnefs, and fymmetry: the fpire is a fine octagon fupported by eight pillars; and a gilt ball terminates the whole, being 160 feet from the ground. Catharine's church firft built in 1105, and re-edified in its prefent form in 1769, is fituated on the fouth fide of Thomas's-ftreet. St Thomas's church is the lateft foundation of the kind in this city, having been begun in the year 1758, and finifhed and confecrated in 1762. It is fituated on the weft fide of Marlborough-ftreet, oppofite Gloucefter-ftreet, to which it forms an elegant termination. The other churches in this city are; on the north fide of the river, Mary's, Michan's, and Paul's; on the fouth fide, James's, Luke's, Kevin's, Peter's, Bride's, Nicholas within, Audeon's, Michael's, Mark's, Anne's, John's and Andrew's; this laft is called alfo the *Round church*, from its form being exactly circular: moft, if not all the others were built in an early age: many, however, have been fince re-edified, and affumed a more modern form: fome of thefe are not totally devoid of elegance, particularly Anne's. St John's in Fifhamble-ftreet was rebuilt in 1773, and has now a handfome front of hewn ftone, decorated with columns fupporting a pediment. Befides thefe churches, Dublin is adorned with feveral other public buildings; the moft remarkable of which are the following: The caftle, the refidence of the chief governor, built in 1213 by Henry de Londres, was formerly moated and flanked with towers; but the ditch has been long fince filled up, and the old buildings rafed, the chapel and wardrobe tower excepted, which ftill remain: Birmingham tower was rebuilt in 1777, and is now called *Harcourt tower*. The caftle at prefent confifts of two courts, the principal of which is an oblong fquare, formed by four ranges of building: within a few years, in the middle of the fouth range, a handfome edifice called *Bedford tower* has been erected; the front is decorated with a fmall arcade of three arches, over which is a colonade fupporting a pediment, from whence rifes an octagon fteeple crowned with a fmall cupola and gilt ball in a light pleafing ftyle. This tower, which fronts the entrance to the viceroy's apartments, is connected with the buildings on each fide by two fine gates; over that on the right hand is a ftatue of Fortitude; and over the left gate, which is the grand portal to the upper court, is the ftatue of Juftice. In the lower court are the treafury and other offices, with military ftores, an arfenal and armory for 40,000 men, and a barrack in which a captain's detachment of infantry are ftationed. Between this barrack and the arfenal is the caftle garden; oppofite to which, at the rere of the lord Lieutenant's apartments, is a range of building called the *Garden-front*, erected about the year 1740, finifhed in mountain ftone, ornamented by femicolumns of the Ionic order, and the windows embellifhed with cornices and architraves, in a fine tafte. The ball-room is now titled St *Patrick's Hall*. The viceroy's body guard confifts of a captain, two fubalterns, and fixty private men, with a fubaltern's guard of horfe. The parliament houfe, a moft fuperb ftructure, is fituated on the north fide of college-green: it was begun in 1729, finifhed in 10 years, and coft 40,000 l. it is built with Portland ftone, and the front formed by a grand portico of Ionic columns in the moft finifhed ftyle of architectural elegance: the internal parts (which have been lately much improved, under the aufpices of the prefent fpeaker the right honourable John Forfter) correfpond with its outward magnificence; and the manner in which the infide is lighted is univerfally admired. The houfe of commons is an octagon, covered with a dome fupported by columns of the Ionic order, that rife from an ampitheatrical gallery balluftraded with iron fcroll-work: this room is admirably well adapted to its purpofe. The houfe of lords is an oblong room, fpacious and lofty, and ornamented in a fuperb manner: it is alfo judicioully adapted for the reception of the augult affembly which meet there:

Dublin. there: among other decorations are two pieces of tapestry, representing the battle of the Boyne and siege of Derry, allowed to have much merit. By order of both houses of parliament, a grand new front has been lately erected on the east side of this magnificent pile; and preparations are making to front the north and west sides in a similar manner, from a design of Mr Gandon's: thus insulated, the whole will form a suit of senatorial apartments matchless in elegance and convenience.

The College founded by queen Elizabeth in 1591, is situated at the east end of College-green. It is a most beautiful structure, consisting of two spacious squares, the first of which contains the refectory, the old hall and chapel, and the new theatre for lectures and examinations; the front of this last building is finely decorated with Corinthian columns supporting a pediment, and over the front of the old hall, on the east side of this square, a handsome steeple rises crowned with a cupola. In the other square, which consists partly of brick buildings for the students, there is a superb library, extending through its whole length on the south side: behind this square there is a fine park. The west side of the first square, which is built with Portland stone, forms the grand front, upward of 300 feet in length, ornamented with Corinthian pillars and other decorations in a very fine taste. At a small distance to the south side of this front is an elegant edifice in which the provost resides. The printing-office is a neat handsome structure on the north side of the park; and opposite to it is the anatomy house, in which are to be seen the celebrated wax models of the human figure, executed at Paris by M. Douane, purchased by the right honourable the earl of Shelburne, and presented to this university. The College of Dublin is an university in itself, consisting of a provost, vice-provost, 7 senior and 15 junior fellows, and 17 scholars of the house; the number of students is generally about 400: it has also professors in divinity, common and civil law, physic, Greek, modern languages, mathematics, oriental tongues, history and oratory, modern history, natural philosophy, anatomy and surgery, chemistry, and botany. His royal highness the duke of Gloucester is chancellor, and his grace the lord primate of Ireland vice-chancellor: the visitors are the chancellor (or, in his absence the vice-chancellor) and the archbishop of Dublin.

The Royal Exchange, situated on Cork-hill, was begun in 1769, and opened for business in 1779; the expence, amounting to L. 40,000, being defrayed by lottery schemes, conducted by the merchants of Dublin with an integrity that did them honour. The building is nearly a square, having three fronts of Portland stone in the Corinthian order, and crowned in the midst with a fine dome, which is supported on the inside by 12 Composite fluted pillars that form a circular walk in the centre of the ambulatory: above these pillars are twelve circular windows, and the cieling of the dome, which is ornamented with stucco, in the Mosaic style, has also a large window in the middle that illumines most of the building. Opposite to the north entrance, in the circular walk, is a statue of his present majesty George III. in a Roman military habit; it is executed in bronze by Van Nost, and elevated on a white marble pedestal; in a niche on the stair-case leading to the coffee-room is a white marble statue of the late Dr Charles Lucas, executed by Smyth. The north front which commands a fine view of Parliament-street and Essex-bridge, is embellished by a range of six columns and their correspondent pilasters, supporting a grand pediment with a balustrade on each side: a flight of stone steps leads from the street to the entrance, which is by three fine iron-railed gates: the west front varies but little from the north, except in the want of a pediment, and having only three steps ascending to the entrance, the ground on that side being nearly on a level; this front is opposite the east end of Castle-street near the principal entrance to the Castle.

The Hospital for Lying-in-Women, founded by Dr Bartholomew Mosse, and opened in 1757, stands on the north side of Great Britain street. The building is extremely light and elegant; a beautiful steeple rises in the centre, and the wings are formed, by semicircular colonnades on each side. Adjoining the east colonnade is the Rotunda, where balls and assemblies are held, and concerts performed, for the benefit of the charity: close to it are now erecting the grand suit of apartments before mentioned. The garden at the rere of the hospital is laid out in a good taste.

The Blue-coat Hospital was founded on the west side of Queen-street by Charles II. in 1670, for educating the children of reduced freemen of the city: but the originial building being greatly decayed, was taken down, and the new Blue-coat Hospital, situated in Oxmantown-green, was begun in 1773. The front is enriched by four Ionic columns, supporting a pediment in the centre, over which the steeple rises, embellished with Corinthian and Composite columns in an admired taste. Connected with the front by circular walls ornamented with ballustrades and niches, are the school on one side and the church on the other: these form two well proportioned wings; they are of a similar construction; and each is crowned with a small steeple or turret, corresponding with the rest in uniform harmony and beauty.

The Barracks, the foundation of which was laid in 1704, are esteemed the largest and most commodious in Europe. They consist of four squares, situated at the west end of the town, on the north side of the river. The royal square in the centre, with a horse barrack and the little square on each side, form a spacious and extensive front to the south: the palatine, now called the new square, is opposite to Oxmantown-green; it has been lately rebuilt with hewn stone in a very elegant manner.

The Royal Hospital at Kilmainham for the support of invalids of the Irish army was founded by king Charles II. on a plan similar to that of Chelsea in England. The building was completed in 1683, and cost upwards of L.23,500. It is situated at the west end of the town on a rising ground near the south side of the river, from whence there is an easy ascent to it through several rows of tall trees. This edifice is of a quadrangular form, inclosing a spacious area handsomely laid out in grass-plots and gravel walks: an arcade is carried along the lower story in each square to the entrance of the hall and chapel, which are both curiously

Dublin. curiously decorated; in the former are several whole-length portraits of royal personages and other distinguished characters.

Dr Stevens's Hospital, the foundation of which was laid in 1720, is a neat quadrangular building, pleasantly situated on the banks of the river near the west end of James's street, from whence a gravelled walk leads by a gentle descent to the enterance of the hospital, and is continued from thence to the water's edge.

The Linen-hall, at the north end of Linen-hall street, which was opened at the public expence in 1728 for the reception of linen cloths brought to the Dublin market, is a handsome building, lately enlarged with treble its number of former rooms, which furnish a new proof of commercial prosperity.

The New Prison in Green-street, the first stone of which was laid in 1773, is a large quadrangular structure, designed and executed under the direction of the late Mr Cooley. The east front consists of a centre break of mountain stone rusticated and crowned by a pediment, with a plain facade of black limestone on each side; and at the external angles of the building are four round towers.

There are many other public edifices in this city and its environs which merit particular notice. The Hospital for Lunatics in west Bow-lane, founded by Dean Swift, and opened in 1757; the Hibernian School in the Phœnix Park, and the Marine School on Sir John Rogerson's Quay, the first for educating the poor children of soldiers, and the other for bringing up to the sea service the sons of deceased or disabled seamen; the Hospital for Incurables in south Townsend-street; Mercer's Hospital in Stephen-street; the Meath Hospital on the Coombe; and Simpson's Hospital in Great Britain street, the last of which was established for the reception of blind and gouty men; are all handsome edifices constructed of hewn stone in the modern style.

To these public buildings may be added St Nicholas's Hospital in Francis-street; the infirmary for sick and wounded soldiers of the army; and the Foundling Hospital in James's-street; the Magdalen Asylum in Leeson-street; and the House of Industry in Channel-row; the halls for corporations (particularly the Weavers Hall on the Coombe, over the entrance of which is a statue of his late majesty George II.); the Tholsel; the old Four Courts; the old Customhouse: and several others. The Charitable Infirmary, which was first opened in 1728 and rebuilt in 1741, stood on the Inn's Quay, but has lately been pulled down, together with most of the houses on that quay, where the new courts of justice are to be erected: and the benefits of this humane institution are now dispensed to the public at a house taken for that purpose in Jervis-street. The new courts of justice, which will be a principal ornament to the metropolis, are from a design of Mr Gandon's, as is also the new Customhouse, now nearly finished on the north wall. This front extends 375 feet, enriched with arcades and columns of the Doric order, crowned with an entablature: the centre has a portico finished with a pediment, in which is a bas-relief of emblematical figures alluding to commerce: over the pediment is an attic story; and a magnificent dome finishes the centre, whereon is a pedestal supporting a statue of Commerce: the key-stones over the entrances and in the centre of the pavilions are decorated with emblematical heads representing the produce of the principal rivers of Ireland; the south or front to the river, with the arms of Ireland over each pavilion, is of Portland stone; the whole, being formed with large and striking parts, adds much to the picturesque scene of the river, and will remain a lasting monument of reputation to the several artists employed in this superb building. Dublin.

The playhouses, considered as public buildings, have nothing to recommend them to notice. One only, viz. the old house, now the theatre-royal, in Smock-alley, is kept open by Mr Daly: who, in consequence of the bill passed last session of parliament for the regulation of the stage, enjoys the exclusive pivilege of managing and directing the theatrical exhibitions in this metropolis. The playhouse in Crow-street, which formerly possessed the distinction of theatre-royal, has been shut up these several years past.

But a minute description of every public edifice would occupy more room than this publication admits, not to mention the several private houses, justly admired for their elegance. Among these are:

Leinster-house, the town residence of his grace the Duke of Leinster. The entrance to this princely mansion is from Kildare-street, through a grand gateway of rustic stone work, into a spacious court which forms a segment of a circle before the principal front. The inside of this magnificent structure is equal to its exterior appearance; the hall lofty and noble; and the apartments decorated and furnished in a splendid taste, and enriched with several very valuable paintings. The garden front, plain yet bold, possesses a pleasing simplicity; the garden is spacious and elegant, with a beautiful lawn in the centre. The whole of this building is inferior to few private edifices in the British dominions.

The Earl of Charlemont's house is finely situated in the middle of palace-row, on an eminence exactly fronting the centre of the garden at the rere of the Lying-in-Hospital. The front is built with hewn stone brought from Arklow, superior to that of Portland. The inside of this house is superb and convenient: the hall ceiling is supported by columns; some of the apartments are decorated with a select but choice collection of paintings of the best masters; among which are one of Rambrandt's finest pictures, representing Judas repenting and casting the silver pieces on the ground; a portrait of Cæsar Borgia, by Titian: and the Lady's Last Stake by Hogarth, &c. &c. The library is esteemed one of the finest apartments in Dublin, and contains a very valuable collection of the best authors. At one end of it is an anti-chamber, with a fine statue in white marble of the Venus de Medicis by Wilton; and at the other end are two small rooms, one a cabinet of pictures and antiquities, the other of medals: it is situated at the rere of the house, and connected with it by a corrodore, in which are some handsome statues and Egyptian curiosities.

Dublin, which is the seat of government and of the chief courts of justice, has received many charters and ample privileges from the kings of England since the reign of Henry II. who introduced the English laws into this kingdom. Richard II. erected it into a marquisate in favour of Robert de Vere Earl of Oxford, whom he also created Duke of Ireland. It is an archie-

Dublin. archiepiscopal see, and returns with the university and the county six members to parliament. The civil government of Dublin is executed by a lord-mayor, recorder, two sheriffs, twenty-four aldermen, and a common council formed of representatives from the twenty-five corporations. Every third year the lord-mayor, in conformity with an old charter, perambulates the bounds of the city and its liberties; and formerly the freemen of the several corporations, armed and mounted on horseback, were accustomed to attend the chief magistrate on this occasion, which was titled riding the franchises: but as this custom was productive of idleness, intoxication, and riots, among the lower orders of the people, it has been of late years very properly laid aside. Besides the silk, woollen, and worsted manufactures carried on in that quarter of the suburbs called the Earl of Meath's Liberty, and which have been considerably improved within these few years, other branches of useful manufacture are establishing in different parts of the metropolis; and though the trade of Dublin has heretofore consisted chiefly in the importation of foreign commodities, yet, now that the restrictions on their woollens and most of their other goods are removed, it is hoped the daily enlargement of their export trade will cause a proportionable increase of national opulence.

Dublin would have had a commodious station for shipping, were it not that the harbour is choaked up with two banks of sand, called the *North and South Bulls*, which prevent vessels of large burden from coming over the bar. This, however, is in some measure remedied by a prodigious work of stone, and piles of wood extending some miles into the bay on the south side, at the end of which there is a lighthouse, beautifully constructed, after a design of the late Mr Smith's. But the port of Dublin is capable of much greater improvement; particularly by turning the course of the river Dodder, building a mole from the north-wall to Ringsend, and clearing the harbour, so as to form a grand bason on the south side for the reception of vessels of all burthens. This work is to be immediately carried into execution, and will no doubt meet every possible encouragement, from that spirit for promoting the national welfare which now prevails throughout this kingdom, and is remarkably conspicuous in the capital, where, among others, are the following public institutions.

The board of trustees for promoting the linen and hempen manufactures, established by act of parliament. The Dublin society, incorporated by charter in the year 1749, for improving husbandry and other useful arts. The royal college of physicians, established in the year 1679 for promoting of medical knowledge. The royal college of surgeons, instituted in the year 1785. The royal Irish academy, for the advancement of science, polite literature, and antiquities, incorporated by letters patent the 28th of January 1786: His majesty is patron, and the chief governor for the time being is visitor. The Hibernian society, for maintaining, educating, and apprenticing, the orphans and children of soldiers in Ireland. The Hibernian marine society, for maintaining, educating, and apprenticing, the orphans and children of decayed seamen in his majesty's navy and the merchants service, also incorporated by royal charter.

But among these public institutions, that of the bank of Ireland must not be omitted: it was established by act of parliament in 1783; and by facilitating the circulation of specie, gives life and vigour to manufactures and commerce. It is conducted under the management of a governor, deputy-governor, and fifteen directors chosen annually from among the subscribers; with this restriction, that five new directors at least must be chosen every year. This bank is kept in Mary's-abbey. There are four other banks in this city under the following firms, *viz.* Right Honourable David La Touche and Co. and Sir William Gleadowe Newcomen, Bart. and Co. both in Castle-street; John Dawson Coates, Esq; Thomas-street; and John Finlay and Co. upper Ormond-quay. The houses in which the first three are kept are structures worthy of notice, particularly that of Sir William Gleadowe Newcomen's, which has been rebuilt with hewn stone, in a good taste, after a design of the late Mr Ivory's.

To these public institutions may be added the General Post-Office of Ireland, established by act of parliament in 1784, previous to which time the post-office of this kingdom was only considered a branch of the English one. The building erected for this purpose is on the south side of College-green: it is a fine lofty extensive structure, and the offices for clerks, &c. are extremely well adapted. There are two post-masters general, a secretary, treasurer, accountant-general, resident surveyor, and comptroller. There is also a penny-post under the direction of the same officers, established for the conveyance of letters to all parts throughout the city and its environs.

Dublin is remarkably well supplied with flesh, fowl, and fish, the latter in much greater perfection than any other capital in Europe. It is supplied with coals chiefly from Cumberland and Scotland; and water is conveyed to the city on the north side from the river Liffey, by machines curiously constructed for the purpose, at an outlet called *Island-bridge:* the south side is supplied with that necessary article from a fine reservoir or bason, surrounded with a wall and a handsome grass walk enclosed on each side by a thick-set hedge and trees planted at equal distances. From one end of it there is a view of the canal for the convenience of inland water carriage, now completed as far as Monastereven, between which and the canal harbour in James's-street, passage-boats ply daily; they are well appointed and accommodated with all necessary refreshments. At a small distance from the bason there is a bridge of a single arch thrown over the canal, the elegance and architecture of which are much admired: the sides of the canal for some miles into the country are planted with elm-trees, which renders its banks in fair weather a delightful place of exercise for the citizens; who also resort for recreation to his majesty's Phœnix-park, a fine extensive enclosure at the west end of the town, and on the opposite side of the river to the canal, diversified with woodland, campaign, and rising ground, and well stocked with deer. It is seven miles in circuit; and besides the Hibernian school, is adorned with the viceroy's beautiful villa and some handsome lodges belonging to the rangers: in this park are also a magazine for powder and a battery that commands the city. In 1747, a fluted pillar 30 feet high, with a phœnix on the top, was erected in the

 centre

centre of a ring in this park by the celebrated earl of Cheſterfield when lord lieutenant of Ireland.

The circular road which ſurrounds the city, beginning on one ſide of the river, at the eaſt end of the town, and terminating on the oppoſite ſhore, is carried through the park. This road forms a very agreeable ride, and is much frequented. It is the boundary of the juriſdiction of the new police, inſtituted for the better preſervation of the peace and good order of the city and the perſonal ſecurity of its inhabitants. This inſtitution, lately eſtabliſhed by act of parliament, is under the direction of a chief commiſſioner, three aſſiſtant commiſſioners, and four diviſional juſtices, who are all aldermen of the city: which is therefore properly termed *the diſtrict of the metropolis*, and divided into four wards. The police-guard conſiſts of 40 horſemen and 400 foot, well armed, and in regular uniform: they are taught military diſcipline, and ſtationed at night-time in the ſeveral watch-houſes; from whence parties are conſtantly patrolling the ſtreets, and centinels are placed at different ſtands. This inſtitution is found by experience to be a much more effectual prevention of robberies, riots, and nocturnal outrages, than the pariſh watches; and to this ſecurity which the well diſpoſed working manufacturers enjoy, may in a great meaſure be attributed that encreaſing ſpirit of induſtry and peaceable behaviour now ſo prevalent among this uſeful claſs of the community, which cannot fail to be productive of the moſt ſalutary conſequences to the future welfare of the metropolis and the kingdom in general.

DUBOS (John Baptiſt), a learned and ingenious French author, born at Beauvais in 1670. He finiſhed his ſtudies at Paris, and at length was intruſted with the management of ſeveral important affairs in Italy, England, and Holland. At his return to Paris, he had a prebendary given him; afterwards he had a penſion of two thouſand livres, and the abbey of Notre Dame at Reſſons, near Beauvais. He died at Paris, when perpetual ſecretary of the French academy, on the 23d of March 1742. His principal works are, 1. Critical Reflections on Poetry and Painting, in three volumes duodecimo. 2. A Critical Hiſtory of the French Monarchy in Gaul, two volumes 4to.

DUBRIS (anc. geog.), a town of Britain; now *Dover*, from the *Dovoria* of the lower age. A port town of Kent, oppoſite to Calais.

DUCAL, in general, ſomething belonging to a duke. See DUKE.

The letters patent granted by the ſenate of Venice are called *ducals:* ſo alſo are the letters wrote, in the name of the ſenate, to foreign princes. The denomination of ducal is derived hence; that, at the beginning of ſuch patents, the name of the duke or doge is wrote in capitals, thus, *N—Dei Gratia Dux Venetiarum*, &c. The date of ducals is uſually in Latin, but the body is in Italian. A courier was diſpatched with a ducal to the emperor, returning him thanks for renewing the treaty of alliance (in 1716), againſt the Turks, with the republic of Venice.

DUCAS, a learned Greek, who wrote an hiſtory of what paſſed under the laſt emperors of Conſtantinople, till the ruin of that city. This work, which is eſteemed, was printed at the Louvre in 1649, with the Latin tranſlation and notes of Bouillaud.

DUCAT, a foreign coin, either of gold or ſilver, ſtruck in the dominions of a duke; being about the ſame value with a Spaniſh piece of eight, or a French crown, or four ſhillings and ſixpence ſterling when of ſilver; and twice as much when of gold. See COIN.

The origin of ducats is referred to one Longinus, governor of Italy; who, revolting againſt the emperor Juſtin the Younger, made himſelf duke of Ravenna, and called himſelf *Exarcha*, i. e. *without lord or ruler;* and, to ſhow his independence, ſtruck pieces of money of very pure gold in his own name, and with his own ſtamp, which were called *ducati, ducats;* as Procopius relates the ſtory.

After him, the firſt who ſtruck ducats were the Venetians, who called them *Zecchini* or *ſequins*, from Zecca, the place where they firſt were ſtruck. This was about the year 1280, in the time of John Dandali: but we have pretty good evidence, that Roger king of Sicily had coined ducats as early as 1240. And Du Cange ſcruples not to affirm, that the firſt ducats were ſtruck in the duchy of Apulia in Calabria. The chief gold ducats now current are, the ſingle and double ducats of Venice, Florence, Genoa, Germany, Hungary, Poland, Sweden, Denmark, Flanders, Holland, and Zurich. The heavieſt of them weighs 5 pennyweights 17 grains, and the lighteſt 5 pennyweights 10 grains; which is to be underſtood of the double ducats, and of the ſingle in proportion.

The Spaniards have no ducats of gold; but, in lieu thereof, they make uſe of the ſilver one; which, with them, is no real ſpecies, but only a money of account like our pound. It is equivalent to 11 rials. See RIAL. The ſilver ducats of Florence ſerve there for crowns.

DUCATOON, a ſilver coin, ſtruck chiefly in Italy; particularly at Milan, Venice, Florence, Genoa, Lucca, Mantua, and Parma: though there are alſo Dutch and Flemiſh ducatoons. They are all nearly on the ſame footing; and being a little both finer and heavier than the piece of eight, are valued at two pence or three pence more, viz. at about four ſhillings and eight pence ſterling.

There is alſo a gold ducatoon, ſtruck and current chiefly in Holland: it is equivalent to twenty florins, on the footing of one ſhilling and eleven pence halfpenny the florin.

DUCENARIUS, in antiquity, an officer in the Roman army, who had the command of 2000 men.

The emperors had alſo ducenarii among their procurators or intendants, called *procuratores ducenarii*. Some ſay, that theſe were ſuch whoſe ſalary was two hundred ſeſterces; as in the games of the circus, horſes hired for two hundred ſeſterces were called *ducenarii*. Others hold, that ducenarii were thoſe who levied the two hundredth penny, the officers appointed to inſpect the raiſing of that tribute. In the inſcription at Palmyra, the word *ducenarius*, in Greek Δεκηναριος, occurs very often.

DUCENTESIMA, in antiquity, a tax of the two hundredth penny, exacted by the Romans.

DUCHAL (James), D. D. a late pious and learned diſſenting miniſter, was born in Ireland, and finiſhed his ſtudies at the univerſity of Glaſgow; which afterwards, from a regard to his merit, conferred on him the degree of doctor of divinity. He reſided 10 or 11 years at Cambridge, as the paſtor of a ſmall congregation there; where he enjoyed his beloved retirement, the advantage of books and of learned conversation, which he improved with the greatest diligence. On Mr Abernethy's removal from Antrim, he succeeded him there; and on that gentleman's death, he succeeded him as minister of the dissenting meeting-house in Wood-street, Dublin. In this situation he continued till his death, which happened on the 4th of May 1761, when he had completed his 64th year. He published a volume of excellent discourses on the presumptive arguments in favour of the Christian religion, and many occasional tracts; and after his death were published a number of his sermons, in three volumes 8vo.

DUCHY, in geography, an appellation given to the dominions of a duke.

Duchy Court, a court in England wherein all matters belonging to the duchy or county palatine of Lancaster are decided by decree of the chancellor of that court.

The origin of this court was in Henry the IV.'s time, who obtained the crown by deposition of Richard II. and having the duchy of Lancaster, by descent, in right of his mother, became seised thereof as king, not as duke: So that all the liberties, franchises, and jurisdictions of the said county passed from the king, by his great seal, and not by livery or attornment, as the earldom of March, and other possessions, which descended to him by other ancestors than the king's did. Henry IV. by authority of parliament, severed the possessions, liberties, &c. of the said duchy from the crown: but Edward IV. restored them to their former nature.

The officers belonging to this court are, a chancellor, attorney-general, receiver-general, clerk of the court, and messenger; beside the assistants, as an attorney in the exchequer, another in chancery, and four councellors.

DUCK, in ornithology. See Anas and Decoy.

This fowl is furnished with a peculiar structure of vessels about the heart, which enables it to live a considerable time under water, as is necessary for it in diving. This made Mr Boyle think it a more proper subject for experiments with the air-pump than any other bird. A full grown duck being put into the receiver of an air-pump, of which she filled one third part, and the air exhausted, the creature seemed to bear it better for the first moments than a hen or other such fowl; but, after about a minute, she showed great signs of uneasiness, and in less than two minutes her head fell down, and she appeared dying, till revived by the letting in of the air. Thus, whatever facility of diving this and other water-fowl may have, it does not appear that they can subsist, without air for respiration, any longer than other animals. A young callow duck was afterwards tried in the same manner, and with the same success, being reduced very near death in less than two minutes. But it is observable, that both birds swelled very much on pumping out the air, so that they appeared greatly larger to the spectators, especially about the crop; it not being intended that any water-fowl should live in an exceedingly rarefied air, but only be able to continue occasionally some time under water. Nature, though she has provided them with the means of this, has done nothing for them in regard to the other.

The strongest instance of these creatures being calculated to live almost in any situation, we have in the accounts of the blind ducks in the Zirchnitzer lake in Carniola. It is supposed that this lake communicates with another lake under ground in the mountain Savornic, and fills or empties itself according to the fulness or emptiness of that lake; the water of the upper lake running off, and that in vast quantities, by holes in the bottom. The ducks, which are here always in great numbers, are often carried down along with the water, and forced into the subterraneous lake to which it retires. In this unnatural habitation, many of these creatures undoubtedly perish, but some remain alive. These become blind, and lose all their feathers; and in the next filling of the lake, both they and vast numbers of fish are thrown up with the water. At this time they are fat, but make a strange appearance in their naked state, and are easily caught, by reason of their want of sight. In about a fortnight they recover their sight and feathers; and are then of the size of a common wild-duck, but of a black colour, with a white spot in their forehead. When opened, on being taken at their first coming up in their blind state, their stomachs are found full of small fishes, and somewhat resembling weeds. From this it seems, that they cannot be absolutely blind; but that the degree of light to which they have been accustomed in their subterraneous habitation, was sufficient to enable them to procure food for themselves; and their blindness, on coming again into open day-light, is no other than that of a man who has been long in the dark, on having in an instant a large blaze of candles set under his eyes.

Duck (Stephen), originally a thresher in a barn, was born about the beginning of the present century. By his poetical talents he first attracted the notice of some gentlemen at Oxford; and being recommended to Queen Caroline, he, under her patronage, took orders, and was preferred to the living of Byfleet in Surry. His abilities were, however, much more conspicuous in his primitive station than in his advancement; though, it is said, he was not disliked as a preacher. Falling at length into a low-spirited melancholy way, probably owing to his change of life and cessation from his usual labour, he in a fit of lunacy flung himself into the Thames, in 1756.

DUCKING, plunging in water, a diversion anciently practised among the Goths by way of exercise; but among the Celtæ, Franks, and ancient Germans, it was a sort of punishment for persons of scandalous lives.—At Marseilles and Bourbon their men and women of scandalous life are condemned to the cale, as they call it; that is, to be shut up naked to the shift in an iron cage fastened to the yard of a shallop, and ducked several times in the river. The same is done at Thoulouse to blasphemers.

Ducking, a sort of marine punishment, inflicted by the French, on those who have been convicted of desertion, blasphemy, or exciting sedition. It is performed as follows: The criminal is placed astride of a short thick batten, fastened to the end of a rope, which passes through a block hanging at one of the yard-arms. Thus fixed, he is hoisted suddenly up to the yard, and the rope being slackened at once, he is plunged into the sea. This chastisement is repeated several times conformable to the purport of the sentence pronounced against the culprit, who has at that time several cannon-shot fastened to his feet during the punishment; which

which is rendered public by the firing of a gun, to advertise the other ships of the fleet thereof, that their crews may become spectators.

Ducking is also a penalty which veteran sailors pretend to inflict on those who, for the first time, pass the tropic of Cancer, the equator, or the straits of Gibraltar, in consequence of their refusal or incapacity to pay the usual fine levied on this occasion.

Ducking-Stool. See Castigatory.

DUCKUP, at sea, is a term used by the steer'sman, when the main-sail, fore-sail, or sprit-sail, hinders his seeing to steer by a land-mark: upon which he calls out, *Duckup the clew-lines of these sails*; that is, hale the sails out of the way. Also when a shot is made by a chace-piece, if the clew of the sprit-sail hinders the sight, they call out, *Duckup*, &c.

DUCT, in general, denotes any tube or canal. It is a term much used by anatomists.

DUCTILITY, in physics, a property possessed by certain solid bodies, which consists in their yielding to percussion or pressure, and in receiving different forms without breaking.

Some bodies are ductile both when they are hot and when they are cold, and in all circumstances. Such are metals, particularly gold and silver. Other bodies are ductile only when heated to a sufficient degree; such as wax and other substances of that kind, and glass. Other bodies, particularly some kinds of iron, called by the workmen *red-short*, brass, and some other metallic mixtures, are ductile only when cold, and brittle when hot. The degrees of heat requisite to produce ductility in bodies of the first kind, vary according to their different natures. In general, the heat of the body must be such as is sufficient to reduce it to a middle state betwixt solidity and perfect fusion. As wax, for instance, is fusible with a very small heat, it may be rendered ductile by a still smaller one; and glass, which requires a most violent heat for its perfect fusion, cannot acquire its greatest ductility until it is made perfectly red-hot, and almost ready to fuse. Lastly, some bodies are made ductile by the absorption of a fluid. Such are certain earths, particularly clay. When these earths have absorbed a sufficient quantity of water to bring them into a middle state betwixt solidity and fluidity, that is to the consistence of a considerably firm paste, they have then acquired their greatest ductility. Water has precisely the same effect upon them in this respect that fire has upon the bodies abovementioned.

DUDLEY (Edmund), an eminent lawyer and able statesman in the reign of Henry VII.; who with Sir Richard Empson, another lawyer of the same complexion, assisted in filling that rapacious monarch's coffers by arbitrary prosecutions of the people on old penal statutes. They were beheaded on the accession of Henry VIII. to pacify the clamours of the people for justice.

Dudley (John), duke of Northumberland, son of the above, a statesman; memorable in the English history for his unsuccessful attempt to place the crown on the head of his daughter-in-law, lady Jane Gray, who fell a victim to his ambition; was born in 1502, and beheaded in 1553. See (*History of*) England. Ambrose his eldest son was a brave general and able statesman under queen Elizabeth; and received the appellation of *the good earl of Warwick*. Henry, the duke's second son, was killed at the siege of St Quintin. Robert, the third son, a man of bad character, was created ear of Leicester; and was one of queen Elizabeth's favourites. His fourth son was the unfortunate lord Guildford Dudley, whose only crime was his being the husband of lady Jane Grey, for which he was beheaded in 1554.

Dudley (Sir Robert), as he was called in England, and, as he was styled abroad, *earl of Warwick and duke of Northumberland*, was the son of Robert abovementioned, by the lady Douglas Sheffield; and was born at Sheen in Surry in 1573, where he was carefully concealed, to prevent the queen's knowledge of the earl's engagement with his mother. He studied at Oxford; when his father dying, left him the bulk of his estate. He was at this time one of the finest gentlemen in England; and having a particular turn to navigation, fitted out a small squadron at his own expence, with which he sailed to the river Oroonoque, and took and destroyed nine sail of Spanish ships. In 1595, he attended the earl of Essex, and the lord high admiral of England, in their expedition against the Spaniards; when, for his gallant behaviour at the taking of Cadiz, he received the honour of knighthood. He now endeavoured to prove the legitimacy of his birth, in order to be entitled to his hereditary honours. But being overpowered by the interest of the countess dowager of Leicester, he applied for a licence to travel: and being well received at the court of Florence, resolved to continue there, notwithstanding his receiving a letter of recal; on which his whole estate was seised by king James I. and vested in the crown. He discovered at the court of Cosmo II. great duke of Tuscany, those great abilities for which he had been admired in England, and was at length made chamberlain to his serene highness's consort. He there contrived several methods of improving shipping; introduced new manufactures; and by other services obtained so high a reputation, that at the desire of the archduchess, the emperor Ferdinand, in 1620, created him a duke of the holy Roman empire. He afterwards drained a vast tract of morass, between Pisa and the sea; and raised Leghorn, which was then a mean, pitiful place, into a large and beautiful town, improving the haven by a mole, which rendered it both safe and commodious; and having engaged his highness to declare it a free port, he, by his influence and correspondence, drew many English merchants to settle and set up houses there, which was of very great service to his native country, as well as to the Spaniards. He was also the patron of learned men, and held a high place himself in the republic of letters. His most celebrated work is his *Del Arcano del Mare*, in two volumes, folio.

DUEL, a single combat, at a time and place appointed, in consequence of a challenge. This custom came originally from the northern nations, among whom it was usual to decide all their controversies by arms. Both the accuser and accused gave pledges to the judges on their respective behalf; and the custom prevailed so far amongst the Germans, Danes, and Franks, that none were excused from it but women, sick people, cripples, and such as were under 21 years of age or above 60. Even ecclesiastics, priests, and monks, were

Duel.

were obliged to find champions to fight in their stead. The punishment of the vanquished was either death, by hanging or beheading; or, mutilation of members, according to the circumstances of the case. Duels were at first admitted not only on criminal occasions, but on some civil ones for the maintenance of rights to estates, and the like: in latter times, however, before they were entirely abolished, they were restrained to these four cases. 1. That the crime should be capital. 2. That it should be certain the crime was perpetrated. 3. The accused must by common fame be supposed guilty. And, 4. The matter not capable of proof by witnesses.

Duel, at present, is used for single combat on some private quarrel; and must be premeditated, otherwise it is called a *rencounter*. If a person is killed in a duel, both the principals and seconds are guilty, whether the seconds engage or not. (See the article Murder.) It is also a very high offence to challenge a person either by word or letter, or to be the messenger of a challenge, (See Law, nº clxxxv. 20.)

The general practice of duelling, in this last sense, took its rise in the year 1527, at the breaking up of a treaty between the emperor Charles V. and Francis I. The former desired Francis's herald to acquaint his sovereign, that he would henceforth consider him not only as the base violator of public faith, but as a stranger to the honour and integrity becoming a gentleman. Francis, too high-spirited to bear such an imputation, had recourse to an uncommon expedient to vindicate his character. He instantly sent back the herald with a cartel of defiance, in which he gave the emperor the lie in form, challenged him to single combat, requiring him to name the time and place of the encounter, and the weapons with which he chose to fight. Charles, as he was not inferior to his rival in spirit or bravery, readily accepted the challenge; but after several messages concerning the arrangement of all the circumstances relative to the combat, accompanied with mutual reproaches bordering on the most indecent scurrility, all thoughts of this duel, more becoming the heroes of romance than the two greatest monarchs of their age, were entirely laid aside.

The example of two personages so illustrious, drew such general attention, and carried with it so much authority, that it had considerable influence in introducing an important change in manners all over Europe. Duels, as has already been observed, had been long permitted by the laws of all the European nations; and, forming a part of their jurisprudence, were authorised by the magistrate on many occasions, as the most proper method of terminating questions with regard to property, or of deciding in those which regarded crimes. But single combats being considered as solemn appeals to the omniscience and justice of the Supreme Being, they were allowed only in public causes, according to the prescription of law, and carried on in a judicial form*. Men, accustomed to this manner of decision in courts of justice, were naturally led to apply it to personal and private quarrels. Duels, which at first could be appointed by the civil judge alone, were fought without the interposition of his authority, and in cases to which the laws did not extend. The transaction between Charles and Francis strongly countenanced this practice. Upon every affront or injury which seemed to touch his honour, a gentleman thought himself intitled to draw his sword, and to call on his adversary to make reparation. Such an opinion, introduced among men of fierce courage, of high spirit, and of rude manners, where offence was often given, and revenge was always prompt, produced most fatal consequences. Much of the best blood in Christendom was shed; many useful lives were lost; and, at some periods, war itself hath hardly been more destructive than these contests of honour. So powerful, however, is the dominion of fashion, that neither the terror of penal laws, nor reverence for religion, have been able entirely to abolish a practice unknown among the ancients, and not justifiable by any principle of reason; though at the same time we must ascribe, in some degree, the extraordinary gentleness and complaisance of modern manners, and that respectful attention of one man to another, which at present render the social intercourses of life far more agreeable and decent than among the most civilized nations of antiquity.

* See the article *Battle*.

Duel ‖ Dugdale.

Public opinion is not easily controlled by civil institutions; for which reason it may be questioned whether any regulations can be contrived of sufficient force to suppress or change the rule of honour which stigmatizes all scruples about duelling with the reproach of cowardice.

The inadequate redress which the law of the land affords for those injuries which chiefly affect a man in his sensibility and reputation, tempts many to redress themselves. Prosecutions for such offences, by the trifling damages that are recovered, serve only to make the sufferer more ridiculous.—This ought to be remedied.

For the army, where the point of honour is cultivated with exquisite attention and refinement, there might be established a court of honour, with a power of awarding those submissions and acknowledgments which it is generally the object of a challenge to obtain; and it might grow into a fashion with persons of rank of all professions to refer their quarrels to the same tribunal.

Duelling, as the law now stands, can seldom be overtaken by legal punishment. The challenge, appointment, and other previous circumstances, which indicate the intention with which the combatants met, being suppressed, nothing appears to a court of justice but the actual rencounter; and if a person be slain when actually fighting with his adversary, the law deems his death nothing more than manslaughter.

DUERO, or Duro, a large river, which, rising in Old Castile in Spain, runs from east to west, crosses the province of Leon, and after dividing Portugal from Spain by a southerly course, turns westward, crosses Portugal, and falls into the Atlantic Ocean at Porto-Port.

DUGDALE (Sir William), an eminent English historian, antiquarian, and herald, born in Warwickshire in 1605. He was introduced into the herald's office by Sir Christopher Hatton; and ascended gradually through all the degrees, until he became garter principal king at arms. His chief work is the *Monasticon Anglicanum*, in three vols folio; containing the charters and descriptions of all the English monasteries, adorned with engravings: in the former part of which

work

work he was assisted by Mr Roger Dodsworth. Nor are his Antiquities of Warwickshire less esteemed. He wrote likewise, among other things of less note, the History of St Paul's Cathedral; a History of Embanking and Draining; a Baronage of England; and completed the second volume of Sir Henry Spelman's Councils, with a second part of his Glossary. He died in 1686. His son, Sir John, was Norroy king at arms, and published a Catalogue of English Nobility. His daughter Elizabeth married the famous Elias Ashmole.

DUILLIA LEX, was enacted by M. Duillius, a tribune, in the year of Rome 304. It made it a capital crime to leave the Roman people without its tribunes, or to create any new magistrate without a sufficient cause. Another in 392, to regulate what interest ought to be paid for money lent.

C. DUILLIUS NEPOS, a Roman consul, the first who obtained a victory over the naval power of Carthage in the year of Rome 492. He took fifty of the enemy's ships, and was honoured with a naval triumph, the first that ever appeared at Rome. The senate rewarded his valour by permitting him to have music playing and torches lighted at the public expence every day while he was at supper. There were some medals struck in commemoration of this victory; and there exists a column at Rome which was erected on the occasion.

DUKE, DUX, a sovereign prince, without the title or quality of king. Such are the duke of Lorrain, of Holstein, Savoy, of Parma, &c. The word is borrowed from the modern Greeks, who call *doucas* what the Latins call *dux*.

There are also two sovereigns who bear the title of *grand-duke*; as the grand-duke of Tuscany, and the grand-duke of Muscovy, now called the *czar* or emperor of Russia. The title of *great-duke* belongs to the apparent heir of Russia; and the title of *arch-duke* is given to all the sons of the house of Austria, as that of *arch-duchess* to all the daughters.

DUKE, *Dux*, is also a title of honour or nobility, the next below princes.

The dukedom or dignity of duke is a Roman dignity, denominated *a ducendo*, "leading" or "commanding." Accordingly, the first dukes, *duces*, were the *ductores exercituum*, "commanders of armies." Under the late emperors, the governors of provinces in war-time were intitled *duces*. In after times the same denomination was also given to the governors of provinces in time of peace. The first governor under the name of *duke* was a duke of the Marchia Rhaetica, or Grisons, whereof mention is made in Cassiodorus; and there were afterwards thirteen dukes in the eastern empire, and twelve in the western. The Goths and Vandals, upon their over-running the provinces of the western empire, abolished the Roman dignities wherever they settled. But the Franks, &c. to please the Gauls, who had long been used to that form of government, made it a point of politics not to change any thing therein: and accordingly they divided all Gaul into duchies and counties; and gave the names sometimes of dukes, and sometimes of counts, *comites*, to the governors thereof.

In England, during the Saxons time, Camden observes, the officers and commanders of armies were called dukes, *duces*, after the ancient Roman manner, without any addition. After the Conqueror came in, the title lay dormant till the reign of Edward III. who created his son Edward, first called the *Black Prince*, duke of Cornwal; which hath ever since been the peculiar inheritance of the king's eldest son during the life of his father; so that he is *dux natus, non creatus*. After whom there were more made, in such manner as that their titles descended to their posterity. They were created with much solemnity, *per cincturam gladii, cappaeque, & circuli aurei in capite impositionem*. However, in the reign of Queen Elizabeth, A. D. 1572, the whole order became utterly extinct; but it was revived about 50 years afterwards by her successor, in the person of George Villiers duke of Buckingham.

Though the French retained the names and form of the ducal government, yet under their second race of kings there were scarce any such thing as dukes: but all the great lords were called *counts, peers*, or *barons*; excepting, however, the dukes of Burgundy and Aquitain; and the duke of France, which was a dignity Hugh Capet himself held, corresponding to the modern dignity of maire de palais, or the king's lieutenant. By the weakness of the kings, the dukes or governors sometimes made themselves sovereigns of the provinces trusted to their administration. This change happened chiefly about the time of Hugh Capet; when the great lords began to dismember the kingdom, so that that prince found more competitors among them than subjects. It was even with a great deal of difficulty they could be brought to own him their superior, or to hold of him by faith and homage. By degrees, what with force, and what by marriages, these provinces, both duchies and counties, which had been rent from the crown, were again united to it. But the title *duke* was no longer given to the governors, of provinces. From that time duke became a mere title of dignity, annexed to a person and his heirs male, without giving him any domain, territory, or jurisdiction over the place whereof he was duke. All the advantages thereof now consist in the name, and the precedence it gives.

The dukes of our days retain nothing of their ancient splendor but the coronet on their escutcheon, which is the only mark of their departed sovereignty. They are created by patent, cincture of the sword, mantle of state, imposition of a cape, and coronet of gold on the head, and a verge of gold in their hand.

The eldest sons of dukes are by the courtesy of England styled *marquisses*, though they are usually distinguished by their father's second title, whether it be that of marquis or earl; and the younger sons *lords*, with the addition of their Christian name, as Lord James, Lord Thomas, &c. and they take place of viscounts, though not so privileged by the laws of the land.

A duke has the title of *grace*; and being writ to, he is styled, in the heralds language, *most high, potent, and noble prince*. Dukes of the blood royal are styled *most high, most mighty, and illustrious princes*.

DUKE, among Hebrew grammarians, is an appellation given to a species of accents answering to our comma. See ACCENT.

DUKE-Duke, a quality given in Spain to a grandee of the house of Sylva, on account of his having several duchies from the uniting of two considerable houses in his person. Don Roderigo de Sylva, eldest son of Don Ruy

Ruy Gomez de Sylva, and heir of his duchies and principalities, married the eldeft daughter of the Duke de l'Infantado; in virtue of which marriage, the prefent Duke de Paftrana, who is defcended therefrom, and is grandfon of Don Roderigo de Sylva, has added to his other great titles that of duke-duke, to diftinguifh himfelf from the other dukes; fome whereof may enjoy feveral duchies, but none fo confiderable ones, nor the titles of fuch eminent families.

DULCIFYING, in chemiftry, is the fweetening any matter impregnated with falts, by frequently wafhing it in pure water.

DULL, in the manege. The marks of a dull horfe, called by the French *marquis de ladre*, are white fpots round the eye and on the tip of the nofe, upon any general colour whatfoever. Though the vulgar take thefe fpots for figns of ftupidity, it is certain they are great marks of the goodnefs of a horfe; and the horfes that have them are very fenfible and quick upon the fpur.

DULLART (Heiman), a Dutch painter and poet. He was a pupil to Rembrandt, for whofe works the few he left are often miftaken. He died in 1684.

DUMBARTON. See DUNBARTON.

DUMBNESS, the privation of the faculty of fpeech. The moft general, or rather the fole caufe of dumbnefs, is the want of the fenfe of hearing. The ufe of language is originally acquired by imitating articulate founds. From this fource of intelligence, deaf people are entirely excluded: they cannot acquire articulate founds by the ear: unlefs, therefore, articulation be communicated to them by fome other medium, thefe unhappy people muft for ever be deprived of the ufe of language; and as language is the principal fource of knowledge, whoever has the misfortune to want the fenfe of hearing, muft remain in a ftate little fuperior to that of the brute creation. Deafnefs has in all ages been confidered as fuch a total obftruction to fpeech or written language, that an attempt to teach the deaf to fpeak or read has been uniformly regarded as impracticable, till Dr Wallis and fome others have of late fhewn, that although deaf people cannot learn to fpeak or read by the direction of the ear, there are other fources of imitation, by which the fame effect may be produced. The organs of hearing and of fpeech have little or no connection. Perfons deprived of the former generally poffefs the latter in fuch perfection, that nothing further is neceffary, in order to make them articulate, than to teach them how to ufe thefe organs. This indeed is no eafy tafk; but experience fhows that it is practicable. Mr THOMAS BRAIDWOOD, late of Edinburgh, was perhaps the firft who ever brought this furprifing art to any degree of perfection. He began with a fingle pupil in 1764; and fince that period has taught great numbers of people born deaf to fpeak diftinctly; to read, to write, to underftand figures, the principles of religion and morality, &c. At the time we firft converfed with him, being a few years after the commencement of his practice, he had a confiderable number of deaf pupils, fome of them above 20 years of age, all making a rapid and amazing progrefs in thofe ufeful branches of education.

Mr Braidwood's principal difficulty, after he had difcovered this art was to make people believe in the practicability of it. He advertifed in the public papers; he exhibited his pupils to many noblemen and gentlemen; ftill he found the generality of mankind unwilling to believe him. A remarkable inftance of this incredulity occured fome years ago. A gentleman in England fent a deaf girl of his to Mr Braidwood's care. A year or two afterwards, Mr Braidwood wrote to the father, that his daughter could fpeak, read, and write diftinctly. The father returned an anfwer, begging Mr Braidwood's excufe, as he could not believe it; however, he defired a friend of his, who was occafionally going to Edinburgh, to call at Mr Braidwood, and inquire into the truth of what he had wrote him; he did fo; converfed with Mr Braidwood, faw the young lady, heard her read, fpeak, and anfwer any queftions he put to her. On his return, he told the father the furprifing progrefs his child had made; but ftill the father thought the whole an impofition: the girl herfelf wrote to her father, but he looked upon the letter as a forgery. About this time the father died; and the mother fent an uncle and coufin of the deaf lady's from Shrewfbury, in order to be fatisfied of the truth. When they arrived, Mr Braidwood told the girl her uncle and coufin were in the parlour; and defired her to go and afk them how they did, and how her mother and other friends did. The friends were aftonifhed, and could hardly credit their own ears and eyes.

When we converfed with Mr Braidwood concerning the nature and method of teaching this wonderful art, he feemed to be very defirous of communicating and tranfmitting his difcovery to pofterity; but obferved, from the nature of the thing we believe it to be true, that he could not communicate it fo fully in writing as to enable any other perfon to teach it. The firft thing in the method is, to teach the pupil to pronounce the fimple founds of the vowels and confonants. We have even feen him performing this operation; but are unable to give a clear idea of it. He pronounces the found of *a* flowly, pointing out the figure of the letter at the fame time; makes his pupil obferve the motion of his mouth and throat; he then puts his finger into the pupil's mouth, depreffes or elevates the tongue, and makes him keep the parts in that pofition; then he lays hold of the outfide of the windpipe; and gives it fome kind of fqueeze, which it is impoffible to defcribe: all the while he is pronouncing *a*, the pupil is anxioufly imitating him, but at firft feems not to underftand what he would have him to do. In this manner he proceeds, till the pupil has learned to pronounce the founds of the letters. He goes on in the fame manner to join a vowel and a confonant, till at length the pupil is enabled both to fpeak and read.

That his pupils were taught not only the mere *pronunciation*, but alfo to underftand the *meaning* of what they read, was eafily afcertained by a converfation with any of them. Of this Mr Pennant gives a remarkable inftance in a young lady of about 13 years of age, who had been fometime under the care of Mr Braidwood. "She readily apprehended (fays he) all I faid, and returned me anfwers with the utmoft facility. She read; fhe wrote well. Her reading was not by rote. She could clothe the fame thoughts in a new fet of words, and

and never vary from the original sense. I have forgot the book she took up, or the sentences she made a new version of: but the effect was as follows:

"*Original passage.* Lord Bacon has divided the whole of human knowledge into history, poetry, and philosophy; which are referred to the three powers of the mind, memory, imagination, and reason.

"*Version.* A nobleman has parted the total or all of man's study or understanding into, An account of the life, manners, religion or customs of any people or country; verse or metre; moral or natural knowledge: which are pointed to the three faculties of the soul or spirit; the faculty of remembering what is past, thought or conception, and right judgment."

Mr Braidwood's success since he went to settle in London is universally known. Several other persons have since attempted the same art with various degrees of ability. But a new and different method, equally laborious and successful, we understand, is practised by the Abbé de l'Epee of Berlin. We are informed* that he begins his instructions not by endeavouring to form the organs of speech to articulate sounds, but by communicating ideas to the mind by means of signs and characters: to effect this, he writes the names of things: and, by a regular system of signs, establishes a connection between these words and the ideas to be excited by them. After he has thus furnished his pupils with ideas, and a medium of communication, he teaches them to articulate and pronounce, and renders them not only grammarians but logicians. In this manner he has enabled one of his pupils to deliver a Latin oration in public, and another to defend a thesis against the objections of one of his fellow pupils in a scholastic disputation: in which the arguments of each were communicated to the other, but whether by signs or in writing is not said; for it does not appear that the Abbé teaches his pupils to discern what is spoken, by observing the motion of the organs of speech, which those instructed by Messrs Braidwoods are able to do with astonishing readiness.

* *Nouv. Mem. de l'Academie Royale,* &c. *de Berlin,* 1785. [Mon.Rev. vol. lxxx. p. 651.]

There is perhaps no word, says the Abbé, more difficult to explain by signs than the verb *croire,* "to believe." To do this, he writes the verb with its significations in the following manner:

Je crois { *Je dis oui par l'esprit, Je pense que oui.*
Je dis oui par le coeur, J'aime a penser que oui.
Je dis oui par la bouche.
Je ne vois pas des yeux. }

After teaching these four significations, which he does by as many signs, he connects them with the verb, and adds other signs to express the number, person, tense, and mood, in which it is used. If to the four signs, corresponding with the lines abovementioned, be added that of a substantive, the pupil will write the word *foi,* "faith;" but, if a sign, indicating a participle used substantively, be adjoined, he will express *la croyance,* "belief;" to make him write *croyable,* "credible," the four signs of the verb must be accompanied with one that indicates an adjective terminating in *able;* all these signs are rapidly made, and immediately comprehended.

M. Linguet, a member of the Royal Academy, having asserted that persons thus instructed could be considered as little more than automata, the Abbé invited him to be present at his lessons, and expressed his astonishment that M. Linguet should be so prejudiced in favour of the medium by which he had received the first rudiments of knowledge, as to conclude that they could not be imparted by any other; desiring him, at the same time to reflect, that the connection between ideas and the articulate sounds, by which they are excited in the mind, is not less arbitrary than that between these ideas and the written characters which are made to represent them to the eye. M. Linguet complied with the invitation; and the Abbé having desired him to fix upon some abstract term which he would by signs communicate to his pupils, he chose the word *unintelligibility;* which, to his astonishment, was almost instantly written by one of them. The Abbé informed him, that to communicate this word he had used five signs, which, though scarcely perceivable to him, were immediately and distinctly apprehended by his scholars: the first of these signs indicated an internal action; the second represented the act of a mind that reads internally, or, in other words, comprehends what is proposed to it; a third signified that such a disposition is possible; these, taken together, form the word *intelligible:* a fourth sign transforms the adjective into the substantive; and a fifth, expressing negation, completes the word required. M. Linguet afterwards proposed this question, *What do you understand by metaphysical ideas?* which being committed to writing, a young lady immediately answered on paper in the following terms: "I understand the ideas of things which are independent of our senses, which are beyond the reach of our senses, which make no impression on our senses, which cannot be perceived by our senses." On reading this, we cannot help exclaiming with the poet, *Labor omnia vincit improbus!* a maxim by none more forcibly illustrated than by the Abbé de l'Epee.

Periodical DUMBNESS. In the Ephemerides of the Curious, we have an account of a periodical dumbness, which had continued for more than 15 years, and had not gone off at the time the account was wrote. The person was son to an inn-keeper at Jesing in the duchy of Wirtemberg in Germany. He was one night taken so ill after supper, that he could neither stand nor sit. He continued for about an hour, oppressed with sickness to such a degree as to be in danger of suffocation. At the expiration of this time he grew better; but during three months, he was much dejected, melancholy, and, at times, fearful. He was then suddenly struck dumb, and became unable to pronounce the least word, or form the least sound, though he could speak very articulately before. The loss of speech was at first instantaneous, and continued only a few minutes: but the duration of it began to lengthen every day; so that it soon amounted to half an hour, two hours, three hours, and at last to 23 hours, yet without any order. At last the return of speech kept so constant and regular an order, that for 14 years together, he could not speak except from noon, during the space of one entire hour, to the precise moment of one o'clock. Every time he lost his speech, he felt something rise from his stomach to his throat. Excepting this loss of speech, he was afflicted with no other disorder of any animal function. Both his internal and external senses continued sound: he heard always perfectly well, and answered the questions proposed to him by gestures or writing.

writing. All ſuſpicion of deceit was removed by his keeping exactly the ſame hour, though he had no acceſs to any inſtruments by which time can be meaſured.

DUMFERMLINE, a parliament-town of Scotland, ſituated in the county of Fife, 15 miles north-weſt of Edinburgh: W. Long. 3. 20. N. Lat. 56. 15. Here was formerly a magnificent abbey and palace of the kings of Scotland, in which the princeſs Elizabeth, daughter of king James VI. and mother of the princeſs Sophia, from whom the preſent royal family are deſcended, was born. In the inn of this town is the marriage bed of James VI. and his queen; it is ſtill entire, and uſed by ſtrangers who lodge here. This place is noted for a manufactory of figured linen cloth called diaper. The town gave title of earl to a baronet of the Seton family, which was forfeited in the year 1690.

DUMFRIES, a county in the ſouth of Scotland, comprehending the ſhire of Nithſdale, and ſtewartry of Annandale, and the lordſhip of Eſkdale, extends in length from north-weſt to ſouth-eaſt about 60 miles, and is about 30 miles in breadth where broadeſt. It is bounded on the ſouth-weſt by Galloway and part of Kyle; on the north-eaſt by the counties of Roxburgh, Selkirk, and Peebles; on the north-weſt by Clydeſdale; and on the ſouth eaſt by Solway Frith and the marches between Scotland and England. A great part of the country is mountainous and overſpread with heath, well ſtocked with game of all kinds: but the valleys, through which the Eſk, the Annan, the Nith, and other ſmaller rivers run, are extremely pleaſant; and ſome of them well cultivated and very fertile, and produce oats, barley and wheat in abundance, both for maintaining the inhabitants and for exportation; while the mountainous parts afford paſture for innumerable flocks of ſheep and herds of black cattle, many thouſands of which are annually exported to England. In the valleys are ſeveral natural woods and ſome extenſive plantations of different kinds of timber. In the diviſion called *Nithſdale*, are the rich lead mines of Wanlockhead, the coal mines of Sanquhar and Cairnburn, the inexhauſtible lime-quarries of Cloſeburn and Barjarg, and free ſtone in almoſt every pariſh. Annandale has the rich lime-quarries of Kellhead and Comtongan, with plenty of free ſtone near the towns of Annan and Lochmaben: and in the lower part of Eſkdale are lime ſtone and coal in abundance.

Dumfries, the capital of the abovementioned county, a handſome town, ſituated on a ridge or riſing ground on the north-eaſt ſide of the river Nith, about 10 miles above where it falls into Solway Frith, in N. Lat. 55. 8. 30. Long. W. of Greenwich Obſervatory, 3. 56. Its ancient name, it is ſaid by ſome of the Scotch hiſtorians, was *Cotiac*; but on what authority we cannot tell. Its preſent name appears to have been derived partly from its ſituation, and partly from the monaſtery of Grey Friars that formerly ſtood near the head of the ſtreet called the *Friar-vennal*, the kitchen of which is all that now remains; being only a corruption of *Drumfriars*, or "the eminence of the friary:" and accordingly, till within theſe 40 or 50 years, it was always ſpelt *Drumfries*, and not *Dumfries*, as it is now for the ſake of greater ſoftneſs. Beſides the pleaſantneſs of its ſituation on the ſide of a beautiful winding river, it is ſurrounded on all ſides with one of the fineſt and beſt cultivated ſheets of dale country that one can any where meet with, and the proſpect from it terminated at the diſtance of a few miles, by a continued chain of hills, forming altogether one of the grandeſt natural amphitheatres perhaps in Britain. There was anciently a ſtrong caſtle at the ſouth end of the town belonging to the Cummings, lords of Badenoch, of which there are now no remains. Another caſtle was afterwards built at the north-weſt end, which was taken down about 70 years ago. On the north-eaſt ſide of it, at ſome little diſtance, are the ruins of a chapel built by K. Robert Bruce, and endowed for a number of prieſts to ſay maſs for the repoſe of the ſoul of Sir Chriſtopher Seaton his brother-in-law, who was taken priſoner by Edward I. at Loch-Urr, and hanged at this place. It is now only employed as a burying place for ſuicides. It is not certain at what period Dumfries was erected into a royal borough; but it muſt have been before the middle of the eleventh century, as a grave-ſtone was diſcovered ſome time ago bearing the date of 1079, and mentioning the perſon buried under it to have been a merchant and burgeſs of the town: and that it was a place of conſequence in the beginning of the fourteenth century, is evident from this circumſtance, that Edward II. called the eſtates of Scotland to meet there in the year 1307. In the abovementioned monaſtery too, K. Robert Bruce killed his rival Cumming of lord of Badenoch, with the aſſiſtance of James Lindſay and Roger Kirkpatrick, on the 5th of February 1305. As to the preſent ſtate of the town, the houſes are well built and commodious, the ſtreets ſpacious, open, and neatly paved. It has two very elegant churches, an epiſcopal chapel with a fine little organ, beſides three meeting houſes belonging to different diſcriptions of ſectaries; a tolbooth; a council-chamber; a trades hall: a meal-market; a ſtrong priſon; a correction-houſe; a large hoſpital; an infirmary, with apartments for inſane patients; a narrow bridge of 9 arches over the river, ſaid to have been built by one of the three daughters and coheireſſes of Alan lord Galloway. A large village, called the *Bridge-end*, ſtands on the oppoſite ſide, and is within the ſtewartry of Kirkcudbright. The aſſizes for the county, and for the ſhire of Galloway and ſtewartry of Kirkcudbright, are held in the town twice a-year. It is alſo the place for holding the ſheriff and commiſſary courts, the quarter-ſeſſions of the peace, and the courts of the commiſſioners of ſupply. It is governed by a provoſt, three bailies, a dean of guild, and a town-council, compoſed of merchants and the conveener and deacons of the incorporated trades, of which there are ſeven, viz. ſquare-men, ſmiths, weavers, tailors, ſhoemakers, ſkinners, and butchers; all of whom are choſen into their reſpective offices at Michaelmas annually. The trades got from king James VI. in one of his journeys to England, a ſmall ſilver tube, like a piſtol barrel, called the *ſilver gun*, with his royal licence to ſhoot for it every year. At that feſtival they all appear in arms, and march out of the town under their reſpective colours, to ſome convenient place where they ſhoot at a mark; and the perſon that hits or ſhoots neareſt to it returns to town, marching at the conveener's right hand, with the ſilver gun tied to his hat with ribbons: after which they conclude the day with a ſocial entertainment. The town has a weekly

weekly market on Wednesday, with two annual fairs, the first on the Wednesday on or next after the 13th of February, and the other on the Wednesday on or next after the 25th of September. At these fairs vast numbers of horses and black cattle are sold; and no town in Scotland is better provided with all sorts of butcher-meat in their season. But though well situated for fuel at a cheap rate, it has only two manufactures, one for stockings and the other for cottons; but the latter only in its infancy. Its foreign trade for many years has only consisted in timber, iron, and other articles for home consumption. It gives the title of Earl to the chief of the family of Crichton; and is the seat of a presbytery and provincial synod. It contains about 6000 inhabitants.

DUMONT (Francis), a Frenchman; compiler of a general collection of treaties of commerce, alliance and peace, between the powers of Europe. This collection, with Barbeyrac's, containing the treaties B. C. makes 16 vols folio, very useful for historical writers. Dumont retired to Holland in 1720. The time of his death is uncertain.

DUMOSÆ (from *Dumus*, a bush), an order of plants in the *Fragmenta methodi naturalis* of Linnæus, containing the following *genera*, viz. *Viburnum*, *Tinus*, *Opulus*, *Sambucus*, *Rondeletia*, *Bellonia*, *Cassine*, *Ilex*, *Tomax*, &c.

Plate CLXV.

DUN, or BURGH, the name of an ancient species of buildings, of a circular form, common in the Orkney and Shetland islands, the Hebrides, and northern parts of Scotland. The latter term points out the founders, who at the same time bestowed on them their natal name of *borg*, "a defence or castle," a Sueo-Gothic word; and the Highlanders universally apply to these places the Celtic name *dun*, signifying a hill defended by a tower, which plainly points out their use. They are confined to the countries once subject to the crown of Norway. With few exceptions, they are built within sight of the sea, and one or more within sight of the other; so that on a signal by fire, by flag, or by trumpet, they could give notice of approaching danger, and yield a mutual succour. In the Shetland and Orkney islands, they are most frequently called *wart* or *wardhills*, which shows that they were garrisoned. They had their wardmadher, or watchman, a sort of centinel, who stood on the top, and challenged all who came in sight. The gackman was an officer of the same kind, who not only was on the watch against surprise, but was to give notice if he saw any ships in distress. He was allowed a large horn of generous liquor, which he had always by him, to keep up his spirits. Along the Orkney and Shetland shores, they almost form a chain: and by that means not only kept the natives in subjection, but were situated commodiously for covering the landing of their countrymen, who were perpetually roving on piratical expeditions. These towers were even made use of as state-prisons; for we learn from Torfæus, that after Sueno had surprised Paul, count of Caithness, he carried him into Southerland, and confined him there in a Norwegian tower. Out of this kingdom, no buildings similar to these are to be found, except in Scandinavia. On the mountain Swalberg in Norway is one: the Stir-biskop, at Upsal in Sweden, is another; and Umseborg, in the same kingdom, is a third. These towers vary in their inner structure; but externally are universally the same; yet some have an addition of strength on the outside. The burgh of Culswick in Shetland, notwithstanding it is built on the top of a hill, is surrounded with a dry ditch 13 feet broad; that of Snaburgh in Unst, has both a wet and a dry ditch; the first cut, with great labour, through the live rock. The burgh of Moura is surrounded by a wall, now reduced to a heap of stones, and the inside is cylindrical, not taper, as usual with others. The burgh of Hogscter, upon an isle in a loch of the same name, has also its addition of a wall; a peculiarity in a causeway, to join it to the main land, and a singular internal structure. Numbers of little burghs, with single cells, are scattered about these islands, in the neighbourhood of the greater; and which probably were built by the poorer sort of people, in order to enjoy their protection. A multitude of places in these islands have the addition of burgh to their names, notwithstanding there is not a vestige of a tower near them; the materials having long since been carried away, and applied to various uses.

DUNBAR, a parliament town of Scotland, in the shire of East-Lothian, once remarkable for a strong castle, the key of Scotland from the east, and which gave shelter to Edward II. of England in his flight from Bannockburn, but of which scarce a vestige now remains. Here are still preserved some of the Scottish pikes, fix ells long, and formed for both offence and defence. This town has now a tolerable trade in the fisheries, and is remarkable for making good malt. Dunbar has given titles of honour to different families, who are all now extinct.

DUNBARTON, the chief town of Lenox or Dunbarton shire in Scotland, situated in W. Long. 4. 32. N. Lat. 56. 30. It is remarkable for nothing but its castle. This is a steep rock, rising up in two points, and every where inaccessible, except by a very narrow passage or entry, fortified with a strong wall or rampart. Within this wall is the guard-house, with lodgings for the officers; and from hence a long flight of stone-steps ascends to the upper part of the castle, where there are several batteries mounted with cannon, the wall being continued almost round the rock. In the middle of this upper part where the rock divides, there are commodious barracks with a deep well, in which there is always plenty of water. Here likewise are the remains of a gateway and prodigious high wall, at the top of which there was a wooden bridge of communication from one rock to another. This gateway was sometimes blocked up during the intestine commotions of Scotland, so that garrisons of different factions possessed different parts of the castle, and each had a gate towards the water. The castle stands in the angle formed at the conflux of the Clyde and Leven: so that it is wholly surrounded by water, except a narrow isthmus, and even this is overflowed at every spring-tide: nor is there any hill or eminence within a Scots mile of this fortress. It commands the navigation of the Clyde; and, being deemed the key of the western Highlands, is kept in some repair, and garrisoned with invalids, under the command of a governor and some subaltern officers. The government of it is worth 700 l. a-year.—Dunbarton is a royal borough; and formerly

merly gave title of Earl to a branch of the family of Douglas.

DUNCANNON, a fort in the county of Wexford, and province of Leinster, in Ireland, seated on the river Ross. It commands the river, insomuch that no ship can pass to Waterford or Ross without its permission. Here are barracks for three companies of foot. W. Long. 6. 30. N. Lat. 52. 10.

DUNCARDS, DUNKERS, or *Tunkers*. See TUNKERS.

DUNCOMBE (William), younger son of John Duncombe, Esq; of Stocks in Hertfordshire, in 1722 published a translation of Racine's Athalia; which was well received by the public, and has gone through three editions. In 1724 he was editor of the works of Mr Needler; in 1735, of the poems of his deceased brother-in-law, Mr Hughes, 2 vols 12mo; in 1737, of the miscellanies of his younger brother Mr Jabez Hughes, for the benefit of his widow, in one volume 8vo; and in 1745, of the works of the Rev. Mr Samuel Say, in one volume 4to. In 1726 he married the only sister of John Huges, Esq; whom he long survived. In 1734 his tragedy of Lucius Junius Brutus was acted at Drury-Lane Theatre. It was published in 1735, and again in 1747. The works of Horace, in English verse, by several hands, were published by him in two vols 8vo, with notes, &c. in 1757. A second edition, in four vols 12mo, with many imitations, was published in 1762. In 1763 he collected and republished "Seven sermons by archbishop Herring, on public occasions, with a biographical preface." He died Feb. 26. 1769, aged 80.

DUNDALK, a town of Ireland, in the county of Louth, about 40 miles from Dublin. It is a large, ancient, and thriving town, with a wide street, near a mile long, and a very fine market-house, near the entrance from Dublin. In the reign of Edward II. it was a royal city, and the last we read of where a monarch of all Ireland was actually crowned and resided. It was formerly very strong, and had many towers and small castles in it. It is very advantageously situated for a most extensive inland trade, and the port is very safe for shipping. The bay has good moorings at all times, in four to upwards of eight fathoms water, with very good land-marks, either for bringing up to, or making the harbour; and in crossing the bar at high water, or ordinary neap tides, there is from 15 to 18 feet water. The only cambric manufacture in Ireland is carried on in this town.

DUNDEE, a parliament town of Scotland, in the shire of Forfar or Angus, is seated on the north side of the river Tay, about 12 measured miles from its mouth, 40 measured miles north of Edinburgh, and 22 east from Perth, in W. Long. 2. 48. N. Lat. 56. 26. Its situation for commerce is very advantageous. Trading vessels of the largest burden can get into the harbour; and on the quay there are three very convenient and handsome warehouses built in 1756, as well as good room for shipbuilding, which is carried on to a large extent. The houses are built of stone, generally three and four stories high. The market-place or high street in the middle of the town is a very spacious oblong square, 360 feet long and 100 feet broad; from whence branch out the four principal streets, which with a number of lesser ones are all paved in the best manner. On the south side of the market place stands the town-house; an elegant structure, with a very handsome front, piazzas below, and a neat spire over it 140 feet high. This building was finished in the year 1734, and contains the guild-hall, the court-room, a very neat mason-lodge, the bank, vaulted repositories for the records, and the common prison, which is in the upper story, and does honour to the taste and humanity of the magistrates, under whose auspices it was constructed, being well aired commodious rooms, at the same time very strong and secure. Each prison is 20 feet by 12, and $7\frac{1}{2}$ feet high, well arched above and below.

The meal-market and shambles, which were formerly on the high street, and esteemed a nuisance, were removed some years ago; and in the place of the shambles, there is now erected by the incorporated trades, on the east end of the above large square, a grand building, with a large and elegant cupola: in the ground-flat of which is a very neat coffee-room, and several merchant shops; and in the upper stories public rooms for each trade, and a common hall occasionally used as a theatre. This hall is 50 feet long, 30 feet broad, and 25 feet high; having its front to the square decorated with Ionic columns.

The opulence of the corporations, nine in number, may be inferred from this, that they had, along with the kirk-session, but very lately finished a most elegant church when they set about building the hall. This church, which is called *St Andrew's Church*, stands on a rising ground a little north from the Cowgate street; and has an elegant spire 130 feet high, with a peal of bells much admired. There is a neat entry to the church by a broad gravel walk, with grass plots on every side; and the whole policies around it are laid out with excellent taste, and in a superb stile, as complete and well executed as any in Scotland.

Dundee, beside St Andrew's church, has four other churches, and five ministers on the legal establishment. The old church, in which were originally four places of worship, when entire, had been a very magnificent building, with a large square Gothic tower or steeple 186 feet high, on the west end of the church. This building was in the form of a cross, erected by David Earl of Huntington, brother to William I. of Scotland (surnamed the Lion), and was dedicated to the Virgin Mary. This he did on his return from the third crusade (in which with 500 of his countrymen he had accompanied Richard I. of England) *anno* 1189, in gratitude for his deliverance from several imminent dangers, and particularly from shipwreck, by which he had nearly perished when in sight of this town. At the same time he changed the name of the town from *Allectum* to *Dei Donum*, whence its present name is thought by many to be derived; while others maintain that its name was *Duntay*, or "the Hill of Tay." The word *Allectum* in the Gaelic signifies "beautiful," and harmonizes very well with the scripture sense of the Hill of God. The word *Duntay* has the very same signification, "the Hill of God;" and both agree with the delightful situation of Dundee, and unite in giving it with propriety the name of *Bonny Dundee*. The hill rises on the north of the town to a great height, and is called *The Law of Dundee*; *law* being a Saxon word for a round hill such as it is. On its

top

Dundee. top there are evidently the remains of a camp, said to have been first erected by Edward I. of England, and lastly repaired by General Monk. Where the meal-market stood is now erected an elegant Episcopal meeting-house, with handsome shops below.

Dundee had an old castle which was demolished by the famous Scots governor Sir William Wallace, who was educated in this town. The castle had proved very useful to Edward I. when he put a garrison into it to awe the inhabitants; but Wallace getting possession, ordered it to be destroyed, lest it should again fall into the hands of the English. This treatment so exasperated Edward, that, taking the town by storm, he set fire to the churches; and a number of the inhabitants having taken sanctuary there with their most valuable effects, were all burnt along with them. At that time he burnt also a great part of the town. The desolation he brought on the church has continued ever since, till the year 1787, when a noble edifice began to be built on the site of the one that was burnt down, and is now finishing; in which the ancient Gothic of the outside is excellently united with internal modern architecture, making one of the largest and neatest churches in the kingdom, and again completing the superb superstructure as erected at the first by the Earl of Huntington.

This town suffered greatly last century during the troubles of Charles II. and the usurpation of Oliver Cromwell; being sometimes under the command of one party, and at others in the mercy of another. In 1645 the Marquis of Montrose took it by storm; and in 1651, under the command of its provost Major General Lumsden, it vigorously opposed General Monk, who carried it by storm the first of September, and put all in arms to the sword. And so great were the riches of Dundee, all the neighbouring gentlemen having retired to it with their best effects as a place of safety, that every private soldier in General Monk's army had near 60 l. Sterling to his share of the plunder; there being above 60 merchant vessels in the harbour at that time, and the like number of vessels sailed for England loaded with the spoils of the unfortunate inhabitants. By these and other invasions, the whole ancient records of the town were destroyed, except a deed of Queen Mary, signed by herself, conferring the present burying ground: and some charters of the Charles's, confirming the ancient rights and privileges as disponed by the Alexanders and other kings of Scotland. This burying-ground is the only place in Scotland we know of called *The Hoff*, a Dutch word bearing all the senses of the English word *court*, having been formerly the burying-ground of one of the many religious houses that were in this town previous to the Reformation.

Dundee at present has 113 vessels belonging to the port, of above 8200 tons burden, and near 1000 seamen. Of these vessels four went last season to Greenland, a trade of long standing here. And beside the three public warehouses on the shore, there are above twenty large private warehouses belonging to the merchants. The magistrates have been lately and still are at great expence in enlarging and fitting up the harbour, so as to render it of easy access, safe, and commodious; and have now made the passage over the Tay, where there is a great resort, so convenient, that travellers with their horses can get over at any time of tide, and a sufficient number of good boats properly manned are always ready. The river Tay opposite Dundee is about three miles broad; and being sheltered by high lands on both sides, is a safe road for ships of the greatest burden: the piers are extensive, broad, and well adapted for the purposes of loading and discharging vessels; and when the harbour is completed in the plan they are presently engaged in, there will not be one superior to it in Scotland. Dundee.

To enable the town to repair the damage done by Cromwell's army, and also their harbour and other public works, Charles II. granted them a small impost of one-sixth of a penny sterling, for 25 years, on the pint of ale brewed, or brought into the town for sale; which grant has been frequently renewed by subsequent parliaments: and the fund arising therefrom is most properly bestowed by the magistrates in improving the town, and making it more convenient and healthy. For these purposes, several new streets have been made, the old ones have been widened, and a large convenient one at a considerable expence carried down from the market-place to join a fine walk, shaded very neatly with trees, that leads from the shore. This new street makes the access easy and commodious, which was formerly much confined and steep.

Till the year 1745, the town had only draw-wells; but since that period it is most amply supplied from a large fine fountain of excellent water, conveyed thro' the town in lead pipes, and discharged by good wells at proper distances. These, with a fine well in the town's meadows, and a stream of water that runs thro' the ward and the meadows (two large beautiful greens on the north of the town), make it as well watered as any town in Scotland; and these greens, just at hand, serve all the inhabitants most commodiously for the necessary labours of washing and bleaching.

The number of inhabitants in Dundee have increased above 4000 since 1780. There was then an accurate list of them taken, when they amounted to near 16,000; and lately they were reckoned and found within a few of 20,000; and since the year 1760 they are fully doubled. Beside the established churches, there are three Episcopal meeting-houses, two of Seceders, one of Methodists, two of Independents, one Berean, and two Anabaptists. One of the Independents is of the Glassite denomination. Mr John Glass, from whom they take that name, resided here; and his principles, though spread far and wide, have always had the greatest following in Dundee.

The trade in the town has increased amazingly of late. Its staple is undoubtedly the linen manufacture: for which in summer 1788 they imported from the Baltic 32 cargoes of flax, hemp, &c. near 3000 tons, beside several quantities from London, Leith, and other places; and on an average the brown linen stamped for the two preceding seasons at the stamp-office here amounted to about four millions of yards, in value about 115,000l. Sterling. The flax is wrought up into coarse linens, chiefly Osnaburgs, sheetings, soldiers shirtings, &c. which is sold partly bleached (several fine large bleachfields being well employed in the neighbourhood) and partly brown. These linens are sent principally to London, Glasgow, and Liverpool, and from thence exported. Seven or eight

eight vessels are constantly employed in the trade between Dundee and London, one of which sails every ten or twelve days. The making sail-cloth has been long established here, and is carried on to a good extent. Two rope-works have succeeded well, and a buckram-work has also been established for several years. The Dundee coloured threads have been long justly esteemed, and give bread to a great number of people; indeed it was here that coloured threads first made a figure among the articles of trade in Scotland. Their sugar-house, a large undertaking, and tan works, are of established reputation. There has been lately erected a large glass-work at a great expence, and a plumbery and foundery are also now carried on to advantage. No doubt the trade of the place has been greatly promoted by the Bank; which is carried forward on the surest and most steady footing, and has always managed the business of the town and neighbourhood in such a way as to keep any other establishment of that kind from taking place. Of late the cotton manufactory has been introduced; a number of jennies being employed in spinning, and several looms in weaving it. A large machine for spinning shorts or backens into candlewicks, the first of the kind in Scotland, is also begun to work here, and promises to do well. A spirit for literature and education has greatly prevailed of late years in Dundee: for beside the public grammar-school, which has an able rector and two good masters; the public English and writing school, where are three very proper masters; there is also lately established, and much encouraged, an academy for mathematics, French, Italian, and the polite arts, with masters suitable for the different branches, and a large apparatus for natural philosophy.

The salmon fishing in Tay is of much consequence; and the town is generally well supplied with fish of various kinds, though like every other article of living much raised in price of late years. Their other markets are also well supplied. An excellent nursery at the west end of the town has been much encouraged; and its neighbourhood is now adorned with many neat and elegant villas, showing the wealth and taste of the inhabitants.

Dundee is the birth-place of the celebrated and learned Hector Boethius, whose History of Scotland has been long in much reputation with many. It, with Perth, Forfar, St Andrew's, and Cupar, returns one member to the British parliament.

DUNFERMLINE. See DUMFERMLINE.

DUNG, in husbandry. See AGRICULTURE, n° 20.

DUNG-Bird. See UPUPA.

DUNG *Meers*, in husbandry, places where soils and dungs are mixed and digested together. These consist of pits, prepared at the bottom with stone and clay, that they may hold water, or the moisture of the dung; and ought to be so situated, that the sinks and drips of the houses and barns may run into them. Into these pits they cast refuse, fodder, litter, dung, weeds, &c. where they lie and rot together, till the farmer have occasion for them.

DUNG *Worms*, a species of fly-worms, of a short and somewhat flat body, found in great plenty among cow-dung in the months of September and October.

DUNGANNON, the chief town of the county of Tyrone, in the province of Ulster in Ireland. It is seated on a hill, and is a place of some strength.

DUNGARVON, a town of Ireland, in the county of Waterford. It stands on a bay of the same name, has a commodious harbour for ships, and is a walled town with a castle. W. Long. 7. 55. N. Lat. 51. 57.

DUNIPACE. See the article CARRON.

DUNKELD, a town of Scotland, in the shire of Perth, seated on the north side of the river Tay, is a situation truly romantic, under and among very high and almost inaccessible craggs, part naked and part wooded. It is the chief market town of the Highlands, and has been greatly improved with buildings by the Dukes of Athol.

The place is of great antiquity. It was the capital of ancient Caledonia. About the dawn of Christianity, a pictish king made it the seat of religion, by erecting a monastery of Culdees there; which King David I. in 1130 converted into a cathedral, and it ranked as the first in Scotland. The entire shell of the cathedral still remains, the east end serving for a kirk, on the north side of which is the burial place of the Dukes of Athol. The style of architecture is simple and elegant, the pillars round. The monument of one of its bishops remains in the south aisle of the nave, as also that of Alexander Stuart Earl of Buchan, third son of Robert II. called for his cruelty *The Wolf of Badenoch*, who died 1394. The tower at the west end, with a singular crack down one of its sides, adds to the picturesque appearance which the whole makes among the venerable pines at the end of the Duke's garden. His Grace's seat is a modern building, and not large, with pleasant walks and policies, and a fine cascade on the water of Bran, which in its way from the western hills forms an astonishing fall of 150 feet, called the *Rumbling Brig*, from a narrow bridge made by the fall of two rocks across the stream. The pencil of Rosa never formed a more horrid scene. The stream has a second fall, which, without seeing the other, would be deemed capital. Sir James Galloway, Master of requests to James VI. and Charles I. was created Lord Dunkeld 1645, whose grandson James was attainted at the Revolution, and dying at the beginning of this century, the title became extinct.

DUNKERS, DUNCARDS, or *Tunkers*. See TUNKERS.

DUNKIRK, a maritime town of the French Netherlands, situated in E. Long. 2. 28. N. Lat. 51. 10. and is the most easterly harbour on the side of France which is next to Great Britain.—It was originally a mean hamlet, consisting only of a few fishermen's huts; but a church being built there, it was from that, and from its situation, which is a sandy eminence, called *Dunkirk*; *dun* signifying, in the old Gallic language, a hill; and *kirk* being the old Flemish name for church.

About the year 960, Baldwin Earl of Flanders, thinking the situation convenient, enlarged it into a kind of town, and surrounded it with a wall. In the year 1322, Robert of Flanders, who held it as an appendage, built a castle for its defence; which was afterwards demolished by the revolters of Flanders. Robert of Bar erected a fortification round it, the remains of which are visible on the side next the harbour. The emperor Charles V. who held it as part of Flanders, built

built another caſtle to defend the harbour; but this was alſo demoliſhed ſoon afterwards. In 1558, the French, under Marſhal de Thermes, took Dunkirk by ſtorm, and almoſt ruined the place; the Spaniards recovered it again in about a fortnight, and put all the French to the ſword.

During a peace procured for the Dunkirkers by Philip II. of Spain, they rebuilt their town with greater ſplendor than before, and the inhabitants for a long time ſubſiſted by privateers fitted out againſt the Dutch; and at length, growing rich by theſe hoſtilities, they fortified their town and harbour, and fitted out no leſs than 15 ſhips of war at their own charge.

In 1634, the Dunkirkers agreed with the inhabitants of Bergues to dig a canal, at their joint expence, for a communication between the two towns; which was ſome time afterwards effected. By this time, Dunkirk was become the beſt harbour the Spaniards poſſeſſed in Flanders, which induced many foreigners to ſettle there; and it being neceſſary to enlarge the town for their accommodation, a new fortified wall was built at a conſiderable diſtance from the former. In 1646, it was beſieged and taken by the prince of Condé. In 1652 it was retaken by the archduke Leopold, then governor of the Netherlands. France entering into a treaty with England in 1655, the Dunkirkers, with views of pecuniary advantage, fitted out privateers againſt both thoſe powers: the conſequence of which was, that the French, aſſiſted by Cromwell, attacked and took it; and it was put into the hands of the Engliſh, in conſequence of a treaty between them and the French. To the Engliſh it was even then of very great importance; for, during the war in which it was taken, the Dunkirkers had made prizes of no leſs than 250 of their ſhips, many of which were of great value. They therefore improved the fortifications, and built a citadel: yet they kept it only four years; for in 1662, two years after the reſtoration, Charles II. ſold this valuable acquiſition to France, for the paltry ſum of 500,000l. In conſequence of this ſale, the town was taken poſſeſſion of for the French king Louis XIV. by the count d'Eſtrades, on the 29th of November 1662. Louis having acquainted the celebrated engineer Monſieur Vauban, that he intended to make Dunkirk one of the ſtrongeſt places in Europe, Vauban drew up a plan with that view, which was gradually executed. An arſenal was erected, large enough to contain all the ſtores neceſſary for fitting out and maintaining a large fleet of men of war; the fortifications on the land-ſide were conſtructed in a manner that was thought to render them impregnable; and towards the ſea, the entrance of the harbour being properly formed, it was fortified by the jetties, and the two forts called *Green Fort* and the *Fort of Good Hope* at their extremities; the famous Riſbank was alſo erected on one ſide of the jetties, and Fort Gilliard on the other, to ſecure the town. Theſe works were all completed in 1683; and in 1685, the whole circumference of the baſon was faced with maſonry, and the keys completely formed: at the ſame time care was taken to build at the entrance of this baſon a ſluice, almoſt 45 feet wide, that the ſhips within might be conſtantly afloat. In 1689, the fort called the *Cornichon*, and ſome other works, were completed. But though 30 years had been now employed in improving the fortifications of Dunkirk, it was not yet in the ſtate in which Louis intended to put it; and therefore, in 1701, he cauſed a new riſbank to be built, called *Fort Blanc*.

At the treaty of Utrecht, it having been made appear, that the privateers of Dunkirk had, during the war then cloſing, taken from the Engliſh no leſs than 1614 prizes, valued at 1,334,375l. Sterling, it was ſtipulated, that the fortifications of the city and port of Dunkirk ſhould be entirely demoliſhed, and the harbour filled up, ſo as never to be an harbour again.

The treaty, of which this demolition of Dunkirk was an article, was ſigned on the 28th of April 1713; but the demolition did not take place till the September following, when the queen deputed colonel Armſtrong and colonel Clayton to overſee the execution of the treaty as far as concerned the works and harbour of Dunkirk.

Under the inſpection of theſe gentlemen, the places of arms were broken down, the ditches filled up, and the demi-lunes, baſtions, and covered way, totally deſtroyed; the citadel was razed, and the harbour and baſon filled up; the jetties were alſo levelled with the ſtrand, and all the forts which defended the entrance into the harbour were demoliſhed. A large dam, or bar, was alſo built acroſs the mouth of the harbour between the jetties and the town, by which all communication between the harbour and the canal, which formed its entrance, was entirely cut off. The ſluices were alſo broken up, and the materials of them broken to pieces.

But this was no ſooner done, than Louis XIV. ordered 30,000 men to work inceſſantly upon a new canal, the canal of Mardick, which in a ſhort time they accompliſhed; by which the harbour was rendered almoſt as commodious as ever: but in 1717 this likewiſe was rendered unſerviceable.

In the year 1720, during a great ſtorm, the ſea broke up the bar or dam, and reſtored to the Dunkirkers the uſe of the Harbour in a very conſiderable degree.

In the year 1740, when Great Britain was engaged in a war with Spain, Louis XV. ſet out about improving the advantage which Dunkirk had derived from the ſtorm in 1720, by reſtoring the works, and repairing the harbour. He rebuilt the jetties, and erected new forts in the place of thoſe which had been deſtroyed; and ſoon afterwards he eſpouſed the cauſe of Spain, and became a principal in the war.

But at the peace of Aix-la-Chapelle in 1748, it was ſtipulated, that all the works towards the ſea ſhould be deſtroyed a ſecond time; yet, before the declaration of the laſt war, the place was in as good a ſtate of defence towards the ſea as it was at any time during the war which was concluded by the treaty of Aix-la-Chapelle.

DUNSE, a market-town of Scotland, in the ſhire of Mers, ſituated in W. Long. 2. 15. N. Lat. 55. 42. It is ſeated on a riſing ground in the middle of the ſhire, and has a weekly market for cattle. It is by ſome reputed the birth-place of the famous John Duns Scotus.—A mile ſouth of the town is a well of mineral-water, of great uſe as a deobſtruent and antiſcorbutic, firſt diſcovered in 1747 by Dr Thomas Simpſon who practiſed there.

DUNS

Duns.

DUNS SCOTUS (John), a Franciscan friar, commonly called *Doctor Subtilis*, was born in the year 1274; but whether in England, Scotland, or Ireland, hath long been a matter of dispute among the learned of each nation. Dempster, Mackenzie, and other Scottish writers, assert positively that he was born at Dunse, a town in Scotland, about 15 miles from Berwick; and, to secure him more effectually, Mackenzie makes him descended from the Dunses in the Mers. MacCaghwell, an Irish author, who wrote the life of this Scotus, proves him to have been born at Down in the province of Ulster in Ireland: but Leland, Bale, Camden, and Pits, assure us, that was born at Dunstone in the parish of Emildune, near Alnwick in Northumberland; and this opinion is rendered probable by the following conclusion of his manuscript works in the library of Merton college in Oxford.—"Here end the writings of that subtile doctor of the university of Paris, John Duns, who was born in a certain village, in the parish of Emildune, called *Dunston*, in the county of Northumberland." We are told, that, when a boy, he became accidentally known to two Franciscan friars; who, finding him to be a youth of very extraordinary capacity, took him to their convent at Newcastle, and afterwards persuaded him to become one of their fraternity. From thence he was sent to Oxford, where he was made fellow of Merton college and professor of divinity; and Mackenzie says, that not less than 30,000 students came to Oxford to hear his lectures. His fame was now become so universal, that the general of his order commanded him to go to Paris, that the students of that university might also profit from his lectures. He went to Paris in the year 1304, where he was honoured first with the degree of bachelor, then of doctor of divinity, and in 1307 was appointed regent of the divinity schools: during his residence here, the famous controversy about the *Immaculate conception of the virgin Mary* arose. Albertus Magnus maintained that she was born in original sin. Scotus advanced 200 arguments in support of the contrary opinion, and convinced the university of Paris that she was really conceived immaculate. This important nonesense, however, continued to be disputed till the year 1496, after the council of Basil, when the university of Paris made a decree, that no student, who did not believe the *immaculate conception*, should be admitted to a degree. Our author had not been above a year at Paris, when the same general of the Franciscans ordered him to remove to Cologne; where he was received with great pomp and ceremony by the magistrates and nobles of that city, and where he died of an apoplexy soon after his arrival, in the year 1308, in the 34th year of his age. Some writers have reported, that Scotus was buried in an epileptic fit; and that, upon removing his bones, he appeared to have turned himself in his coffin. This *doctor subtilis* was doubtless one of the first wranglers of this time, admirably well versed in scholastic divinity, and a most indefatigable scribbler; but the misfortune is, that all his huge volumes do not contain a single page worth the perusal of a rational being. He was the author of a new sect of schoolmen called *Scotists*; who opposed the opinions of the Thomists, so called from St Thomas Aquinas. The reader will find a more particular account of Scotus in the Franciscan Martyrology, published at Paris in 1638.—He was a most voluminous writer; his works making 12 vols. folio, as published at Lyons by Luke Wadding, 1639.

Dunstable ‖ Dunstan.

DUNSTABLE, a town in Bedfordshire, with a market on Wednesdays. It is seated on a chalky hill; and has ponds in the streets, which are never dry tho' only supplied with rain water. It is remarkable for several good inns, it being a great thoroughfare on the northern road. It consists of four streets, intersecting each other at right angles; and in the centre stood one of those beautiful crosses of queen Eleanor, which was destroyed by the enthusiasts in the time of the civil wars. W. Long. 0. 29. N. Lat. 51. 50.

DUNSTAFFNAGE. See LORNE.

DUNSTAN, a famous saint, and archbishop of Canterbury; of whom the monkish historians give us the following account. He was descended from a noble family in Wessex, and educated in the abbey of Glastonbury. Here he studied so hard, that it threw him into a violent fever which brought him to the very point of death. When the whole family were standing about his bed, dissolved in tears, and expecting every moment to see him expire, an angel came from heaven in a dreadful storm, and give him a medicine which restored him to perfect health in a moment. Dunstan immediately started from his bed, and run with all his speed towards the church to return thanks for his recovery; but the devil met him by the way, surrounded by a great multitude of black dogs, and endeavoured to obstruct his passage. This would have frightened some boys; but it had no such effect upon Dunstan; who pronouncing a sacred name, and brandishing his stick, put the devil and all his dogs to flight. The church-doors being shut, an angel took him in his arms, conveyed him through an opening in the roof, and set him softly down on the floor, where he performed his devotions. After his recovery, he pursued his studies with the greatest ardor, and soon became a perfect master in philosophy, divinity, music, painting, writing, sculpture, working in gold, silver, brass, and iron, &c. When he was still very young he entered into holy orders, and was introduced by his uncle Athelm archbishop of Canterbury to King Athelstan: who, charmed with his person and accomplishments retained him in his court, and employed him in many great affairs. At leisure hours he used to entertain the king and his courtiers with playing on his harp, or some other musical instrument; and now and then he wrought a miracle, which gained him great admiration. His old enemy the devil was much offended at this, and prompted some envious courtiers to persuade the king that his favourite was a magician, which that prince too readily believed. Dunstan discovering by the king's countenance that he had lost his favour, and resolving to resign rather than be turned out, retired from court to another uncle, who was bishop of Winchester. This good prelate prevailed upon his nephew to forsake the world and become a monk; after which he retired to a little cell built against the church-wall of Glastonbury. Here he slept, studied, prayed, meditated, and sometimes amused himsel with forging several useful things in brass and iron. One evening, as he was working very busily at his forge, Dunstan.

forge, the devil, putting on the appearance of a man, thrust his head in at the window of his cell, and asked him to make something or other for him. Dunstan was so intent upon his work that he made him no answer; on which the devil began to swear and talk obscenely, which betrayed the lurking fiend. The holy blacksmith, putting up a secret ejaculation, pulled his tongs, which were red-hot, out of the fire, seized the devil with them by the nose, and squeezed him with all his strength; which made his infernal majesty roar and scold at such a rate, that he awakened and terrified all the people for many miles around. Thus far the legend.

Ridiculous as were these fictions, they served, in those times of ignorance, to procure Dunstan a reputation which has been confirmed by the authority of several succeeding historians. It appears that this extraordinary person was recalled to court by king Edmund, A. D. 941: who bestowed upon him the rich abbey of Glastonbury, which for his sake he honoured with many peculiar privileges. He enjoyed a very high degree of the favour of this prince during his short reign of six years; but he stood much higher in the favor of his brother and successor king Edred, to whom he was confessor, chief confident, and prime minister. He employed all his influence during this period of court-favour in promoting the interest of the monks of the Benedictine order, to which he belonged, and of which he was a most active and zealous patron. Having the treasures of these two princes, especially of the last, very much at his command, he lavished them away in building and endowing monasteries for these monks, because almost all the old monasteries were in the possession of secular canons. Not contented with this, he persuaded Edred (who was a bigotted valetudinary) to bestow such immense treasures on the churches and monasteries by his last will, that the crown was stripped of its most valuable possessions, and left in a state of indigence. This conduct of Dunstan, while he was in power, rendered him very odious to Edwi, who succeeded his uncle Edred, A. D. 955; and his rude behaviour to himself, and his beloved queen Elgiva, raised the resentment of that prince so high, that he deprived him of all his preferments, and drove him into exile*. The banishment of Dunstan, the great patron, or (as Malmsbury calls him) the prince of monks, was a severe blow to that order, who were expelled from several monasteries; which were made the impure stables (according to the same author) of the married clergy. But their sufferings were of not long continuance. For Edgar, the younger brother of Edwi, having raised a successful rebellion against his unhappy brother, and usurped all his dominions on the north side of the river Thames, recalled Dunstan, and gave him the bishopric of Worcester, A. D. 957. From this moment he was the chief confident and prime minister of king Edgar, who became sole monarch of England, A. D. 959, by the death of his elder brother Edwi. In the following year Dunstan was raised to be archbishop of Canterbury; and being thus possessed of the primacy and assured of the royal support and assistance, he prepared to execute the grand design which he had long meditated, of compelling the secular canons to put away their wives and become monks; or of driving them out and introducing Benedictine monks in their room. With this view he procured the promotion of Oswald to the see of Worcester, and of Ethelwald to that of Winchester; two prelates who were monks themselves, and animated with the most ardent zeal for the advancement of their order. And these three great champions of the order found means, by their arts and intrigues in the course of a few years, to fill no fewer than 48 monasteries with Benedictines. But on the death of Edgar in 975 they received a check. The sufferings of the persecuted canons had excited much compassion; and many of the nobility, who had been overawed by the power and zeal of the late king, now espoused their cause and promoted their restoration. Elferc Duke of Mercia drove the monks by force out of all the monasteries in that extensive province, and brought back the canons, with their wives and children; while Elfwin Duke of East Anglia, and Brithnot Duke of Essex, raised their troops to protect the monks in these countries. To allay these commotions, several councils were held: in which Dunstan was so hard pushed by the secular canons and their friends, that he was obliged to practise some of his holy stratagems; and finally, by dint of miracles, overcame all opposition*.

St Dunstan died A. D. 988, in the 64th year of his age, having held the bishopric of London, together with the archbishopric of Canterbury, about 27 years. As this prelate was the great restorer and promoter of the monastic institutions, the grateful monks, who were almost the only historians of those dark ages, have loaded him with the most extravagant praises, and represented him as the greatest wonder-worker and highest favourite of heaven that ever lived. To say nothing of his many conflicts which the devil, in which he often belaboured that enemy of mankind most severely, the following short story, which is told with great exultation by his biographer Osbern, will give the reader some idea of the astonishing impiety and impudence of those monks, and of the no less astonishing blindness and credulity of those unhappy times. "The most admirable, the most inestimable Father Dunstan (says that author), whose perfections exceeded all human imagination, was admitted to behold the mother of God and his own mother in eternal glory: for before his death he was carried up into heaven, to be present at the nuptials of his own mother with the Eternal King, which were celebrated by the angels with the most sweet and joyous songs. When the angels reproached him for his silence on this great occasion, so honourable to his mother, he excused himself on account of his being unacquainted with those sweet and heavenly strains; but being a little instructed by the angels, he broke out into this melodious song, O King and Ruler of nations," &c. It is unnecessary to make any comment on this most shocking story.

The violent and too successful zeal of Dunstan and his associates, in promoting the building and endowing so great a number of houses for the entertainment of useless monks and nuns, was very fatal to their country: for by this means a spirit of irrational unmanly superstition was diffused amongst the people, which debased their minds and diverted them from nobler pursuits; and a very great proportion of the lands of England being put into hands who contributed nothing

* See England, n° 57.

* See England, n° 64.

thing to its defence, rendered it an easy prey, first to the insulting Danes, and afterwards to the victorious Normans.

DUNUM, a Celtic term, denoting a hill or eminence, and which often concurs to form the names of towns, to signify their high situation, places of strength or citadels, hills or eminences, being adapted to such structures. See DUN.

DUNUM (Ptolemy), a town of Ireland; now thought to be *Down* or *Down-Patrick*, in the county of Down. W. Long. 5. 57. N. Lat. 54. 23.

DUO, in music, a song or composition, to be performed on two parts only, one sung, the other played on an instrument, or by two voices.

DUO is also when two voices sing different parts, as accompanied with a third, which is a thorough bass. It is seldom that unisons and octaves are used in duos, except at the beginning and end.

DUODECIMA, in music, is the twelfth or the fifth doubled.

DUODENUM. See ANATOMY, p. 727.

DUPIN (Lewis Ellis), a learned doctor of the Sorbonne, and one of the greatest critics of his time, especially in ecclesiastical matters, was born at Paris in 1657. When he published the first volume of his *Bibliotheque Universelle des Auteurs Ecclesiastiques*, in 1686, the liberty with which he treated some ecclesiastical writers, gave such offence, that M. de Harlay, archbishop of Paris, obliged Dupin to retract many propositions, and suppressed the work. He was nevertheless suffered to continue it, by altering the title from *Bibliotheque Universelle*, to *Biliotheque Nouvelle*. This great undertaking continued in several successive volumes, though sufficient to occupy the life of an ordinary man, did not hinder M. Dupin from obliging the world with several other works. He was a man of prodigious reading; and had an easy happy way of writing, with an uncommon talent at analysing the works of an author; which makes his Ecclesiastical Bibliotheque so valuable. M. Dupin was professor of philosophy in the royal college; but was banished some time from the chair to Chatelleraut, on account of the famous *Cas de Conscience*; but was restored, and died in 1719.

DUPLE, among mathematicians, denotes the ratio of 2 to 1. Thus the ratio of 8 to 4 is duple, or as 2 to 1.

Sub-DUPLE Ratio, is just the reverse of the former, or as 1 to 2. Such is 4 to 8, or 6 to 12.

DUPLICATE, among lawyers, denotes a copy of any deed, writing, or account. It is also used for the second letters-patent, granted by the lord chancellor in a case wherein he had before done the same. Also a second letter written and sent to the same party and purpose as a former, for fear of the first's miscarrying, is called a *duplicate*.

DUPLICATE Proportion or *Ratio*. See RATIO.

DUPLICATION, in general, signifies the doubling of any thing, or multiplying of it by 2: also the folding of any thing back again on itself.

DUPLICATURE, among anatomists, a term used to denote the folds of any membrane or vessel: thus we say, the *duplicatures of the intestines, peritonæum*, &c.

DUPONDIUS, in antiquity, a weight of two pounds, or a money of the value of two asses. See As.

As the as at first weighed a just pondo or libra, the dupondius then weighed two; and hence the name.

And though the weight of the as was afterwards diminished, and of consequence that of the dupondius also, yet they still retained the denomination. See POUND and LIBRD.

DUPPA (Brian), a learned English bishop born in 1589 at Lewisham in Kent, of which place his father was then vicar. In 1634, he was instituted chancellor of the church at Sarum, and soon after made chaplain to Charles I. He was appointed tutor to Charles prince of Wales, and his brother James duke of York; was made bishop of Chichester: and in 1641 translated to Salisbury, though the confusions that followed deprived him of all benefit from his promotion. Charles I. held him in high esteem, and he is said to have assisted the king in composing the *Eikon Basilike*. On the Restoration he was made bishop of Winchester, and lord high almoner; but died in 1662. He bequeathed large sums to charitable purposes: and published a few sermons, with other religious pieces.

DURANDUS (William), born at Puimoission in Provence in the 13th century, was one of the most knowing lawyers of his time. Pope Martin made him one of his nuncios, and then bishop of Mende and Languedoc. His *Speculum Juris* gave him the name of *Speculator*; his second piece was *Rationale divinorum officiorum*, containing eight books. He wrote several others.

DURANTA, in botany: A genus of the angiospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 40th order, *Personatæ*. The calyx is quinquefid, superior; the berry tetraspermous; the seeds bilocular.

DURATION, an idea we get by attending to the fleeting and perpetual perishing parts of succession, See METAPHYSICS.

DURATION, is marked by certain periods and measures, is what we most properly call *time*. See TIME.

DURATION of Action, according to Aristotle, is confined to a natural day in tragedy; but the epopea, according to the same critic, has no fixed time. See POETRY.

DURER (Albert), descended of an Hungarian family, and born at Nuremberg in 1471, was one of the best engravers and painters of his age. He was at the same time a man of letters and a philosopher; and he was an intimate friend of Erasmus, who revised some of the pieces which he published. He was a man of business also, and for many years the leading magistrate of Nuremberg. Though not the inventor, he was one of the first improvers of the art of engraving; and he bethought himself of working also in wood, for expedition, having an inexhaustible fund of designs. In many of those prints which he executed on copper, the engraving is elegant to a great degree. His *Hell Scene* particularly, which was engraved in the year 1513, is as highly finished a print as ever was engraved, and as happily executed. In his wooden prints too we are surprised to see so much meaning in so early a master; the heads so well marked, and every part so well executed

cuted.—This artist seems to have understood the principles of design. His composition, too, is often pleasing; and his drawing generally good. But he knows very little of the management of light; and still less of grace: and yet his ideas are purer and more elegant than we could have supposed from the aukward archetypes which his country and education afforded. In a word, he was certainly a man of a very extensive genius; and, as Vasari remarks, would have been an extraordinary artist, if he had had an Italian instead of a German education. His prints are very numerous. They were much admired in his own life-time, and eagerly brought up; which put his wife, who was a teazing woman, upon urging him to spend more time upon engraving than he was inclined to do. He was rich; and chose rather to practise his art as an amusement than as a business. He died in the year 1527.

DURESSE, HARDSHIP, in law, is where a person is kept in prison or restrained of his liberty, contrary to order of law; or is threatened to be killed, maimed, or beaten. In which case, if a person so in prison, or in fear of such threats, make any specialty or obligation, by reason of such imprisonment or threats, such deed is void in law; and in an action brought on such specialty, the party may plead, that it was brought by duresse.

D'URFEY (Thomas), an eminent English satyrist and songster, whose name, though as well known as that of any writer extant, yet there are very few particulars of his life to be collected. He was born in Devonshire; but when, where, or of what family, are all uncertain. He was bred to the law, which he forsook for the more agreeable employment of writing plays and songs; and the latter he had so happy a talent both of writing and singing, that he received many favours from persons of quality on that account. Even crowned heads did not disdain his company. The writer of the Guardian, N° 67. tells us, he remembered to have seen Charles II. leaning on Tom D'Urfey's shoulder more than once, humming over a song with him. This indeed was not extraordinary in so merry a monarch; but even the phlegmatic king William could relax his muscles on hearing him sing. He was certainly by all accounts a cheerful, honest, good-natured man: but as this character does not include prudence, D'Urfey grew poor as he grew old; and prevailing on the managers of the playhouse to act his comedy of the *Plotting Sisters* for his benefit, Mr Addison wrote the abovementioned paper in the Guardian, with another, N° 82. presenting him in a good humoured light, to procure him a full house. He died very old, in 1723.

DURHAM (bishopric of), one of the counties of England. Before the arrival of the Romans it was included in the British principality of the Brigantes, and after their arrival made part of the province of Maxima Cæsariensis. During the Heptarchy it made part of the kingdom of Northumberland; the 5th established, which began in 547, and ended in 827, having been governed by 31 kings. It was not mentioned by Alfred in his division of counties, being at that time considered as a part of Yorkshire. At present it is included in the northern circuit, in the province of York; and is a diocese and principality under the government of its own bishop, being a county palatine, the second in rank, and the richest in England. It is bounded on the north by Northumberland, on the south by Yorkshire, on the east by the North Sea, and on the west by Cumberland. It is 39 miles long, 35 broad, and 107 in circumference; containing 410,000 square acres, or 758 square miles; with 97,000 inhabitants, 80 parishes, 21 vicarages, one city (Durham), and 9 market-towns, *viz*. Stockton, Sunderland, Barnard-Castle, Darlington, Stanhope, Hartlepool, Aukland, Staindrop, and Marwood; besides 223 villages. It is divided into 4 wards, sends 4 members to parliament, pays three portions of the land-tax, and provides 400 of the national militia. It has 21 parks, 4 castles, and 20 bridges, with the rivers Tees, Tine, Were, Tame, Lune, Darwent, Gauntless, Skern, &c. The Lune and Teesdale forests. Its principal products are lead, coals, iron, corn, mustard, salt, glass, fine ale, with excellent butter and salmon. The soil is various; the south is rich, but the western parts rocky and moorish.

Durham, as already observed, is a county palatine, governed by the bishop, who had formerly great prerogatives. He had power to create barons, appoint judges, convoke parliaments, raise taxes, and coin money. The courts of justice were kept in his name; and he granted pardons for trespasses, alienations, rapes, murders, and felonies of every denomination. He erected corporations, granted markets and fairs, created officers by patent, was lord admiral of the seas and waters within the county palatine: great part of the lands were held of the see *in capite*. In a word, he exercised all the power and jurisdiction of a sovereign prince. How and at what period these prerogatives were obtained, it is not easy to determine. Malmsbury says, the lands were granted by king Alfred, who likewise made the church a sanctuary for criminals. This see was anciently called the *patrimony of St Cuthbert*, who had been bishop of Landisfarne or Holy Island near Berwick. His bones being transferred to Durham, were long esteemed as precious relics; and the people of the county considered themselves as Halwerk men, exempted from all other but holy work, that is, the defence of St Cuthbert's body. Certain it is, they pretended to hold their lands by this tenure; and refused to serve out of the county either for the king or bishop: but king Edward I. broke through these privileges, and curtailed the prerogatives of the bishops, which were still further abridged by Henry VIII. Nevertheless, the bishop is still earl of Sadberg, a place in this county which he holds by barony. He is sheriff paramount, and appoints his own deputy, who makes up his audit to him, instead of accounting to the exchequer. He has all the forfeitures upon outlawries: and he and his temporal chancellor act as justices of the peace for the county palatine, which comprehends Creke in Yorkshire, Bedlington, Northam, and Holy Island, in Northumberland, the inhabitants of these places having the benefit of the courts at Durham. The judges of assize, and all the officers of the court, have still their ancient salaries from the bishop; and he constitutes the standing officers by his letters patent. He has the power of presiding in person in any of the courts of judicature. Even when judgment of blood is

Durham.

is given, this prelate may sit in court in his purple robes, though the canons forbid any clergyman to be present in such cases: hence the old saying, *Solum Dunelmense stola jus dicet et ense*. It was not till the reign of Charles II. that the bishopric sent representatives to parliament.

DURHAM, the capital of the abovementioned county, is situated in W. Long. 1. 4. N. Lat. 54. 50. It stands on a hill almost surrounded by the river Were; and is considerable for its extent and the number of its inhabitants, as well as for being the see and seat of the bishop, who is lord paramount. It stands about 280 miles north from London; being remarkable for the salubrity of its air, and the abundance and cheapness of its provisions. These circumstances have induced a great deal of good company to take up their residence at Durham, which is still further animated by the presence and court of the bishop and his clergy. The town is said to have been built about 70 years before the Norman conquest, on occasion of bringing hither the body of St Cuthbert. It was first incorporated by king Richard I. but queen Elizabeth extended its privileges. At length, in the year 1684, it obtained a charter; in consequence of which, it is now governed by a mayor, 12 aldermen, 12 common council men, with a recorder, and inferior officers. These can hold a court-leet and court-baron within the city; but under the style of the bishop, who as count palatine appoints a judge, steward, sheriffs, and other inferior magistrates. The mayor and aldermen also keep a *pie poudres* court at their fairs, and pay a yearly toll to the bishop. They have a weekly market on Saturday, and three annual fairs. Durham is about a mile in length, and as much in breadth, resembling the figure of a crab, the market-place exhibiting the body, and the claws being represented by the streets, which bend according to the course of the river, that almost surrounds one part of the city. They are, morever, dark and narrow; and some of them lying on the acclivity of a steep hill, are very difficult and dangerous to wheel-carriages. The houses are in general strong built, but neither light nor elegant. The most remarkable edifices are the cathedral with six other churches, three standing in the city, and as many in the suburbs; the college; the castle, or bishop's palace; the tolbooth near St Nicholas's church; the cross and conduit in the market-place; with two bridges over the Elvet. The cathedral was begun by bishop Carilepho in the 11th century. It is a large, magnificent, Gothic structure, 411 feet long, and 80 in breadth, having a cross aile in the middle 170 feet in length, and two smaller ailes at each end. On the south-side is a fine cloister; on the east, the old library, the chapter-house, and part of the deanery; on the west, the dormitory, under which is the treasury and a chantry; and on the west side is the new library, an elegant building begun by dean Sudbury about 70 years ago, on the spot where stood the old refectory of the convent. The middle tower of the cathedral is 212 feet high. The whole building is arched and supported by huge pillars. Several of the windows are curiously painted; and there is a handsome screen at the entrance into the choir. Sixteen bishops are interred in the chapter-house, which is 75 feet long and 33 broad, arched over-head, with a magnificent seat at the upper end for the instalment of the bishops. The consistory is kept in the chapel or west aile called *Galilee*, which was built by bishop Pudsey, and had formerly 16 altars for women, as they were not allowed to advance farther than the line of marble by the side of the font; here likewise are deposited the bones of the venerable Bede, whose elogium is written on an old parchment scroll that hangs over his tomb. The long cross aile, at the extremity of the church, was formerly distinguished by nine altars, four to the north, and four to the south, and the most magnificent in the middle dedicated to the patron St Cuthbert, whose rich shrine was in this quarter, formerly much frequented by pilgrims. The church is possessed of some old records relating to the affairs of Scotland, the kings of which were great benefactors to this cathedral. The ornaments here used for administering the divine offices, are said to be richer than those of any other cathedral in England. Before the reformation it was distinguished by the name *Ecclesia sanctæ Mariæ et sancti Cuthberti*; but it obtained the appellation of *Ecclesia cathedralis Christi et beatæ Mariæ*, in the reign of Henry VIII. who endowed the deanery with 12 prebendaries, 12 minor canons, a deacon, sub-deacon, 16 lay singing men, a schoolmaster and usher, a master of the choir, a divinity reader, eight alms-men, 18 scholars, 10 choiristers, two vergers, two porters, two cooks, two butlers, and two sacristans. On the south-side of the cathedral is the college: a spacious court formed by the houses of the prebendaries, who are richly endowed and extremely well lodged. Above the college-gate, at the east end, is the exchequer; and at the west, a large hall for entertaining strangers, with the granary and other offices of the convent. The college-school, with the master's house, stands on the north side of the cathedral. Between the churchyard and castle, is an open area called the *palace green*; at the west end of which stands the shire-hall, where the assizes and sessions are held for the county. Hard by is the library built by bishop Cosin; together with the exchequer raised by bishop Nevil, in which are kept the offices belonging to the county-palatine court. There is an hospital on the east, endowed by bishop Cosin, and at each end of it are two schools founded by bishop Langley. On the north, is the castle built by William the Conqueror, and afterwards converted into the bishop's palace, the outward gate of which is at present the county-goal.

The city consists of three manors; the bishop's manor, containing the city liberties and the bailey, held of him by the service of castle-guard; the manor of the dean and chapter, consisting of the Elvet's cross gate, south-gate street; and the manor of Gilligate, formerly belonging to the dissolved hospital of Kepyar in this neighbourhood, but granted by Edward VI. to John Cockburn, lord of Ormistoun, and late in the possession of John Tempest, Esq.

The bishopric of Durham, is deemed the richest bishopric in the kingdom; and the prebends are frequently styled the Golden Prebends of Durham. The diocese contains the whole counties of Durham and Northumberland, except the jurisdiction of Hexham in the latter. It hath also one parish in the county of Cumberland: making in the whole 135 parishes, whereof 87 are impropriate. The see is valued in the king's books at L. 2821 : 1 : 5¼, but is computed to be be worth annually L.8700. The clegy's tenths amount to L.385 : 5 : 6½. It has two archdeacons, viz. of Durham and Northumberland. This see hath given to the church of Rome eight saints and one cardinal; and to the English nation one lord chief justice, five lord chancellors, three lord treasurers, one principal secretary of state, one chancellor to the university of Oxford, and two masters of the rolls.

In the neighbourhood of this city is Nevil's cross, famous for the battle fought in the year 1346, against David II. king of Scotland, who was defeated and taken.

DURIO, in botany: A genus of the polyandria order, belonging to the polyadelphia class of plants. The calyx is a monophyllous perianthium; the corolla has five petals growing to the calyx; the stamina are conjoined in five bodies; the germ is roundish; the style bristly, the length of the stamina. The fruit is a roundish apple every where muricated; the seeds have a mucous orilla.

DURNIUM, or DURNOVARIA, a town of the Durotriges in Britain. Now *Dorchester*, the capital of Dorsetshire, on the Frome.

DUROBRIVÆ (anc. geog.), a town of the Catyeuchlani in Britain. Now in ruins, which lie on the Nen, between Caster and Dronford, in Northamptonshire, on the borders of Huntingdon.

DUROBRIVÆ, or *Durocobrivæ*, a town of the Trinobantes, in Britain; whose ruins are situated between Flamstead and Redburn, in Hertfordshire.

DUROBRIVIS, 25 miles to the west of Durovernum, or Canterbury; from which it appears to be Rochester town, confirmed by the charter of foundation of the church, in which it is called *Durobrevis*.

DUROCASES, DUROCASSIUM, DUROCASSÆ, and DUROCASSES, a town of the Carnutes, in Gallia Celtica; now Dreux. See DRUIDÆ.

DUROCORNOVIUM (anc. geog.), a town of Britain; now *Cirencester*, in Gloucestershire (Camden), Called *Corinium* by Ptolemy.

DUROCORTORUM, or DURICORTORA, a town of the Rhemi in Belgica; now *Rheims* in Champaign. E. Long. 4. N. Lat. 49. 20.

DUROIA, in botany: A genus of the monogynia order, belonging to the hexandria class of plants. The calyx above is cylindrical and loped; the border six-parted; there are no filaments; the fruit a hispid apple.

DUROLENUM, a town of the Cantii in Britain; now *Lenham*, in Kent (Camden); *Charing* (Talbot).

DUROLITUM, a town of the Trinobantes; now *Leiton*, on the Ley, in Essex (Camden).

DUROTRIGES, an ancient British nation, seated in that part of the country which is now called *Dorsetshire*. Their name is derived from the two British words *Dur* "water," and *Trigo* "to dwell;" and it is no less evident that they got their name from the situation of their country, which lies along the sea-coast. It is not very certain whether the Durotriges formed an independent state under a prince of their own, or were united with their neighbours the Danmonii; as they were reduced by Vespasian under the dominion of the Romans, at the same time, and with the same ease, and never revolted. The peaceable disposition of the inhabitants was probably the reason that the Romans had so few towns, forts, and garrisons, in this pleasant country. Dorchester, its present capital, seems to have been a Roman city of some consideration, though antiquaries are not agreed about its Roman name. It is most probable that it was the Durnovaria in the 12th Iter of Antoninus. Many Roman coins have been found at Dorchester; the military way, called *Jeening-Street*, passed through it; and some vestiges of the ancient stone wall with which it was surrounded, and of the amphitheatre with which it was adorned, are still visible. The country of the Durotriges was included in the Roman province called *Flavia Cæsariensis*, and governed by the president of that province, as long as the Romans kept any footing in these parts.

DURY (John), a Scots divine, who travelled much, and laboured with great zeal to reunite the Lutherans with the Calvinists. His discouragements in this scheme started another still more impracticable; and this was to reunite all Christians by means of a new explication of the Apocalypse, which he published at Francfort in 1675. He enjoyed then a comfortable retreat in the country of Hesse; but the time of his death is unknown: his letter to Peter du Moulin concerning the state of the churches of England, Scotland, and Ireland, was printed at London in 1658, by the care of du Moulin, and is esteemed to be curious.

DUSSELDORP, a city of Westphalia in Germany, and capital of the duchy of Berg. It is situated at the conflux of the river Dussel with the Rhine, in E. Long. 6. 20. N. Lat. 51. 15.

DUTCHY. See DUCHY.

DUTY, in general, denotes any thing that one is obliged to perform.

DUTY, in a moral sense. See *MORAL Philosophy*.

DUTY, in polity and commerce, signifies the impost laid on merchandizes, at importation or exportation, commonly called the duties of customs; also the taxes of excise, stamp-duties, &c. See CUSTOMS, EXCISE, &c.

The principle on which all duties and customs should be laid on foreign merchandizes which are imported, are such as tend to cement a mutual friendship and traffic between one nation and another; and therefore due care should be taken in the laying of them, that they may answer so good an end, and be reciprocal in both countries: they should be so laid as to make the exports of a nation at least equal to its imports from those nations wherewith it trades, so that a balance in money should not be issued out, to pay for the goods and merchandizes of other countries; to the end that no greater number of our landholders and manufacturers should be deprived of their revenues arising from the product of the lands, and the labour of the people, by foreign importations, than are maintained by exportations to such countries. These are the national principles on which all our treaties of commerce with other countries ought to be grounded.

DUTY, in the military art, is the exercise of those functions that belong to a soldier: with this distinction, that mounting guard and the like, where there is no enemy directly to be engaged, is called duty; but their marching to meet and fight an enemy is called going on service.

DUUMVIRATE, the office or dignity of the duumviri. See the next article.

The duumvirate lasted till the year of Rome 388, when it was changed into a decemvirate.

DUUMVIRI, in Roman antiquity, a general appellation given to magistrates, commissioners, and officers, where two were joined together in the same functions.

Duumviri Capitales, were the judges in criminal causes: from their sentence it was lawful to appeal to the people, who only had the power of condemning a citizen to death. These judges were taken from the body of the decuriones; they had great power and authority, were members of the public council, and had two lictors to walk before them.

Duumviri Municipales, were two magistrates in some cities of the empire, answering to what the consuls were at Rome: they were chosen out of the body of the decuriones; their office lasted commonly five years, upon which account they were frequently termed *quinquinales magistratus*. Their jurisdiction was of great extent; they had officers who walked before them, carrying a small switch in their hands; and some of them assumed the privilege of having lictors, carrying axes and the fasces, or bundles of rods, before them.

Duumviri Navales, were the commissaries of the fleet, first created at the request of M. Decius, tribune of the people, in the time of the war with the Samnites. The duty of their office consisted in giving orders for the fitting of ships, and giving their commissions to the marine officers, &c.

Duumviri Sacrorum, were magistrates created by Tarquinius Superbus, for the performance of the sacrifices, and keeping of the sibyls books. They were chosen from among the patricians, and held their office for life: they were exempted from serving in the wars, and from the offices imposed on the other citizens, and without them the oracles of the sibyls could not be consulted.

DUYVELAND, or Diveland, one of the islands of Zealand, in the United Provinces, lying eastward of Schonen, from which it is only separated by a narrow channel,

DWAL, in heraldry, the herb nightshade, used for such as blazon with flowers and herbs, instead of metals and colours, for sable or black.

DWARF, in general, an appellation given to things greatly inferior in size to that which is usual in their several kinds: thus there are dwarfs of the human species, dwarf-dogs, dwarf-trees, &c.

The Romans were passionately fond of dwarfs, whom they called *nani* or *nanæ*, insomuch that they often used artificial methods to prevent the growth of boys designed for dwarfs, by enclosing them in boxes, or by the use of tight bandages. Augustus's niece, Julia, was extremely fond of a dwarf called *Sonopas*, who was only two feet and an hand-breadth high.—We have many other accounts of human dwarfs, but most of them deformed in some way or other besides the smallness of their size. Many relations also concerning dwarfs we must necessarily look upon to be fabulous, as well as those concerning giants.—The following history, however, which we have reason to look upon as authentic, is too remarkable not to be acceptable to the generality of our readers.

Jeffery Hudson, the famous English dwarf, was born at Oakham in Rutlandshire in 1619; and about the age of seven or eight, being then but 18 inches high, was retained in the service of the duke of Buckingham, who resided at Burleigh on the Hill. Soon after the marriage of Charles I. the king and queen being entertained at Burleigh, little Jeffery was served up to table in a cold pye, and presented by the duchess to the queen, who kept him as her dwarf. From 7 years of age till 30, he never grew taller; but after 30, he shot up to three feet nine inches, and there fixed. Jeffery became a considerable part of the entertainment of the court. Sir William Davenant wrote a poem called *Jeffreidos*, on a battle between him and a turkey-cock; and in 1638 was published a very small book, called the *New Year's Gift*, presented at court by the lady Parvula to the lord Minimus (commonly called *Little Jeffery*) her majesty's servant, &c. written by Microphilus, with a little print of Jeffery prefixed. Before this period, Jeffery was employed on a negotiation of great importance: he was sent to France to fetch a midwife for the queen; and on his return with this gentlewoman, and her majesty's dancing-master, and many rich presents to the queen from her mother Mary de Medicis, he was taken by the Dunkirkers. Jeffery, thus made of consequence, grew to think himself really so. He had borne with little temper the teazing of the courtiers and domestics, and had many squabbles with the king's gigantic porter. At last, being provoked by Mr Crofts, a young gentleman of family, a challenge ensued: and Mr Crofts coming to the rendezvous armed only with a squirt, the little creature was so enraged, that a real duel ensued; and the appointment being on horseback with pistols, to put them more on a level, Jeffery, with the first fire, shot his antagonist dead. This happened in France, whither he had attended his mistress in the troubles. He was again taken prisoner by a Turkish rover, and sold into Barbary. He probably did not remain long in slavery: for at the beginning of the civil war, he was made a captain in the royal army; and in 1644 attended the queen to France, where he remained till the Restoration. At last, upon suspicion of his being privy to the Popish plot, he was taken up in 1682, and confined in the Gatehouse, Westminster, where he ended his life, in the 63d year of his age.

In the Memoirs of the Royal Academy of Sciences, a relation is given by the Count de Tressau, of a dwarf called *Bebe*, kept by the late Stanislaus king of Poland, and who died in 1764 at the age of 22, when he measured only 23 inches. At the time of his birth, he measured only between eight and nine inches. Diminutive as were his dimensions, his reasoning faculties were not less scanty; appearing indeed not to have been superior to those of a well-taught pointer: but that the size and strength of the intellectual powers are not affected by the diminutiveness or tenuity of the corporeal organs, is evident from a still more striking instance of littleness, given us by the same nobleman, in the person of Monsieur Borulawski, a Polish gentleman, whom he saw at Luneville, who has since been at Paris, and who at the age of 22 measured only 28 inches. This miniature of a man, considering him only as to his bodily dimensions, appears a giant with regard to his mental powers and attainments.

ments. He is described by the count as possessing all the graces of wit, united with a sound judgment and an excellent memory; so that we may with justice say of M. Borulawski, in the words of Seneca, and nearly in the order in which he has used them, "*Posse ingenium fortissimum ac beatissimum sub quolibet corpusculo latere.*" Epist. 66.

Count Borulawski was the son of a Polish nobleman attached to the fortunes of king Stanislaus, who lost his property in consequence of that attachment, and who had six children, three dwarfs, and three well-grown. What is singular enough, they were born alternately, a big one and a little one, though both parents were of the common size. The little count's youngest sister was much less than him, but died at the age of 23. The count continued to grow till he was about 30, and has at present attained his 51st year, and the height of three feet two inches. He never experienced any sickness, but lived in a polite and affluent manner under the patronage of a lady, a friend of the family, till love at the age of 41 intruded into his little peaceful bosom, and involved him in matrimony, care, and perplexity. The lady he chose was of his own country, but of French extraction, and the middle size. They have three children, all girls, and none of them likely to be dwarfs. To provide for a family now became an object big with difficulty, requiring all the exertion of his powers (which could promise but little) and his talents, of which music alone afforded any view of profit. He plays extremely well upon the guittar: and by having concerts in several of the principal cities in Germany, he raised temporary supplies. At Vienna he was persuaded to turn his thoughts to England, where it was believed the public curiosity might in a little time benefit him sufficiently to enable him to live independent in so cheap a country as Poland. He was furnished by very respectable friends with recommendations to several of the most distinguished characters in that kingdom, as the duchess of Devonshire, Rutland, &c. &c. whose kind patronage he is not backward to acknowledge. He was advised to let himself be seen as a curiosity, and the price of admission was fixed at a guinea. The number of his visitors, of course, was not very great. After a pretty long stay in London he went to Bath and Bristol; visited Dublin and some other parts of Ireland; whence he returned by way of Liverpool, Manchester, and Birmingham, to London. He also visited Edinburgh and some other towns of Scotland. In every place he acquired a number of friends. In reality, the ease and politeness of his manners and address please no less than the diminutive, yet elegant, proportions of his figure astonish those who visit him. His person is pleasing and graceful, and his look manly and noble. He speaks French fluently, and English tolerably. He is remarkably lively and cheerful, though fitted for the most serious and rational conversation. Such is this wonderful little man—an object of curiosity really worthy the attention of the philosopher, the man of taste, and the anatomist. His life has been published, written by himself.

DWINA, the name of two large rivers; one of which rises in Lithuania, and, dividing Livonia from Courland, falls into the Baltic Sea a little below Riga: the other gives name to the province of Dwina in Russia, discharging itself into the White Sea a little below Archangel.

DYCK. See VANDYCK.

DYE, in architecture, any square body, as the trunk or notched part of a pedestal: or it is the middle of the pedestal, or that part included between the base and the corniche; so called because it is often made in the form of a cube or die. See ARCHITECTURE, nº 61.

DYER, a person who professes the art of dyeing all manner of colours. See DYEING.

DYER (Sir James), an eminent English lawyer, chief judge of the court of common pleas in the reign of Queen Elizabeth. He died in 1581; and about 20 years after was published his large collection of Reports, which have been highly esteemed for their succinctness and solidity. He also left other writings behind him relative to his profession.

DYER (John), the son of Robert Dyer, Esq; a Welch solicitor of great capacity, was born in 1700. He passed through Westminster-school under the care of Dr Friend, and was then called home to be instructed in his father's profession. His genius, however, led him a different way; for besides his early taste for poetry, having a passion no less strong for the arts of design, he determined to make painting his profession. With this view, having studied a while under his master, he became, as he tells his friend, an itinerant painter, and wandered about South Wales and the parts adjacent; and about 1727 painted Grongar Hill. Being probably unsatisfied with his own proficiency, he made the tour of Italy; where, besides the usual study of the remains of antiquity, and the works of the great masters, he frequently spent whole days in the country about Rome and Florence, sketching those picturesque prospects with facility and spirit. Images from hence naturally transferred themselves into his poetical compositions: the principal beauties of The Ruins of Rome are perhaps of this kind; and the various landscapes in The Fleece have been particularly admired. On his return to England, he published The Ruins of Rome, 1740; but soon found that he could not relish a town-life, nor submit to the assiduity required in his profession. As his turn of mind was rather serious, and his conduct and behaviour always irreproachable, he was advised by his friends to enter into holy orders; and it is presumed, though his education had not been regular, that he found no difficulty in obtaining them. He was ordained by the bishop of Lincoln, and had a law degree conferred on him.

About the same time he married a lady of Coleshill named Ensor; "whose grandmother (says he) was a Shakespeare, descended from a brother of every body's Shakespeare." His ecclesiastical provision was a long time but slender. His first patron, Mr Harper, gave him, in 1741, Calthorp in Leicestershire, of 80l. a-year, on which he lived ten years; and in April 1757 exchanged it for Belchford in Lincolnshire, of 75l. which was given him by lord chancellor Hardwicke, on the recommendation of a friend to virtue and the muses. His condition now began to mend. In 1752, Sir John Heathcote gave him Coningsby, of 140l. a-year; and in 1756, when he was LL. B. without any solicitation of his own, obtained for him from the chancellor Kirby

Dyer. on Bane, of 110l. In 1757, he published The Fleece, his greatest poetical work; of which Dr Johnson relates this ludicrous story. Dodsley the bookseller was one day mentioning it to a critical visitor, with more expectation of success than the other could easily admit. In the conversation the author's age was asked; and being represented as advanced in life, "He will (said the critic) be buried in woollen." He did not indeed long outlive that publication, nor long enjoy the increase of his preferments; for a consumptive disorder, with which he had long struggled, carried him off at length in 1758.

Mr Dyer's character as a writer has been fixed by three poems, Grongar Hill, The Ruins of Rome, and The Fleece; wherein a poetical imagination perfectly original, a natural simplicity connected with, and often productive of, the true sublime, and the warmest sentiments of benevolence and virtue, have been universally observed and admired. These pieces were put out separately in his lifetime: but after his death, they were collected and published in one volume 8vo, 1761, with a short account of himself prefixed.

Dyer's Weed.

Dyer's Weed, in botany. See Reseda.

DYEING,

In the utmost latitude of the word, may be defined, The art of tinging cloth, stuff, or other matter, with a permanent colour, which penetrates the substance thereof.—It is, however, commonly restrained to the art of tinging silk, wool, cotton, and linen, with different colours; and, as such, is practised as a trade by those who do not meddle with any of the other branches, as staining of leather, &c.

1 Antiquity of the art.

The dyeing art is of great antiquity; as appears from the traces of it in the oldest sacred as well as profane writers. The honour of the invention is attributed to the Tyrians; though what lessens the merit of it is, that it is said to have owed its rise to chance. The juices of certain fruits, leaves, &c. accidentally crushed, are supposed to have furnished the first hint: Pliny assures us, that even in his time, the Gauls made use of no other dyes. It is added, that coloured earths and minerals, washed and soaked with rain, gave the next dyeing materials.—But purple, an animal juice found in a shell-fish called *murex**, *conchylium*, and *purpura*, seems from history to have been prior to any of them. This indeed was reserved for the use of kings and princes; private persons were forbidden by law to wear the least scrap of it. The discovery of its tinging quality is said to have been taken from a dog, which having caught one of the purple fishes among the rocks, and eaten it up, stained his mouth and beard with the precious liquor; which struck the fancy of a Tyrian nymph so strongly, that she refused her lover Hercules any favours till he had brought her a mantle of the same colour.

* See *Murex*.

Pliny seems to ascribe the invention of the art of dyeing wool to the Lydians of Sardis: *Inficere lanas Sardibus Lydi*; where the word *incipere* must be understood. But a modern critic suspects a false reading here; and, not without reason, for *Lydi* substitutes *Lydda*, the name of a city on the coast of Phenicia, where the chief mart of the purple dye was.

After the Phenicians, the Sardinians seem to have arrived at the greatest perfection in the dyeing art; insomuch that βαμμα Σαρδιανικον *Sardinian dye*, passed into a proverb among the Greeks. Till the time of Alexander, we find no other sort of dye in use among the Greeks but purple and scarlet.—It was under the successors of that monarch that these people applied themselves to the other colours; and invented, or at least perfected, blue, yellow, green, &c.—For the ancient purple, it has been long lost; but the perfection to which the moderns have carried the other colours, abundantly indemnifies them of the loss. It is still, however, greatly to be doubted whether the permanency of the modern colours at all equals that of the ancient ones; though it is certain that the former greatly exceed them in brightness.

Sect. I. *Theory of Dyeing.*

2 Salts the only means of fixing colours.

Before we can enter into any consideration of the true theory of dyeing, it is necessary to make the following observation concerning the practice, namely, That salts are almost the only means we are acquainted with by which any colouring substance can be made to fix itself upon those matters which are the common subjects of dyeing. A solution of cochineal, for instance, will of itself impart no permanent colour to a piece of woollen cloth put into it. The red colour of the cochineal will indeed stain the cloth while it remains immersed in the solution; but as soon as it is taken out and washed, this temporary stain will immediately vanish, and the cloth become as white as before. If now the cloth is dipped in the solution of any saline substance, alkalies alone excepted, and then immersed in the solution of cochineal for some time, it will come out permanently coloured; nor will the colour be discharged even by washing with soap and water. If a quantity of salt is added to the solution of cochineal, and the cloth put in without being impregnated with any saline substance, the effect will be the same; the cloth will come out coloured; only in this last case, it must be well dried before washing it with soap, or most of the colour will be discharged.

3 They operate by coagulation.

By comparing this with what is delivered under the article *Colour-Making*, n° 13, 14, we shall be able to form a pretty rational theory of dyeing. It is there remarked, that a saline substance (solution of tin in aqua regia) had a surprising power of coagulating the colouring matter of certain solutions, such as cochineal, Brazil-wood, log-wood, &c. If therefore a piece of cloth is previously impregnated with this solution, and put into the colouring one, it is plain that some part of the colouring matter will be coagulated by the solution remaining in the cloth, in the very same manner that it would have been if a small quantity of the saline solution had been poured into the other. The cloth therefore will take up a part of the colouring matter, which cannot be discharged but by entirely discharging the solution of tin. This, however, seems to unite itself with the cloth very firmly, so that scarce a particle of colour will be discharged by washing in plain water, or even with soap; nor can the whole be taken out without boiling the cloth in a solution of fixed alkali.

Though solution of tin produces this coagulation in the most remarkable manner, it is not to be doubted that the same power is possessed in some degree by most of the neutrals and imperfect salts. Alum possesses it very considerably, though not so much as solution of tin; and hence that salt is very much used in dyeing, as well as sugar of lead, which also has a very strong power of coagulation. The process of dyeing, therefore, seems to be most analogous to that of the coagulation or curdling of milk. Before it has suffered this change, the milk is easily miscible with water; but after it is once coagulated, the curd, or caseous part, is very difficultly soluble in any liquid whatever. In like manner, the colouring matter in the solution of cochineal, before the cloth is put in, is easily soluble in water, and may be diffused through any quantity of fluid: but no sooner is the cloth dipped in it, than the saline substance contained in the cloth coagulates that part of the colouring matter which lies in immediate contact with it; and as all the fluid successively comes into contact with it, the whole of the colour is by degrees coagulated and deposited on the cloth.

4 Hypotheses concerning the adhesion of the colour.

To account for the strong adhesion of the colour to the dyed cloth, several hypotheses have been formed. One is, That the fibres of wool, silk, &c. are hollow tubes; that the colouring matter enters them; and after being there coagulated, shows itself through the fine transparent sides of the tubes.—Another considers these filaments as solid lengthwise, but having all round their sides an infinite number of small pores like the extremities of the fine absorbing and exhaling vessels of the human body. In these pores, according to the hypothesis, the colour is lodged; and as the pores are placed exceedingly close to one another, the fine threads appear to our eyes of one uniform colour.—A third is, That the fibres are solid, or at least with respect to us may be considered as such. The saline substance, whatever it is, that is employed to make the colour strike, sinks into the surface, partly corrodes and unites itself with it into a third kind of substance no longer soluble in plain water, nor indeed easily by soap, but which still preserves its coagulating quality. According to this hypothesis, the dye lies entirely on the outside of the stuff, and continues as long as the effect of the salt continues upon the fibres of the matter to be dyed.

5 M. Hellot's theory disproved.

Concerning the truth of these hypotheses, or indeed any others that can be invented, it is impossible to bring any decisive proof. It seems, however, more probable, that the process of dyeing is accomplished by a coagulation of the colouring matter itself, rather than by any agglutination of it to the fibres by means of a vitriolated tartar, as Mr Hellot supposes. According to this gentleman's theory, a vitriolated tartar is generated in every process for dyeing, and proceeds from the acid of the alum and alkaline basis of the tartar used in the preparations, or in some of the dyeing ingredients themselves. He supposes that the pores of the stuff are cleansed and enlarged by the preparatory salts, and by the boiling water, in such a manner as to receive the colouring particles, which particles are afterwards detained by the contraction of the pores occasioned by cold; and further, that these pores are lined with a saline crust of tartar or vitriolated tartar.

On this theory the translator of the Chemical Dictionary has the following observations. "Mr Hellot has not shown that pure fixed alkali is incapable of producing the effects which he attributes to his tartar and vitriolated tartar; and both these salts, though they are difficult of solution, and require a great quantity of water for this purpose, will yet dissolve at last; and therefore, if the colouring particles were fixed chiefly by means of these salts, they might be washed out by a large quantity of water; which we find to be contrary to experience.

6 Another theory.

"We shall find it more difficult to substitute a true theory than to refute that of Mr Hellot. Many experiments ought to be previously made. Nevertheless, it may be observed, That the colorific particles of most substances used in dyeing seem to be insoluble in water, in spirit of wine, and even in alkaline lixiviums: that their diffusion through these liquids is caused merely by their adhesion to certain gummous and resinous particles: and that they may be disengaged from those gummy and resinous matters, by applying a piece of stuff to which they have a greater adhesive power, which seems to be the case of the root-coloured and blue dyes; or by applying another substance to which these particles have a greater power of adhesion; such as the earth of alum, in those dyes where that salt is used, together with some other substance, as fixed or volatile alkali, capable of decomposing alum; or as the ferruginous earth of the green vitriol in black dyes, to which the colorific particles of the galls adhere; which earths are capable of applying themselves and of adhering to the stuffs. The separation of the colouring particles from the gummy and resinous matters is probably facilitated by the addition of acids and neutral salts, which may coagulate in some measure the vegetable matters, and leave the colorific particles disengaged; so that they may apply themselves to the stuff, or to the earths abovementioned."

7 M. de Apligny's theory.

In a treatise on this subject by M. de Apligny, the nature of the different substances usually subjected to this operation is particularly considered. These are wool, silk, cotton, and linen. Wool was probably the first substance to which any kind of dye was applied, and which might probably have been done even in the fleece, while mankind, in their rude state, wore the skins of animals. When some further progress in arts was made, and the method of manufacturing wool into worsted and cloth discovered, the dye would then be applied to it; but it was not till a considerable time afterwards that silk and cotton were known; and the art of dyeing linen is mentioned as a new invention even in the time of Pliny.

Wool, according to our author, consists of tubes, which, like hair, contain a medullary substance, but throughout their length are sieves with an infinite number of lateral pores; and in proportion to the greater or lesser number of these pores, the woolly fibres are more or less curled. The reason assigned for this is, that "the more interruptions there are in the continuity of any body, the more flexible it will be: the fibres of the wool therefore being curled must have many

many pores, and consequently great room for the extraneous substance which may be not only lodged in the exterior pores, but even penetrate into the whole extent of the tubes, after the medullary substance has been expelled. It is not therefore to be wondered at, if wool, being of all substances that are made into stuffs the most porous, should be the most easy to dye, and imbibe the greatest quantity of colour."

Silk, according to our author, may naturally be supposed to proceed originally from the mucilage of the mulberry leaf on which the animal feeds, and which he imagines is converted into an animal substance by a combination with volatile alkali; but which, by the evaporation of a thin oil, and part of this alkaline matter, becomes tough and hard. An example of something similar to this is observed on the leaves of the *ros solis*, on which there are found some drops, which being touched while the sun shines upon it may be drawn out into fine and very white threads. The consolidation of the silk is also promoted by a yellow substance with which the animal impregnates the thread; and this seems to be a concrete oil something similar to wax. Silk thread therefore is nothing else than a continued series of moleculæ of this indurated gluten: but as in this desiccation the moleculæ will remain at unequal distances, there will necessarily be inequalities, and consequently pores in the thread; but as these pores are only on the surface of the thread without any interior concavity as in the wool, it follows, that silk can admit no particles into its pores, but such as are extremely subtile and in very small quantities; that even the particles admitted require a stronger mastic or fixing substance than wool, since they are only superficial, and incapable of penetrating. Hence silk is much more difficult to dye permanently than wool, and requires likewise a much greater quantity of colouring materials; two ounces and a half of cochineal being required to give the same shade to a pound of silk that one ounce will give to a pound of wool. For the same reason also the colours on silk are less permanent than on wool.

Cotton being a true vegetable substance must necessarily have its fibres hollow like wool, that the juices may circulate properly; but as these are a great deal finer, the cotton is therefore much more difficult to dye. The exterior and lateral pores of cotton are likewise filled with a kind of oil, which it is necessary to expel before the dye can be given.

Flax may likewise be supposed porous, but that its pores are much smaller than those of any of the substances already mentioned. The detached and separated fibres resemble silk in some degree, only that, being more dry and compact, they take the dye with still more difficulty than even cotton; and from the different textures of these substances we may reasonably ascribe the different shades which are taken by them even when the same dyeing ingredients are made use of. This holds good also with respect to stuffs differently manufactured, though of the same kind; the pores being necessarily contracted by certain kinds of fabrication, whence they receive a smaller quantity of the dye: and hence scarlet cloth, when cut, appears white internally, the colouring atoms being too large to penetrate it, which, however, does not happen in the stuffs which have been previously dipped in solution of alum.—A difference of shade will also be occasioned by the different positions and delicacy of the fibres of the stuff; and by this also a difference is made in the brightness of the colour.

8 Of the action of lime.

With regard to the operation of those substances commonly made use of for fixing the dye, our author remarks, that lime seems destined by the Author of nature for binding and uniting the two seemingly opposite substances of salts and earth. "Fire (says he) makes it soluble in water, and therefore easily used: but it again becomes indissoluble by the contact and influence of the air; and these properties render it capable of forming, when united to other bodies, an unalterable cement." We know several mixtures of this kind, of which lime is the basis, and that in consequence of these properties it confirms the solidity of many colours.

9 Of alum.

Alum has the property of attracting the colouring particles of the dye as well as of fixing them; and Pliny informs us that this property was known to the ancients. They made use of certain earths of the argillaceous kind, which they called *creta argentaria, salunisia,* and *anularia,* to imbibe the colour from infusions of dyeing ingredients; and they became much sooner saturated with the colour than wool itself. There are two kinds of alum made use of in dyeing, viz. roch alum and Roman alum. The first is always used for blues and the colours inclining to black; but as this generally contains some particles of iron, the Roman alum is preferred for the more lively colours, as it contains nothing capable of tarnishing their beauty. The colours are brightened by the whiteness of the earth while its tenacity, produced by some kind of unctuosity with which it is combined, makes it more solid; and the plastic quality of the earth makes it take the form of the pores in the substance to be dyed; whence a greater permanency of colour must necessarily ensue.

There are several other saline substances made use of in dyeing, particularly nitre, sea-salt, sal ammoniac, and tartar, &c. By the three first the red colours are always rendered more dark-coloured, while the others enliven the colour and give it an orange hue. Neutral salts with a metallic basis serve to strengthen the colour, which varies its shade according to the nature of the metallic substance with which it is combined. Green and blue vitriol are the most commonly used in this art.

10 Dyeing supposed to be an effect of attraction.

In explaining the theory of the art of dyeing, our author considers the whole as an effect of attraction; and in order to set forth this matter in a proper light it is necessary, in the first place, to explain the conditions requisite for the action of bodies upon one another in this way. These conditions are: 1. That the attractive power be mutual in both. 2. That they should be placed at a distance from each other proportioned to the force of attraction. 3. That this force be superior to that by which the colouring matter is attracted by the water. Hence it is necessary for dyeing stuffs of any kind, that the dye should consist of small particles suspended in a liquid, in such a manner that they may be separated by a substance which has a greater affinity with these minute bodies than water. Some of these substances, however, are not attracted by the earth of alum, and these enter the pores of the cloth without its assistance; but in such as require the assistance of alum, the particles are fixed by the power of attraction, at the same time that the acid of the alum is softned by its combination with the principles of these particles: this acid having served merely as a vehicle for distributing equally into all the pores of the stuff that earth which it held in a state of the greatest possible divisibility.

11 Salts cannot fix the colour in consequence of their own insolubility.

Our author next proceeds to contest the theory, that salts, even such as are the most insoluble, can maintain their stability in the pores of the stuff, however insoluble the salt may be in water. He observes that this insolubility, however great, could not prevent a great quantity of it from being carried off by water, and consequently the colour from being injured by the decomposition of these salts: but fixed earth, such as that of lime and alum, which from its nature obstinately retains the phlogistic principles of all colours, must necessarily produce such as cannot be destroyed but by the strongest acids.

12 Colours depend on phlogiston.

Colours in the opinion of our author, depend entirely upon phlogiston. It is well known that, by the simple addition of any salt to an oily, vegetable, and colouring substance, we may either change or totally expel its colour; because any salt, either simple or compound, destroying the combination then subsisting, a new reflection of the rays of light must necessarily take place. In such substances therefore as cannot have their colour affected by any salt, the phlogiston is most probably in the most perfect combination with the other principles. Were we thoroughly acquainted with this combination, we should be able to make perfect compositions for dyeing, similar to what artificial cinnabar is for painting: but though we certainly know the effects produced upon some kinds of oils by salts, and can decompose some colouring substances and separate their principles, we are still unacquainted with the manner in which these principles are combined; and therefore every effort of this kind has hitherto been found insufficient for the purpose.

13 Aligny's account of the action of acids and alkalies upon colouring substances.

"As the colour (says our author) depends upon the shape or figure of the constituent particles of the colouring bodies, the shade may be varied by changing their figure, but the permanency of the colour is at the same time diminished; because it is impossible to produce this change without altering the principles to which they owe their permanency; and this is the case with cochineal. The shades of its colour are easily varied by acids and alkalies."

M. de Apligny then proceeds to account for the action of acids and alkalies upon colouring substances. Cochineal is rendered darker by alkalies, and always becomes of a deep purple on adding them; and the volatile alkali is found to be more efficacious in this respect than the fixed kind. These salts he supposes to produce this effect, because they are natural solvents of animal substances; which, however, they are incapable of dissolving without combination, causing only a composition without the dissipation of any principle. This combination gives a degree of density to the colouring particles which they had not before: and thus inclines them to black, by occasioning a greater degree of refraction in the pencils of rays. Acids, on the other hand, especially those of the mineral kind, burn the oil, and absorb the phlogiston, which is the principle of all colours. By the violence of their action a part of the phlogiston and volatile alkali evaporates, the colouring matter becomes more rarefied, and reflects a greater number of the rays of light; whence it necessarily acquires a colour nearly yellow, and even quite so if a proper quantity be added; this being, according to our author, of all colours the nearest to white or transparency. Hence it is not customary for dyers to make any use of fixed alkali when cochineal is the colouring substance, as it would make too great an alteration in the consistence, and, by mixing with the animal oil, form a soap which would render the colour miscible in water, and consequently of the false kind of dye; the oil already mixed with fixed alkali being no longer at liberty to combine with the earth of alum. But after the substance has been already dyed, the fixed alkali may then be used with advantage in some cases; because the colouring substance being already converted into what our author calls a *mastic*, cannot be dissolved by the menstruum unless the latter be used in very great quantity.

Acids, according to M. de Apligny, are more destructive in their action than alkalies; and the oil of vitriol, formerly used, always containing some ferruginous particles, a kind of Prussian blue was formed, which rendered the colour purple rather than otherwise; and even by simple boiling in an iron vessel, the solution of cochineal always assumes a purple colour. The activity of spirit of nitre, which has been substituted in place of oil of vitriol, is so great, that it has been found necessary to give it a basis on which it might in part exhaust itself, and, by communicating part of its phlogiston, render it less greedy of the cochineal. This basis is tin, which formerly was dissolved by spirit of nitre, but now by aqua regia, which was found to dissolve it more completely. Our author's method of using this solution, however, is not by diluting it in water, and then by dipping the stuffs in it previous to their being dyed. "This preparation (says he) would not be sufficient; for by diluting with a great quantity of water, a part of the calx would precipitate and be reduced into particles larger than when dissolved in acids, especially if used alone and separate from the dye; the acid in that case not acting on the colour with sufficient force to enliven it. Only part of this solution, therefore, is added to the cochineal liquor; and the acid then abandoning the tin, and combining with the oil of the cochineal, the calx of the metal seizes the colouring matter as it precipitates, and, as Mr Hellot observes, forms a kind of lacker which insinuates into the pores of the stuff, and is there retained by a gluten given by the starch which was added to the dyeing liquor. Hence it is easy to conceive why the scarlet dye is much less solid than the crimson; the lacker being much drier than the simple colouring particles of the cochineal, is in this state nearer to the nature of the mineral colours. The oil and the animal gluten, which in the crimson dye form with the earth of alum a *mastic*, are destroyed by the acid, and the starch then added is an insufficient substitute."

The same thing that has here been mentioned of cochineal, applies equally to gum-lac and kermes; both of which afford a scarlet dye. The kermes he thinks, has the advantage of being composed of finer particles, which more easily penetrate the pores of silk or cotton. Silk indeed, on account of the smallness of its pores, takes up only a part of the cochineal; but it extracts the

the whole of the colour from the cochineal, and the colour is also more fixed, probably because the shrub on which the insect is nourished communicates its astringency, or contains a greater quantity of oil. Cotton may likewise be dyed with kermes, though cochineal cannot penetrate its pores.

But in whatever way the salts used in dyeing do act, it is certain they are capable, except in a very few instances, of fixing and giving a lustre and permanency to the colour which otherwise could never be obtained.

14 **Exceptions to the general rule concerning salts.**

The exception to this general rule most commonly known is that of indigo. This is a fine blue fecula produced by fermentation from the leaves of the Indian plant called *anil*. It is very difficult of solution; however, it may be dissolved by alkaline salts, concentrated oil of vitriol, orpiment, or combinations of sulphur with quicklime. If a quantity of indigo is dissolved in a fixed alkali (for volatile alkalies will not dissolve it), the solution is always green, which is the natural colour produced in all vegetable blues by the alkali: but if any piece of stuff is put into this solution, though it remains green while immersed in the liquid, the moment it comes incontact with the air, the dissolving power of the alkali is totally destroyed; the indigo is precipitated upon the cloth, resumes its native colour, and dyes the cloth blue.

The cause of this precipitation is very difficult to be investigated. Perhaps it may be owing to an attraction of fixed air by the alkali from the atmosphere, which renders the salt unable to dissolve the indigo any longer. The adhesion of the colour seems merely owing to an attraction between it and the cloth; for the alkaline salt can contribute nothing to this, but would rather have the contrary effect. Perhaps, however, the great solvent power possessed by alkaline salts, by perfectly clearing away every kind of sordes, may bring the indigo and cloth into nearer contact with each other, than when it is dissolved in any other way; and consequently the attraction will in these cases be the stronger. This seems to have some probability; for when indigo is dissolved in vitriolic acid, as in dyeing Saxon blue, the colour is much more easily discharged.

Another exception is in the juices of some vegetables, such as the nuts of the anacardium. This produces, without addition, a most deep and lasting black, never to be washed out or discharged by any means whatever. Several other plants are to be found in different parts of the world, which give an indelible black stain upon linen without addition; and the colouring matter of these seems to adhere by means of a very tenacious gluten, with which it is mixed, and which when once thoroughly dried, can never be again dissolved. In this respect, these black staining colours seem analogous to the *purpura* of the ancients; which stained indelibly without addition, and was of an exceedingly viscous and adhesive nature.

Sect. II. *Practice of Dyeing.*

The materials for dyeing different colours are so many and various, that an enumeration of them all is scarce to be expected. The same difference, however, takes place among the materials for dyeing which we have observed to take place among those for *Colour-Making*.

15 **True and false dyes.**

Some ingredients produce durable colours, which cannot be discharged either by exposure to the air or by washing with soap: others, though they may be made to stand the action of soap pretty well, cannot by any means be enabled to resist the action of the air. These are distinguished by the different names of *true* and *false*, *permanent* and *fading*, &c.; nor is there any method yet discovered of giving the false colours an equal degree of durability with the true ones. This hath been attempted by mixing a permanent and a fading colour together; in which case it was thought that the former would impart somewhat of its durability to the latter: but this hath always been found to misgive: the fading colour soon flying off, and leaving the permanent one behind. Nay, in many cases this does not even happen; for, by some means, hitherto not accounted for, the volatile colour imparts its volatility to that which would otherwise be permanent. The same hath also been attempted by dyeing a piece of stuff partially with a fading colour, and then completing the dye with a permanent one. In this case it was hoped that the fading colour being covered over, and defended from the injuries of the air by the permanent one, would necessarily become equally durable, or at least remain a much longer time than if the stuff was dyed with it alone. But this also hath been found ineffectual; and the fading colour hath been dissipated as soon when covered with a permanent one, as when left without any such cover.—Solution of tin in aqua regia will give most of these fading colours an high degree of beauty, and some share of durability, though even that is not able to make them equal to the others.—The most permanent dyes we have are cochineal and gum lac for fine reds and scarlets; indigo and woad for blue; and, when mixed in different proportions with cochineal or lac, for purple and violet colours. Weld, and some other vegetables, for yellow; and madder for coarse reds, purples, and blacks.—The fading colours are much more numerous. In this class are included Brazil-wood, logwood, peach-wood, red-wood, fustic, turmeric root, annotto, archil, &c. &c.

16 **Salts to be used in dyeing.**

With regard to the salts made use of in dyeing, it hath been but too often customary to jumble together such a quantity of different ones, that it was not only impossible to know in what particular salt the virtue resided, but often the efficacy of the whole hath been totally destroyed, and the colour entirely spoiled by such injudicious management. It is proper, therefore, where a mixture of two or more salts is intended to be made for dyeing, first to try the change of colour produced by each of the salts upon the colouring substance. If the colours are nearly alike, the mixture may be safely made as to that particular. But if the two colours produced by the different salts are very different from one another, to mix them together must be very injudicious. Thus, suppose you want to dye scarlet, solution of tin in aqua regia produces the necessary change of colour on the decoction of cochineal, and converts it into a high flame-colour, which shows it to be a proper ingredient; but to the solution of tin, it would surely be the greatest absurdity to add a quantity of saccharum saturni, the effect of which is to change the colour of cochineal to a dull purple. But though the salts taken separately should produce a colour nearly similar, another thing must be regarded, namely, whether

ther they can be mixed with safety to one another? It is the nature of many salts to destroy one another whenever they come into perfect contact by being dissolved in water. Thus, solution of tin and saccharum saturni destroy one another; and so do solution of tin and tartar or cream of tartar. To mix these together must therefore be absurd; and yet we find this last mixture ordered in almost every receipt for dyeing scarlet. It is also to be observed, that a mixture of different salts ought never to be made, out of a notion that the colour will keep the better on that account; for most commonly it will keep the worse. A single salt will answer for this purpose better than a hundred. A mixture should only be made where it is necessary to produce the colour desired; and if a dyer proceeds in this simple manner, he may not only attain to great perfection in the art from his own experience without being taught by others, but even make considerable discoveries; as dyeing is at present far enough from being brought to perfection.—The salts chiefly to be used in dyeing are fixed alkalies; solutions of tin in the vitriolic and marine acids, and in aqua regia; sugar of lead; cream of tartar; alum; oil of vitriol; and solution of iron in the acetous acid. By means of these, almost all kinds of colours may be dyed at an easy rate, and with very little trouble.

17 Primitive colours in dyeing.

With regard to the operative part of this business, M. Hellot observes, that the whole depends on the use of some colours called by the workmen *primitive*, but which have no relation to the colours called primitive by Sir Isaac Newton. The primitive colours used by dyers are in number five, viz. blue, red, yellow, fawn or root colour, and black. Each of these furnish a great number of shades, both according to the nature of the ingredients themselves, and the acid or alkaline substances with which they are mixed. Of these five colours only two should be prepared with ingredients which produce no colour themselves, but which, by their acidity, and the fineness of the earth they contain, dispose the pores of the substance to receive the dye. Those colours which in a more particular manner require such a preparation are the red and yellow, with such others as are derived from them. Black requires a particular preparation; but blue and fawn colour none, at least for wool; it being sufficient for the purpose to scour and soak this substance well; after which nothing more is required than to plunge it into the vat, stirring it well about, and letting it remain for a longer or shorter time as the colour is intended to be more or less deep.

18 Ingredients used in dyeing blue.

The ingredients used in dyeing blue are by our author determined to be three in number, viz. *pastel*, *woad*, and *indigo*.

Pastel, called in Latin *isatis* or *glastum*, is prepared by gathering it when come to maturity, suffering it to rot, and then making it up into balls for drying. For this purpose it is cultivated in Languedoc, and is made up into balls of 150 or 200 pounds weight. These resemble a collection of little dry lumps of earth intermixed with fibres of plants. For extracting the colour, the dyer must provide himself with large wooden vats of a magnitude proportioned to the quantity of stuff to be used. Mr Hellot recommends them from ten to twelve feet in diameter, and six or seven in height. They should be made of staves six inches broad and two inches thick, bound with iron hoops about two or three feet asunder. They are to be sunk in the ground for the more easy managament of their contents, which is done by means of hooks fastened to the end of a staff, the length of which is proportioned to the diameter of the vat. The bottom is made of lime and cement, though it might be made of wood, were it not for the difficulty of getting a wooden bottom strong enough to support the weight. The vats used for dyeing cottons of a blue colour, as M. de Apligny informs us, are generally formed of large brandy pipes newly emptied, or of oil hogsheads containing about 500 quarts. Before the latter are made use of, they ought to be well cleansed, by slaking lime in them, and scrubbing with a broom till the oily matter is thoroughly dissolved by means of the lime.

19 Preparations of the blue pastel vat.

The preparation of the blue vat is the most difficult operation in the whole art of dyeing; and for this our author gives the following directions: "Your copper cauldron should be placed as near as possible to the vat, and then filled with pond-water. If the water be not sufficiently putrid, you put in a handful of hay, viz. two or three pounds, with eight pounds of brown madder, or the bark of the root. If you could have the old liquor of a madder vat, it would save fresh madder, and have a better effect. The fire should be lighted about three in the morning, and the mixture should boil an hour and a quarter; though some continue the boiling for two hours and an half or three hours. The liquor is now to be conveyed into the vat by means of a spout, the vessel being very clean, and having a hatful of wheaten bran at the bottom. The pastel balls are to be put into the vat one after another while the liquor is running into it, that they may be more easily broken, stirred, and mixed with the rake, an instrument composed of a strong semicircular piece of wood, with a long wooden handle. The mixture should be continually stirred till all the hot liquor is emptied out of the copper into the vat; and when the latter is rather better than half full, it should be covered with a lid a little larger than the circumference. There should also be a cloth put over it, to confine the heat as much as possible; after which the whole should be allowed to remain four hours. It ought then to be uncovered, in order to mix it thoroughly, and to give it air. About an handful of lime ought now to be put in for every ball of pastel; and after scattering in this substance, the vat should again be mixed and covered as before, except about a hand breadth to let in the air. In four hours after it should again be stirred, but without giving it any more lime; then it is to be covered and suffered to stand for three hours longer, leaving a small opening for air as before. At the end of three hours it may again be uncovered and well stirred; and if it be not yet ready and *come to*, according to the language of the dyers, that is, if the blue does not rise to the surface, but that it still foams, which may be known by striking with the flat of the rake, it will be necessary, after stirring it well, to let it stand an hour and an half longer, watching it carefully during that time in case it should cast blue. You then supply it with more water till the vat is full, putting in as much indigo as you think proper.

"The indigo used for this purpose should be in solution; and in order to dissolve it you must have a separate

parate cauldron and furnace, and the vessel sufficient for dissolving 80 or 100 pounds of indigo must contain 30 or 35 buckets of hard water. This should be made into a lixivium, by putting 25 buckets of clear water into the copper with the addition of a hatful of bran, 12 or 13 pounds of madder, and 40 of good pot-ash; that is, half a pound of alkaline salt and two ounces and a half of madder to each pound of indigo. It should boil quickly for three quarters of an hour; after which the fire should be taken away from the furnace, and the residuum stand for half an hour, in order to let the sediment fall to the bottom. The clear liquor is then poured into a clean cask placed close to the copper. Take out the grounds at the bottom of the copper, wash it clean, return the lixivium into the copper, light a small fire under it, and at the same time put into the copper 80 pounds of indigo reduced to a gross powder. The liquor should then be made very hot, but not suffered to boil; and to facilitate the solution, it must be kept continually stirring with a small rake, to prevent it from gathering into lumps, or from burning to the bottom of the copper. The liquor should be kept moderately hot, and of as equal a degree of heat as possible, by throwing into it from time to time some lixivium of lime, which should be at hand ready prepared, in order to cool it. As soon as you perceive that there are no longer any lumps in the bottom of the copper, and that the indigo is well dissolved and diluted, the fire is to be withdrawn from the furnace, leaving only a few hot cinders to keep it warm. Cover up the copper then, and put in a pattern of stuff which ought to be green when taken out, and turn blue immediately on being exposed to the air. Should this not be the case, some fresh and clear lixivium, prepared as just now directed, must be added.

"In preparing the pastel-vats, one common dyehouse kettle full is to be put in for every ball of pastel; the vessel is then to be filled within six fingers breadth of the edge, when it is to be well mixed and covered as before.

"An hour after the vat has been supplied with water, it must have two measures (about two handfuls) of lime for every ball of pastel, or in proportion as it is thought that it will be required; but as some kinds of pastel require much less preparation than others, it is impossible to give any accurate directions upon the subject. In general, however, the lime should not be scattered in till the vat be well stirred.

"Having again covered the vat, a pattern is to be put in at the end of three hours, which should also be kept three hours immersed in the liquor, when it is to be taken out, in order to examine the state of the vat. The pattern, as has already been observed, ought to be green when immediately taken out, but instantly to turn blue; and if it is of a good green, you stir the vat, adding one or two handfuls of lime, and then cover it. Three hours afterwards it is to be stirred again, adding more lime if necessary. Cover it then for an hour and an half longer; and when the matter is settled, immerse a pattern, which must remain for an hour, and then be inspected to know the state of the pastel. If the pattern be of a good green when taken out, and becomes a deep blue when exposed to the air, another pattern is to be put in, in order to ascertain the effect of the vat. Should the colour of the pattern be sufficiently high, the vat is to be filled with hot water, or, if it can be procured, the liquor of an old madder vat, and then stirred again. If the vat wants lime, a sufficient quantity must be added according to the smell, and as it may be found necessary during the working. This being done, and the vat brought to a proper state it is to be once more covered for an hour; after which the stuffs are to be immersed in it."

20 M Hellot's method of preparing a blue vat on a small scale.

This operation is supposed by some dyers to be impracticable, except upon a very large scale; but M. Hellot has made some experiments on this subject, which seem to evince the contrary. For this purpose he took a little barrel containing about 25 gallons, and put it into a copper full of water kept carefully heated. He then put 20 gallons of water into a small copper with an ounce and an half of madder, and a very small handful of dyer's weed; which last, however, he does not suppose to be of any use. Having made the whole to boil together for three hours, he poured all the liquor into the barrel about nine in the evening, previously putting into it two small handfuls of bran. At the same time he added four pounds of pastel; and having stirred it well for a quarter of an hour, he covered it up, and took care to have it stirred every three hours during the night. It is cumstomary to put some sour water into the large vats, but this was omitted in the present case: and the bran, which soured with the liquor, was found to be a sufficient substitute. Next morning the mixture was found to be in a state of fermentation, frothing up and making an hissing noise. On mixing it well, and adding an ounce and an half of slaked lime, the froth was increased; and as the smell became stronger, it was judged proper to add a little more pastel. At half an hour after ten the vat smelt stronger of the lime; a pattern was put into it; and at the expiration of an hour, it was taken out green; and which, on being exposed to the air, became blue. On being stirred, another pattern was put in about an hour afterwards; which having also remained an hour immersed in the liquor, came out afterwards of a deeper blue than the former. At half an hour after twelve two ounces of indigo, not dissolved, but only powdered, sifted and diluted with hot water, were put in, with about the bigness of a walnut of the *cendres gravelees* or burnt lees of wine, which contain a large quantity of alkaline salt; and every two hours afterwards a pattern was put in an hour after stirring the vat, letting each also remain an hour in the liquor. This was continued till ten o'clock and the last patterns were not only evidently darkest, but of the brightest colour.

The last pattern showed that the lime was exhausted; but on account of the lateness of the hour, our author added only another half ounce of lime, and an hour after put in another pattern; which after having remained an hour in the liquor, was taken out more blue than the rest, though the colour had been rendered less lively by the lime. Two other patterns put in during the night were still darker, though the colour was somewhat dull; an evidence that the lime was not yet exhausted. The paste which lay at the bottom was of a yellowish brown when taken out, but by exposure to the air became of an olive green. Under the surface it appeared of the same colour if moved with the hand, but instantly became green, smelling rather strong, though not very much of the lime. The liquor itself

itself was of the colour of beer, but the scum or froth of a blue colour. Patterns were now put in every two hours till two in the afternoon; when that which was taken out appeared of such a fine blue, that it was judged proper to fill the vat. For this purpose about eight gallons of water were put into a little copper with a quarter of an ounce of madder and an handful of bran; and when it had boiled for half an hour, the liquor was put into the little vat for three hours. On stirring and letting it then remain for an hour afterwards, a pattern was put in, which in an hour's time was taken out of a beautiful blue. An ell of serge was then immersed by means of what our author calls a *cross;* which is an iron hoop with a net fastened to it, the meshes of which are about an inch square; and the whole may be suspended at any height required by means of three or four cords fastened to it. The serge had no other preparation than being made thoroughly wet; nevertheless, in about a quarter of an hour it was taken out very green, and on being wrung out turned blue, but on a second immersion for another quarter of an hour the colour turned out much more lively and brighter than could have been expected. The experiment was repeated with a pound of worsted; but the vat had been so much exhausted that it came out only a skye blue; however, by sprinkling in about half an once of fresh lime, the colour was afterwards made sufficiently deep.

21 His directions for working the pastel vat.

For working this vat our author gives the following directions. 1. It is in a proper state for working, *i. e.* for imparting the blue colour to the stuffs put into it, when the sediment or grounds at the bottom is of a fine brown green; when it changes upon being taken out of the vat; when the froth which rises to the top is of a fine Persian blue; and when the pattern, which had been steeped for an hour, is of a fine green colour. 2. The vat is also in a proper state for working when the liquor is clear and reddish, and the drops which adhere to the rake are of a brown colour. 3. When the liquor is neither harsh nor too greasy to the feel, and when it smells neither of lime nor of the lixivium. 4. It may be known when too much lime has been put in, by the colour of the pattern immersed in the liquor; which, instead of being a fine grass green, will be only a dirty greyish blue, or some other colour of that kind. The same thing may likewise be understood when the sediment does not change colour; when there is scarce any efflorescence on the vat; and when the liquor smells only of lime or lixivium.

In order to rectify the state of the vat in this case, several methods have been recommended by practical dyers. 1. Some use tartar or bran, adding a quantity of either as occasion may require. 2. Others attempt to correct it by throwing in a bucket of urine. 3. Sometimes they use a large iron stove, which may reach from the grounds at the bottom to the top of the vat. This machine is furnished with a grate about a foot from the bottom, and an iron funnel, one end of which commences with the grate, and communicates with the external air. On forcing down the stove to the bottom of the vat, where it ought to be retained by iron bars, the heat of the stove will force up the lime to the top, where as much as is required may be taken out by the sieve. 4. Some dyers correct a vat which has got too much lime with urine and tartar: but the best method, according to our author, is to put into it a sufficient quantity of bran and madder; and if the excess of lime is not very great, it may be allowed to stand four, five, or six hours, or more, adding to it two hatfuls of bran and three or four pounds of madder, which should be slightly sprinkled on the top without any covering. At the end of four or five hours it should then be stirred by a rake, and a pattern put in to try the effect of it. If the blue does not rise until it be cold, it ought to have time to recover, by allowing it to stand without disturbance, which sometimes requires whole days to accomplish; but, in general, the lime which seems to want strength to carry on the fermentation, revives and prevents the vat for some time from yielding any colour. To bring it forward, some bran and madder should be sprinkled on the top, besides an addition of two full baskets of fresh pastel, which assists the liquor, when heated again, in dissolving the lime. 5. The vat ought now to be frequently tried by putting in a pattern, that from one hour to another you may be able to judge by the green colour how far the lime has operated. Thus the operation may be accurately conducted; for when the vat has suffered either by too much or too little lime, it is very difficult to manage it. 6. If, during the time that you are thus employed in retrieving the vat, it should cool too fast, you must endeavor to preserve the heat by emptying some of the liquor, and replacing it with hot water; for when the liquor grows cold, neither the pastel nor lime are consumed but in a very small quantity. The action of the lime is also retarded by too great a degree of heat; and in this case it is proper rather to wait a little than to be in too great a hurry to restore the vats. 7. It is evident that the vat has suffered by not being sufficiently supplied with lime, when there are no large air bubbles on the top of a fine blue colour, but only a settled froth of small tarnished bubbles; and when, by dashing upon the surface of it with the rake, it makes a hissing noise produced by the breaking of a vast number of these small air-bubbles as soon as they are formed. The liquor has also an offensive smell like rotten eggs, and the sediment does not change colour when taken out of the liquor. This accident will very probably take place, if you do not carefully attend to the smell of the vat, but imprudently put in the stuffs when the pastel has spent the lime; for in that case the small quantity of lime which remains will adhere to the stuffs, and will thus give them a bad colour. When this is perceived, you must immediately take them out, and add three or four handfuls of lime in proportion to what you suppose the vat has suffered, but without stirring it up from the bottom. On stirring the vat you ought to attend to the noise as well as to the smell; for if the hissing ceases, and the bad smell is also removed, there are great hopes that the liquor only has suffered, and that the pastel is not impoverished. But when the liquor smells of lime, and is soft to the feel, the vat is then to be covered, and allowed to settle for an hour and an half; after which period, if the efflorescence commences, a pattern is to be put in, and the subsequent process is to be regulated by the colour it assumes.

Some are of a opinion that the pastel blue is much superior

ſuperior to that obtained with a mixture of indigo; but it is undoubtedly much dearer, as yielding a much ſmaller quantity of colour: and from the experiments of M. du Fay, as well as of our author on this ſubject, it appears that the prejudice in favour of paſtel is by no means well founded. When a vat has been heated and well worked two or three times, the ſame colour is frequently preſerved, only taking out part of the ſediment, and ſupplying it with freſh paſtel; but for this no directions can be given, as it is evident that the whole muſt be regulated by the practice of the dyer. Some are accuſtomed to allow the ſame liquor to remain for years in their vats, only ſupplying it with ingredients from time to time; but this practice ſeems not to meet our author's approbation, who thinks it rational to ſuppoſe that the beſt colours will be made by emptying the vats entirely when they have been heated ſix or ſeven times, and ceaſe to give any more colour.

22
Danger of reheating a paſtel vat when the lime is exhauſted.

With regard to the reheating of the paſtel vats, our author further obſerves, that if you heat a vat when it is exhauſted, viz. when deficient in lime, it will imperceptibly turn in ſuch a manner as to be in danger of being ſpoiled; becauſe the lime, already too much diminiſhed, will be entirely conſumed by the heat. The only remedy, if diſcovered in time, is to throw it back into the vat, to ſupply it with lime, and then wait till it recovers before you reheat. In this operation alſo care ſhould be taken to put the grounds into the copper with the liquor; and it muſt not be allowed to boil, otherwiſe ſome of the more volatile parts neceſſary for producing a good colour will be evaporated. Some do not put the indigo into the vat until ſome hours after the liquor has been emptied out of the copper, and the mixture begins to recover itſelf. This precaution is taken leſt the vat ſhould not recover, and then the indigo would be loſt. An inconvenience, however, ariſes from this practice, viz. that the indigo does not give out its colour freely; ſo that it is beſt to put it into the vat immediately with the liquor, and to ſtir it well afterwards. If a vat that has not been worked is to be reheated, it muſt not be ſkimmed as in the common operations of this kind; for then the indigo would be ſkimmed off; but in ordinary caſes the ſcum is compoſed of the earthy particles of the indigo and paſtel, with a ſmall quantity of lime. When too much lime is added, you muſt wait till it be conſumed. It might indeed be corrected by an addition of acid or other ingredients; but as theſe alſo conſume the colour, it is better to wait the natural operation of the lime itſelf. Weak lime proves likewiſe diſadvantageous, becauſe it remains in the liquor without incorporating with the paſte. When this is the caſe, the paſte ſmells ſtrong, and the liquor has a kind of ſweetiſh ſmell; but both ought to be alike in this reſpect. The remedy is to haſten the ſolution by ſtirring it often in order to mix the lime with the paſte, till the proper ſmell of the vat be reſtored, and the froth on the ſurface becomes blue.

23
To ſlack lime for the purpoſes of dyeing.

To ſlack the lime for the purpoſe of dyeing, ſeveral pieces are to be thrown into water one after another, taking out each piece when it begins to ferment, and putting in another. It is then put into an empty copper or other veſſel; and when fallen thoroughly into powder, it is to be ſifted through a fine ſieve, and kept in a very dry caſk.

24
Preparation of acid waters.

In this operation acid waters are ſometimes neceſſary; the method of preparing which is as follows: Fill a copper of any ſize with river water; put fire under it; and when it boils, throw it into a caſk in which you had before put a ſufficient quantity of bran. It ſhould be well ſtirred three or four times a-day. Three buſhels of bran into a veſſel containing about 70 gallons of water have been found to anſwer the purpoſe. This water, at the end of four or five days, becomes acid; and therefore may be applied in all caſes where it does not injure the preparation of the worſted. It muſt be obſerved, however, that woollen fleece, by too great a quantity of acid liquor, would be rendered difficult to ſpin, as being in a manner glued together by the matter proceeding from the bran. It is alſo neceſſary to take notice, that the acid muſt not be left in the cauldron, eſpecially if this is made of copper; becauſe it will corrode enough of the metal to occaſion a deficiency in the colour. This metal, when diſſolved gives a greeniſh colour.

25
Construction of Dutch vats.

The Dutch vats are conſtructed in ſuch a manner as to require leſs frequent heating than thoſe above deſcribed. The upper part of them for three feet downward is of copper, and they are almoſt ſurrouned by a brick wall at about the diſtance of ſix or ſeven inches from the metal. A quantity of hot embers are depoſited in this interval, which maintain the heat of the vat ſo effectually, that it remains for ſeveral days in a ſtate fit for working even after it becomes very weak. This is not the caſe with the others, which frequently give a much deeper colour than was intended, unleſs you ſuffer them to grow conſiderably colder; and in that caſe the colour is leſs bright.

26
Of the woad-vat.

The woad-vat differs from that already deſcribed only in being weaker and yielding leſs colour; but it is prepared in the ſame manner. The following is a deſcription of the woad-vat, according to an experiment made by M. Hellot, ſimilar to that concerning the paſtel already mentioned.

"I placed (ſays he) in a cauldron a ſmall caſk containing about twelve gallons, two-thirds full of river-water, an ounce of madder, and a ſmall quantity of weld; at the ſame time I put into the caſk a good handful of bran and five pounds of woad. At five o'clock in the evening the vat was well ſtirred and covered. It was again ſtirred at ſeven, at nine, at twelve, at two, and at four. The woad was then working, as has been already obſerved with regard to the paſtel. Some air bubbles began to riſe pretty large, but in a ſmall quantity, and of a very faint colour. It was then garniſhed with two ounces of lime, and ſtirred. At five o'clock I put in a pattern which I took out at ſix, and again ſtirred. This pattern had received ſome colour. At ſeven o'clock I put in another, and at eight ſtirred again. This pattern was tolerably bright: I then added an ounce of indigo; at nine o'clock another pattern; at ten ſtirred again, and put in an ounce of lime becauſe it began to ſmell ſweetiſh; at eleven another pattern, and at twelve ſtirred again. This proceſs was continued till five o'clock. I then added three ounces of indigo. At ſix I tried another pattern, and at ſeven ſtirred again. It would have been now time to fill it, being in a proper ſtate for

for working, as the last pattern which had been taken out very green became a bright blue: but as I was very much fatigued, having sat up the whole night, I chose to defer it till the next day, in order to see its effect by day-light; and for this reason I added an ounce of lime, sufficient to sustain it till nine o'clock in the morning. Patterns were put in from time to time; and the last being very beautiful, I filled the vat with a liquor composed of water and a small handful of bran only. It was then stirred, and patterns tried every hour. Being in a proper state at five o'clock, it was immediately worked. It was then garnished with lime, and mixed, in order to preserve it till such time as it might be convenient to reheat.

"Two months afterwards I prepared another woad vat without indigo, that I might be enabled to judge of the solidity of the dye; and was convinced, by experiment, that it was of equal goodness with the pastel. Hence the pastel is superior to the woad only because the latter yields less colour than the other.

27 M. Hellot's remarks on the preceding operations.

"The little variations to be observed in the method of setting these different vats, sufficiently demonstrates that there are many circumstances in the several processes not absolutely necessary. In my opinion, the only matter of importance, and which demands attention, is to conduct the fermentation with caution, and to avoid supplying with lime till, from the indications I have described, it appears necessary. With regard to the indigo, whether it be added at twice or all at once, whether a little sooner or a little later, is, I think, of very little importance. The same may be said of the weld, which I used twice, and twice omitted; and likewise of the pearl-ash, a little of which I put into the small pastel vat, and omitted in that of the woad. In short, it appears to me very demonstrable, that the distribution of the lime either in the setting or reheating the vats requires most attention. It must also be observed, that in setting either a pastel or woad vat, it cannot be too frequently examined; because though some are too slow, which is attributed to the weakness of the pastel or woad, others become too soon ready for working. I have seen seventy pounds of pastel lost by this neglect. It was ready for working at eight o'clock, but for want of the workman's constant inspection, he did not discover it till two hours afterwards. The pastel was then entirely risen to the surface of the liquor, which smelt very sour. It was now impossible to recover it; he was therefore obliged to throw it out immediately, or it would very soon become insupportably putrid and fetid.

"This difference in the vat may be also produced by the temperature of the air, as it cools much sooner in winter than in summer. It is therefore necessary to watch very attentively, though it is seldom fit for working in less than 14 or 15 hours.

28 Of the indigo vat.

"The indigo vat (says our author) is about five feet high, two feet in diameter, and grows narrower towards the bottom, being surrounded by a wall, and a vacancy left for the embers. In a vat of this size you may put from two to five or six pounds of indigo. In order to set a vat containing twenty gallons, you boil in a copper about fifteen gallons of river-water for half an hour, with two pounds of pot-ash, two ounces of madder, and a handful of bran. The indigo is prepared mean while in the following manner:

"Take two pounds of indigo, and put it into a pail of cold water, in order to separate the solid from the volatile particles, which will immediately rise to the surface. The water is then poured off, and the remaining indigo pounded in an iron mortar; you then put a little hot water into the mortar, shaking it from side to side, and pouring into another vessel that which swims, and which is consequently the best bruised. In this manner you continue to pound what remains in the mortar, still adding fresh water, in order to make the finest part rise to the surface, and so on till all the indigo is reduced to a powder so fine as to rise in the water, which is all the preparation required. The liquor which had boiled in the copper, with the grounds of the madder and pot-ash, which probably fell to the bottom, is thrown into the high narrow vat; at the same time adding the pounded indigo. The whole is then well stirred with a rake, the vat covered, and the embers put around it. If this operation was begun in the afternoon, you must renew the hot embers in the evening, which should also be repeated both morning and evening the next day: the vat should be lightly stirred twice the second day. In order to maintain the heat of the vat, you renew the embers on the third day, stirring the vat twice. You then perceive, that a shining brassy scum, divided and interrupted in many places, begins to rise on the surface. By continuing the heat, on the fourth day the scum becomes more perfect and less broken. The froth that rises upon stirring is now blue, and the vat a deep green.

"When it becomes green in this manner, it is an indication that the vat should be filled. For this purpose you must prepare a fresh liquor, by putting five gallons of water into a copper, a pound of pot-ash, and half an ounce of madder. When this has boiled a quarter of an hour, you fill the vat. You then stir it; and if it produces much froth, it will be in a proper state for working the next day. This is sufficiently known by the quantity of froth, and by the brassy scaly crust that swims on the top of the liquor; also when, by blowing or stirring it with the hand, the liquor beneath is green, though the surface appears of a brown blue.

"This vat, of which I have just described the process, and the first I had set, was much longer in coming to a colour than the others, because the heat was too strong the second day; but for this accident, it would have been ready for working two days sooner. It was attended with no other bad consequence; and therefore, as soon as it was in a proper state for working, I dipped at several times 30 or 40 pounds of serge. As the liquor was by this means diminished and weakened, it was necessary in the afternoon to replenish with a fresh mixture, composed of a pound of pot-ash, half an ounce of madder, and a handful of bran. Having boiled this a quarter of an hour, it was put into the vat; which was then stirred, covered, and a few embers put round it. In this manner it may be kept for many days; but when you mean to work it, it should be stirred the preceding evening, and supplied with hot embers.

"When

"When you would reheat this kind of vat, and replenish it with indigo, you put into a copper two-thirds of the liquor, now no longer green, but of a brown blue and almost black. When it is ready to boil, the scum on the top should be taken off with a sieve; after which it should be suffered to boil, with the addition of two handfuls of bran, a quarter of a pound of madder, and two pounds of pot-ash. The embers are then taken from under the copper, and a little cold water thrown in to stop the boiling. It is then emptied into the vat, with the addition of a pound of indigo pulverized and dissolved in some of the liquor, as I have said above. The vat being then stirred, covered, and a few hot embers put round it, will be fit for working the next day.

"When an indigo vat has been reheated several times, it should be emptied out entirely and set anew, because the colour becomes dull: for though heated, and in a proper state for working, the green colour is not so beautiful as at the beginning.

"I have had several other vats set in the same manner, with a greater or less quantity of indigo; as from one to six pounds, proportionably increasing or diminishing the other ingredients; always, however, putting a pound of pot-ash to a pound of indigo. From other experiments which I have since made, I am convinced that this proportion was not absolutely necessary. I am also persuaded that there are many other methods for the preparation of the indigo vat equally effectual. I shall nevertheless make some observations concerning this vat.

"Of all those which I have had prepared in this manner, I failed but in one; which was occasioned by neglecting to put hot embers round it on the second day. I added some pulverized arsenic, but without any effect; it would never come to a colour. Red-hot bricks were also thrown into it at several times; the liquor at times became greenish, but never sufficiently. At length, after having to no purpose tried several other means without being able to discover why it did not succeed, and having reheated it several times, I had it thrown out at the fortnight's end.

"The several other accidents which I met with in the conduct of the indigo vat only retarded the success; so that this operation may be considered as very easy in comparison of the pastel or woad vat. I have indeed made several experiments on each of them, with an intent to shorten the time of the preparation; but for the most part not succeeding, or at least not better than by common practice, it is needless to describe them.

29 Differences betwixt the indigo and pastel liquors.

"The liquor of the indigo vat is not in every respect like that of the pastel. Its surface is a brown blue, covered with coppery scales, and the liquor itself of a fine green. The stuff or woollen which it dyes is green when taken out, and becomes blue immediately afterwards. The same observation has been made with regard to the pastel vat, but it is very singular that the liquor of the latter is not green, though it produces the same effect upon woollen as the other. It is also necessary to observe, that when the liquor of the indigo vat is changed out of the vessel, and too long exposed to the air, it loses its green colour, and at the same time all its qualities; so that, though it yields a blue colour, it is not permanent.

30 Cold indigo vat with urine.

"There is likewise a cold preparation of an indigo vat with urine, and it is also worked cold. For this purpose, you take four pounds of indigo powdered, and put it into a gallon of vinegar, leaving it to digest over a slow fire for 24 hours. At the expiration of this time, if it be not perfectly dissolved, it is again pounded in a mortar with the liquor, adding now and then a little urine. You afterwards put into it half a pound of madder, mixing it well by stirring the whole with a stick. When this preparation is finished, you pour it into a cask containing 60 gallons of urine: it is of no consequence whether it be stale or fresh. You mix and stir the whole well together; and this should be repeated morning and evening during the space of eight days, or till the surface of the liquor becomes green when stirred, and produces froth like the common vats. It may be worked immediately without any other preparation than stirring it three or four hours before hand. This kind of vat is extremely convenient; because when it is once prepared, it remains so always till it is entirely exhausted, that is to say, till the indigo has yielded all its colour: hence it may be worked at all times, whereas a common vat must be prepared over night.

"According as you would have this vat more or less considerable, you augment or diminish the ingredients in proportion to your quantity of indigo: thus for every pound of indigo you always put a quart of vinegar, two ounces of madder, and fifteen gallons of urine. This vat is much sooner prepared in summer than in winter. If you would hasten it, you need only take a little of the liquor, heat it in a copper without suffering it to boil, and afterwards pour it into the vat. This operation is so very simple, that it is almost impossible it should fail.

"When the indigo is entirely exhausted, the vat may be renewed by dissolving some fresh indigo in vinegar; but you must add madder in proportion to the quantity of indigo, and then pour it into the vat, which should be stirred as at first, morning and evening: it will be as good as if it were fresh. This, however, should not be repeated more than four or five times; because the grounds of the madder and indigo would tarnish the liquor, which would consequently render the colour less bright. I must however confess, that as I have not myself experienced this vat, I cannot answer for its success: but the following with urine, which I have seen prepared, dyes woollens a very permanent blue.

31 An hot vat with urine.

"A pound of indigo was first steeped in a gallon of urine for 24 hours; it was afterwards ground in a large iron mortar with the same urine. When by this means the urine became very blue, it was strained through a fine sieve into a small tub; but the indigo which remained in the sieve was beaten again in the mortar with another gallon of fresh urine, and this was repeated till all the indigo passed through the sieve with the urine. This operation, which continued two hours, being finished, about four o'clock in the evening 62 gallons of urine were put into a copper, which was made very hot, but without boiling; and the scum which rose on the surface of the urine was brushed off the copper,

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with a beſom. This was frequently repeated till nothing roſe but a ſlight white ſcum. The urine being thus ſufficiently purified and ready to boil, it was thrown into the wooden vat; the prepared indigo was then added, and the vat ſtirred with a rake, in order that the indigo ſhould incorporate with the urine. Immediately afterwards a mixture, conſiſting of a gallon of urine, a pound of alum, and a pound of red tartar, was added to the vat; but theſe were firſt reduced to a fine powder. The urine was then poured out on it in the mortar, and mixed together till it ceaſed to ferment. It was then poured into the vat, well ſtirred, and covered. In this ſituation it was left all night. The next morning the liquor was very green. This ſhowed that the vat was in a proper ſtate, and that it might have been uſed; but it was ſuffered to remain without working, becauſe all that had been hitherto done was only the firſt preparation of the vat, and the indigo which had been put into it was deſigned only to nouriſh and temper the urine. Hence the vat was ſuffered to reſt two days in order to complete the preparation, but covered all the time to prevent it from cooling too faſt. It was then managed as follows: A ſecond pound of indigo was beaten with purified urine as above. About four o'clock in the afternoon the whole vat was emptied into the copper: it was then made very hot, but not boiled. It ſtill produced a thick ſcum, which was taken off; and the liquor, being near boiling, was returned into the vat. The indigo was immediately added, bruiſed as above, with a pound of alum, a pound of tartar, and two quarts of urine, with the addition of another pound of madder: it was then ſtirred, cloſe covered, and ſuffered to remain ſo all night. The next morning it was in very good order; the liquor being very hot, and of a beautiful green: hence it was evidently in a proper ſtate for dyeing; which was executed in the following manner. The ſubſtance to be dyed was woollen fleece.

"This fleece had been well ſcoured with urine, well waſhed, and perfectly well drained. Being thus prepared, 30 pounds of it were put into the vat. It was then well opened with the hands, that it might be equally drenched; and after this it was ſuffered to remain an hour or two according to the degree of ſhade that was required. During this time the vat was kept cloſe covered, in order to preſerve the heat; for the hotter it is, the better it dyes: when it becomes cold, it ceaſes to act. When the wool was ſufficiently blue, it was taken out in large balls, as big as a man's head; and at the ſame time ſqueezed and wrung over the vat, and immediately given to four or five women who ſtood round the vat, in order to open it, and expoſe it to the air between their hands till the green colour which it had coming out of the vat changed to blue. This change was produced in three or four minutes. Theſe 30 pounds being thus dyed, the vat was raked, and then ſuffered to ſtand for two hours, keeping it always cloſe covered. At the expiration of this time they put in another 30 pounds of wool, which was opened well with the hands. The vat was again covered; and in four or five hours this wool had taken as good a colour as the former: it was then taken out of the vat in balls in the ſame manner as the former. This operation being finiſhed, the vat was ſtill warm, but not ſufficiently ſo to dye any more wool; for when it has not a ſufficient degree of heat, the colour which it yields will be neither uniform nor ſolid: hence it is neceſſary to reheat and repleniſh with indigo as before. This may be done as often as you think proper; becauſe this vat never ſpoils by age, provided that while it is kept idle you give it a little air.

"About four o'clock in the afternoon all the liquor was emptied into the copper, with the addition of a ſufficient quantity of urine to replace what had been evaporated and loſt in the preceding work. This generally requires about eight or nine buckets of urine. The copper was then heated, the ſcum taken off as before: when ready to boil, it was returned into the wooden vat. You add to it a pound of indigo, pounded and mixed with urine as above, a pound of alum, a pound of tartar, a pound of madder, and two quarts of urine. After the vat is ſtirred and cloſe covered, it is ſuffered to ſtand all night. It will be in a proper ſtate the next day, and capable of dyeing 60 pounds of wool at twice, as above. In this manner, the reheatings ſhould be always done the day before you want to dye, and may be repeated *ad infinitum*.

"It is neceſſary to obſerve, that the more indigo you put into the vat at once, the deeper the colour: thus inſtead of one pound, you may add four, five, or ſix, without increaſing the quantity of alum, tartar, or madder; but if the vat contains more than three hogſheads, the quantity of the ingredients ſhould be proportionably augmented. That which I have juſt mentioned contained only three hogſheads, and was conſequently too ſmall to dye at one time a ſufficient quantity of wool to make a piece of cloth, *viz.* 55 or 60 pounds. To do this properly, it ſhould contain ſix hogſheads, which would be attended with a double advantage. Firſt, all the wool might be dyed in two or three hours; whereas, by twice dipping, it could not be finiſhed in leſs than eight or ten. Secondly, at the expiration of the three hours, the vat would be ſtill very warm; ſo that, after ſtirring and letting it ſettle for a couple of hours, the ſame wool may be dipped again. By this means the colour is heightened almoſt as much more; becauſe wool once dyed always takes a much better colour than new or white wool, though ſuffered to remain in the vat even for 20 hours.

"It is neceſſary to be very attentive in opening the dyed balls as ſoon as they are taken out of the vat, and expoſing them to the air, in order to change them from green to blue, which ſhould be done by many hands at the ſame time, that they may be equally affected by the air, elſe the blue colour will not be uniform.

"Some manufacturers pretend that cloth, the wool of which had been dyed in this urine vat, cannot be perfectly ſcoured by fulling even at twice; others affirm the contrary, and I believe they are right. Nevertheleſs, if the firſt be right, one would ſuppoſe that the animal oil of the urine was become reſinous by drying on the wool, or that incorporating with the oil by which the wool had been moiſtened for its other preparations, it would be more likely to reſiſt the fuller's earth and ſoap than ſimple oil by expreſſion. To remedy this, it is only neceſſary to waſh the wool

32 Paſtel vats preferable to the above.

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in running water after it has been dyed, expressed, and opened, ungreened, and again cold. Be this as it may, a pastel vat in a large dye-house is preferable to those kinds of indigo vats prepared with urine; because with a good woad-vat and a dexterous woad-man, you expedite more work than could be accomplished with any other blue vat. In mentioning the several indigo vats in this treatise, my design is not so much to introduce them to great manufactories, as to assist those who work at small fabrics; to whom, I flatter myself, this treatise will be equally useful. I will even describe a cold vat for the dyers of small stuffs mixed with thread or cotton, which succeeds very well, but which would be of no use for woollens.

33 Another cold indigo vat.

"In some places they make use of a cold indigo vat, differing from that already mentioned, which is more commodious, as it is much sooner ready, and has no bad smell. It is prepared in the following manner.

"Three pounds of indigo well pulverized, is put into a glazed earthen vessel, and dissolved in three pints of soap-boiler's lixivium, which is a strong solution of fossile alkali with quicklime. I have made use of a solution of pot-ashes, and succeeded very well. The solution of indigo is performed in about 24 hours, as may be easily discovered by its remaining suspended in the liquor, which is thereby thickened, and becomes like an extract. At the same time you put into another vessel three pounds of slacked lime sifted with six quarts of water. The whole should boil during a quarter of an hour, and when settled should be drained off clear. You afterwards dissolve in this lime-water three pounds of green copperas, suffering it to settle till the next day. You then put 75 gallons of water into a large deal cask, the only wood proper for the purpose; as any other, particularly oak, would blacken and tarnish the liquor. The two solutions, which had been prepared the night before, are then added, the vat stirred, and left to settle. I have seen it sometimes take the colour in two hours; but with this vat it was very different, not being ready till very late the next day. It produces a great quantity of froth; and the liquor takes a fine green colour, but a little yellowish, something like the green of the common vat.

"When the vat is almost exhausted, it is replenished and quickened without fresh indigo, by adding to it a small liquor, consisting of two pounds of green copperas dissolved in a sufficient quantity of lime-water. But when the colour of the indigo is quite exhausted, it should be replenished with fresh indigo dissolved in a lixivium, such as I have just described. It is natural to suppose, that the quantity of your other ingredients must be augmented or diminished in proportion to the indigo. Some dyers use a mixture of vinegar and water impregnated with rusty iron. They suppose that the colour is thereby rendered more solid; but I am convinced by experience that there is no necessity for it, and that the colour is as permanent as any of the other blues prepared as I have directed above.

"The first time I prepared this vat, I proceeded according to a receipt sent me from Rouen. The soap-boiler's lixivium was simply denominated *strong water*. I suspected this to proceed either from malice or mistake, nevertheless, as in matters of fact it is unjust to condemn without examination, I tried the common aqua-fortis, which produced the following effect.

34 Effects of aqua-fortis upon indigo.

"I took half a pound of indigo, well powdered, and steeped it in half a pint of common aqua-fortis, made with vitriol and salt-petre: this produced a fermentation. In this situation I left it for 24 hours; and having, as in the preceding operation, dissolved a pound of copperas in some lime water, I poured these two mixtures into a cask containing about 17 gallons of river water. I stirred it well, but there appeared nothing extraordinary the next day. I still continued to stir three times a-day for two days together, and then suffered it to rest for two days more, persuading myself that it was absolutely spoilt. At the expiration of these four days, the liquor became of a red colour, but clearer than the pastel vats. I stirred it once more, and let it stand six days longer: it had then a little froth, but very pale: six days afterwards the surface of the liquor became brown, and underneath a brown green. I stirred again, and fancied that the liquor underneath was still reddish, though the froth which it threw up was of a good colour; I therefore conceived hopes that it would do, and that I should be able to work it the next day.

"At the expiration of sixteen hours I dipped some cotton, which took colour, but so very weak, that I was obliged to let it remain in the liquor several hours, till the blue became sufficiently deep. It then withstood the summer air and sun tolerably well for 12 days; nevertheless, I had the vat thrown out as useless, on account of its tedious operation. Doubtless it might have been recovered with lime, or some other alkali that would have absorbed the acid of the aqua-fortis, but it was not worth the pains. Besides, the answer which I received from the person who sent me the recept from Rouen, contained an explanation with regard to the kind of aqua-fortis that should be used; from which I learnt that it should have been the soap-boiler's lixivium, which, instead of being acid, is one of the most caustic alkalies. In fact, by making use of this alkaline lixivium, the operation was attended with immediate success, and never failed me since.

35 Of dyeing blue in small quantities.

"I tried several of these different vats in miniature in cucurbits, put into a water or sand bath. These last are attended with no difficulty; it is only necessary to diminish the quantity of the liquor, and of every engredient, in proportion to your vat, and it is scarce possible it should not succeed.

"Concerning that which I first described, and which is set hot, as it is attended with a little more difficulty, and several persons may wish to try this operation themselves, being rather curious, and requiring neither expence nor preparation in miniature: I will give the description of a process which succeeded extremely well, and which I purposely supplied with much more indigo than is generally done in the common method.

"I boiled two quarts of water with two drachms of madder, and four ounces of pearl-ashes. When it had boiled a quarter of an hour, I poured it into a cucurbit, containing about a gallon, which was previously heated with hot water, in which I had put a quarter of a handful of bran. The whole being well stirred with a deal spatula, I put my cucurbit into a very

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moderate sand heat, sufficient only to keep it warm, or nearly of the same degree of heat requisite in a common indigo vat.

"I continued the sand heat all night and the next day, without perceiving any alteration. I stirred it only twice during the day with the spatula. The day following it produced an efflorescence, formed a coppery scum on the surface, and the liquor became a brown green. I then filled it with a mixture, composed of a quart of water, two ounces of pearl-ashes, and a little bran. It was well mixed, and then left to settle. It became perfectly well coloured, and the next day I dyed several bits of woollen stuffs. These vats are reheated and replenished with as much ease as a great one.

36 Method of dyeing wool or woollen stuffs in any of these vats.

"After having prepared the vats according to any of the methods abovementioned, the dyeing any kind of woollen stuff is exceedingly easy; no other preparation for the dye being requisite than simple immersion in warm water, wringing them, and then dipping them in the vat for a longer or shorter time according to the deepness of the colour you wish to impart. From time to time the stuff should be opened; that is, taken out and wrung over the vat, and exposing it for a minute or two to the air till it becomes blue; for it must be observed, that in all the solutions of indigo or other materials hitherto described, the blue colour is produced by exposure to the air alone, and the stuff is always taken out green, and will retain that colour if not exposed to the air. In dyeing blue, therefore, it is necessary to let the colour change in this manner before you immerse it a second time, that the shade may be the better distinguished; for dark blues require to be dipped several times, but it is dangerous to make this experiment with light blues. When a large quantity of wool is to be dyed, which cannot be put into the vat all at once, it very often happens that the quantity first put in will take up the deepest dye. To prevent this, some dilute their indigo-vat with a quantity of warm water; but M. Hellot disapproves of this, as being apt to produce a fading colour. The best method, he says, is to dip them when the vat is nearly exhausted; and for this purpose he recommends the pastel-vat rather than any other: and though the colours produced in this manner are less bright than the others, they may be sensibly enlivened by passing the stuffs through boiling water. This, he says, is proper for all blue colours; as it not only renders the dye more fixed and bright, but cleanses the stuffs from accidental impurities. After the work is taken out of the hot water, it is to be rinsed in a running stream. It will be still more proper to full a dark blue stuff well with soap and water, and afterwards to rinse it in running water; for the soap will be so far from injuring the colour, that it will thereby be rendered more bright and lively. Some dyers, in order to save the dearer ingredients of pastel or indigo, make use of logwood; but this is by no means allowable, as the colour, though rather brighter than that of indigo, is exceedingly perishable. In 1748, M. Macquer of the Royal Academy of Sciences discovered a method of dyeing silk and cloth with a preparation of Prussian blue, superior to all the blues hitherto discovered. This, however, has never yet come into practice, nor is it at all probable that the colour of this pigment can ever be made to stand washing with soap. In all the methods in which we could try the experiment, it could not even bear washing with plain water. Indeed, when we consider the great volatility of the colouring matter of Prussian blue, that it can only be fixed by iron, and that any alkaline matter will instantly disengage it, and make it resume its former volatility, there can be but very little hope of overcoming the difficulties which attend the process."

37 M. Macquer's method of dyeing silk of a blue colour.

Having been so particular with regard to the preparation of the materials and method of dyeing wool, we need say the less concerning the method of dyeing silk or cotton. The following composition is recommended by M. Macquer. "To eight pounds of the finest indigo add six of the best pearl-ash, from three to four ounces of madder for every pound of ashes, besides eight pounds of bran, washed in several waters to take out the flour. When washed, and most of the water squeezed out, it is placed alone at the bottom of the vat. The pearl-ash and the madder are then mixed, bruising them thoroughly together, and then boiling them for a quarter of an hour in a copper containing two-thirds of the vat; the liquor is then suffered to rest, and the door of the furnace shut.

"Two or three days previous to this, eight pounds of indigo are steeped in a bucket of warm water, washing it well, and even changing the water, which has a reddish cast. Some begin with boiling the indigo in a ley of one pound of pearl-ash with two buckets of water; after which they pound it while quite wet in a mortar; then while it is in a paste, they fill the mortar with hot liquor which has been boiled before; letting it stand to settle for a short time, and then pouring off the clear into a separate boiler or into the vat. The same quantity of the mixture is then poured on the indigo which remained in the mortar, bruising and mixing it well, and then as before pouring it off into the boiler; which operation is repeated till the whole of the indigo is thus dissolved in the liquor. That in the boiler is gradually poured into the vat upon the bran in the bottom, adding afterwards the remainder of the composition, grounds and all. After stirring and raking for some time, it is let stand, but without fire, till it becomes cool enough for the hand to bear. After this a little fire is to be put round the vat, only to preserve the same degree of heat; and this should be continued till the liquor becomes green, which is easily known by trying it with a little white silk. This shows that the vat is in a proper state; but in order to be ascertained of this, it will be necessary from time to time to stir it with a rake, when the brown and coppery scum which appears upon it after standing for a little time shows that it is in a proper state for working. Even in this case it is necessary to behave with the utmost caution, and to observe whether on blowing aside the coppery scum just mentioned a fresh one appears or not; for if it does not, it is a sign that the vat is not yet ready. If the scum appears, it must stand three or four hours, when a new composition is made to complete it. For this purpose, as much water as is necessary to fill the vat is put into a copper, boiling it with two pounds of ashes and four ounces of madder as at first. This new liquor is poured into the vat, raked and mixed, and then left to stand for four hours, when it is ready for dyeing.

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The method of preparing ſilk for the blue dye is by boiling with ſoap, uſing 35 or 40 pounds of the latter to 100 of the former; but no impregnation with alum is required. Before dipping it in the vat, however, it ſhould be waſhed from the ſoap; and to cleanſe it more effectually, it ought to be twice beetled at the river, having been divided into hanks for the conveniency of wringing. After being dipped in the vat, it is to be wrung as hard as poſſible, and then opened out to the air, to give it the blue colour, as directed for wool; it ſhould then be immediately waſhed in two waters, and well wrung out again. Laſtly, it is to be dried as quickly as poſſible; cutting the thread which ties it, if the hanks are large, becauſe if kept tied it frequently turns red under the thread.

Silk dyed as above directed is apt to take the blue very unequally, and will moſt certainly do ſo, if not waſhed and dried immediately after dyeing. Fine dry weather is always beſt for theſe operations; for ſhould water accidentally fall upon it, it would be full of reddiſh ſpots. In moiſt weather, therefore, and during the winter, a room with a ſtove will be neceſſary. Different ſhades of blue are produced by dipping that firſt which is intended for the darkeſt colour.

38 **Of dyeing cotton or linen blue.**

The method of dyeing cotton or linen blue is ſo little different from that already deſcribed with regard to woollen or ſilk, that nothing farther needs be ſaid concerning it; only the colour upon cotton is generally leſs bright. M. de Apligny indeed tells us, that he has diſcovered a method of dyeing cotton velvets of a moſt beautiful and durable blue: but as he does not chooſe to communicate it, nothing can be ſaid on the ſubject. In the former edition of this work, a receipt was given for dyeing cotton of a very good blue colour, and which, as being inſtantaneouſly done, may occaſionally be uſeful. The indigo is diſſolved in a mixture of lime and pot-aſh (probably the pure cauſtic lixivium would anſwer fully as well); and after it is diſſolved, ſome raiſins beat into a pulp in a braſs or marble mortar are to be added. This very ſoon produces a copper-coloured ſcum at top: and the cotton being now dipped into the liquor receives the colour in an inſtant. Linen may be dyed in the ſame manner.

39 **Of dyeing red colours.**

The next of the primitive colours to be conſidered is red; of which there are many varieties: but the principal are ſcarlet, crimſon, and madder red. The dyeing of theſe colours differs conſiderably from that of the blues, becauſe they require a previous preparation in the ſtuffs to be dyed; and it is on this preparation that the goodneſs of the colour very often depends. Theſe preparations are generally alum, tartar, aquafortis, aqua-regis, or ſolution of tin in theſe acids. Galls and alkaline ſalts are alſo ſometimes added, tho' they do not of themſelves contribute any thing to the colour.

40 **Venetian ſcarlet.**

There are three kinds of ſcarlet, viz. that dyed with kermes, with cochineal, and with gum-lac. The firſt, called *Venetian ſcarlet*, is the leaſt bright, but more permanent, and leſs apt to be ſpotted than the others; inſomuch that in ſome pieces of tapeſtry done with this at Bruxelles in Flanders, it has ſcarce loſt any of its vivacity in 200 years. However, it is ſcarce ever uſed except for tapeſtry, and is dyed in the following manner, according to Mr Hellot.

"The wool ſhould be firſt drenched; for which purpoſe you put half a buſhel of bran into a copper, with a quantity of water ſufficient for 20 pounds of wool, which to the beſt of my knowledge is the uſual batch for one dyeing. In this liquor it ſhould boil for half an hour, ſtirring it from time to time; after which it is taken out and drained. I ſhall obſerve, once for all, that when you dye worſted, you put a rod through each ſkein, which commonly weighs about a pound, and which ſhould be kept on the rod during the whole proceſs, by which means the ſkein is prevented from tangling. It is alſo convenient for turning the ſkein, in order to dip each part, that the whole may be equally coloured; for which purpoſe, you raiſe it about half way out of the liquor; and holding the rod with one hand, you pull the ſkein with the other, ſo as to let the part which before was next the rod fall into the liquor. If the worſted ſhould be too hot for the fingers, it may be done by means of another rod. The equality of the colour depends ſo entirely upon the frequency of this manœuvre, that it cannot be too ſtrenuouſly urged. In order to drain them, you reſt the ends of the rods juſt mentioned on two poles; which ſhould be fixed in the wall over the copper.

"While the worſted is draining, after being thus drenched, you prepare a freſh liquor, viz. by throwing out what remained in the copper, and repleniſhing with freſh water; to this you add about a fifth part ſour water, four pounds of Roman alum groſsly pounded, and two pounds of red tartar. As ſoon as it boils, the worſted on the rods ſhould be immerſed for two hours, almoſt continually moving the rods, one after another, as I have before directed.

"It is neceſſary to obſerve, that after the alum is put in, when the liquor is ready to boil, it will ſometimes riſe ſuddenly out of the copper, if you do not mind to check the boiling by throwing in cold water. If, when it is ready to boil, you put in the cold worſted quickly, it will have the ſame effect. It is alſo proper to obſerve, that when dyers work in the great, they ſhould have their legs bare, that the hot liquor may not reſt in the ſtockings. When the quantity of tartar is rather conſiderable, as in the preſent operation, the liquor does not riſe ſo high: but when there is nothing beſides the alum, ſometimes, when it begins to boil, half of the liquor boils over, unleſs prevented by the above precautions.

"When the worſted has boiled in this liquor for two hours, drained, lightly ſqueezed, and put into a linen bag, it is depoſited in a cool place for five or ſix days, and ſometimes longer; this is called *leaving the worſted in the preparation*. This delay helps it to penetrate, and increaſes the action of the ſalts; for as a part of the liquor conſtantly evaporates, it is clear that what remains, being more impregnated with the ſaline particles, becomes more active, that is to ſay, provided there remains a ſufficient degree of moiſture; for the ſalts being once cryſtallized and dry, their power is deſtroyed.

"When the worſteds have remained in this ſtate for five or ſix days, they are then in a proper condition for being dyed. A freſh liquor is then prepared, according to the quantity of the worſted; and when it grows warm, if you want a full ſcarlet, you throw into it 12 ounces of pounded kermes to every pound of worſted; but if the kermes be ſtale, it will require pound for pound.

pound. When the liquor begins to boil, the worsted should be put in, being still moist; but if it has been suffered to grow dry after boiling, it should be put into warm water, and well drained.

"Before you put the wool into the copper with the kermes, it were advisible to throw in a small handful of refuse wool, which, being boiled for a moment, imbibes a part of the blackness and dross of the kermes; so that the wool afterwards dyed takes a much more beautiful colour. You now dip the skeins on the rods in the same manner as in the preparation, continually stirring them, and giving them air, from time to time one after another. In this manner they should be kept boiling for a full hour. They are then washed and drained.

"If you would reap any advantage from the dye still remaining in the liquor, you may dip a little prepared wool, which will take a colour in proportion to the goodness of the kermes, and to the quantity which had been put into the copper.

"If you mean to dye a number of shades, one darker than another, you require much less of the kermes; 7 or 8 pounds being sufficient for 20 pounds of prepared wool. You then dip the quantity of worsted intended for the lightest shade, leaving it in the copper no longer than necessary, in order to turn it, that it may imbibe the colour equally. It is then raised upon the pegs, and the next shade immediately put in and suffered to remain for a longer time. You proceed in this manner to the last shade, which should also remain till it has acquired the colour you desire.

"You begin with the lightest colour, because if the wool was suffered to remain in the copper longer than necessary, it would be no loss, provided you reserve this batch for the darker shade: whereas, by beginning with the darkest, you would have no remedy in case of any accidental skip in the light shades. The same precaution is necessary in regular shades of all colours; but of the colour in question these are seldom made, because the dark shades are not much in use: and as the operation for all colours is the same, what I have said respecting this will answer for all the rest.

"When the wool has been dyed in this manner, and before it is carried to the river, you may swill it in warm water, with a small quantity of soap, well dissolved; this adds a brightness to the colour; but, at the same time, gives it a little of the rose, that is to say, a crimson tinct.

"In order to render this colour more bright and beautiful than common, I have tried a great number of experiments, but could not obtain a red equal to that produced by cochineal. Of all the liquors for the preparation of wool, that which succeeded the best was made according to the proportions I have mentioned. By changing the natural tinge of the kermes, by various kinds of ingredients, metallic solutions, &c. various colours may be obtained, which I shall presently mention.

"It is impossible to prescribe any proportions for an ell of stuff, considering the infinite variety of their breadth, and even of their thickness, and the quantity of wool in their fabrication; experience is the best guide. Nevertheless, if you chuse to be exact, the surest way is to weigh the stuff to be dyed, and to diminish about one quarter of the colouring ingredients prescribed for worsteds; because the stuffs take internally less colour, as their texture, being closer, prevents it from penetrating; whereas the worsted or woollen fleece takes the colour internally as easily as on the exterior surface.

"The alum and tartar, used in the preparation for stuffs, should also be diminished in the same proportion; neither is it necessary to let the stuffs remain in the preparation as long as the worsted: they may be dyed even the day after they had been boiled.

"Woollen fleece dyed in the red of kermes, and to be afterwards incorporated in mixed cloth, or for the manufactory of thick cloths, will have a much finer effect than if dyed with madder.

"A mixture of half kermes and half madder, is called *scarlet in half-grain*. This mixture gives a colour extremely permanent; but not so lively, inclining rather to a blood colour. It is prepared and worked precisely in the same manner as if kermes alone were used; only that in the liquor they put but half this grain, the other half is supplied by madder. This is consequently much cheaper; and it frequently happens that the dyers who make it, render it much less beautiful than it might be, by diminishing the quantity of the kermes and increasing that of the madder. 41 Half-grain scarlet.

"From the trials made on scarlet in grain, or scarlet of kermes, both by exposing it to the sun and by various liquors, it is proved that there does not exist a better nor a more lasting colour. It may for solidity be compared to the blues already mentioned. Nevertheless, the kermes is scarce ever used except at Venice; for since the fiery scarlets are become the taste, this colour is almost entirely exploded. It has, notwithstanding, many advantages over the other, as it neither blackens nor spots; so that should the stuff get greased, the spot may be taken out without impairing the colour. Nevertheless, kermes is so little known to the dyers, that when I wanted a certain quantity for the above experiments, I was obliged to have it from Languedoc; the merchants of Paris encumber themselves with no more than what they vend for the use of medicine."

The second kind of scarlet, viz. that dyed with cochineal, is much more expensive and less permanent than the other. For inferior uses, such as tapestry, the colour is sometimes partly done with Brasil wood; but this colour cannot be made equally permanent with cochineal: and it is remarkable, that in whatever manner these fugitive colours be mixed with permanent ones, the latter never convey to them any portion of their durability, but, on the contrary, both go off together. The true cochineal scarlet is very difficult to dye in perfection, and almost every dyer has a receipt of his own for the purpose. The success of the whole operation, however, according to Mr Hellot, depends upon the choice of the cochineal, the water used for dyeing, and the method of preparing the solution of tin, which is now universally known to be the only ingredient by which a scarlet colour can certainly be produced. The following is his receipt for the preparation of this liquid, which from his own experience he gives as the best. To eight ounces of spirit of nitre add as much river water, dissolve in the mixture gradually half an ounce of very white sal-ammoniac, in 42 Cochineal scarlet.

in order to make an aqua regis, to which add two drachms of purified salt-petre. This last ingredient, he owns, might be omitted; but he is persuaded that the use of it contributes to make the colour more uniform. In the liquor thus prepared dissolve an ounce of English tin reduced into grains by dropping it, when melted, into a bason of cold water. These are to be dropped into the liquor one by one, waiting for the dissolution of the first before we add a second, in order to preserve a quantity of red vapours, which are the phlogisticated nitrous acid; and to the mixture of which he supposes the beauty of the colour is partly owing. The solution prepared in this manner is of the colour of solution of gold: and if fine tin be made use of, there is neither black dust nor sediment of any kind to be seen in it; but though transparent when just made, it is apt to become milky with the heats of summer; which, however, is no detriment to it in our author's opinion: and it is certainly just, if the transparency returns with the coolness of the solution. The aquafortis or spirit of nitre used for this purpose ought to be such as will dissolve half its weight of silver: and by following this method you will always be certain of having a composition of an equal strength; so that any slight difference which may arise from the quality of the cochineal will scarce be perceived. A weak solution makes the scarlet incline towards crimson, and a strong one towards orange.

43 Preparation of worsted for the scarlet dye.

When worsted is to be prepared for the scarlet dye, the following operation is necessary. For every pound of the stuff, ten gallons of clear river water are to be put into a small copper; and when it becomes pretty hot, two ounces of cream of tartar, and a drachm and an half of cochineal, both finely sifted, are to be added. A brisk fire is to be kept up; and when the liquor is ready to boil, two ounces of the composition already described must be added, by which the liquor is immediately changed from crimson to blood colour. As soon as it begins to boil, the worsted previously steeped in hot water, and then expressed, is to be added. It must be suffered to boil for an hour and an half; after which it is taken out, gently squeezed, and washed in cold water, having taken care to stir it constantly all the time. It will now be a tolerable flesh colour, or even somewhat darker, according to the goodness of the cochineal and the strength of the solution of tin; but the colour will be so totally absorbed by the stuff, that the remaining liquid will be almost as colourless as water. This is called the *scarlet boiling*; and without this the dye would not hold. To finish the dye there must be another preparation of very clear water, the goodness of this being of the utmost consequence to the goodness of the colour. In this preparation, along with the other ingredients, there must be half an ounce of starch; and when the liquor is pretty hot, six drachms and an half of cochineal, likewise finely powdered, is to be added. A little before it boils, two ounces of the solution of tin are put in; but which, as in the former case, the colour is instantaneously changed. As soon as it begins to bubble, the worsted is to be dipped, allowed to boil an hour and an half, stirring it all the time, and then washing it as already directed. An ounce of cochineal will be sufficient to give a proper depth of colour to a pound of wool; a drachm or two more might be added, if you would have the colour very deep, but if it be much enlarged, the dye will turn out very dull.

44 Proper material for the cauldron.

In dyeing the scarlet colour, the material of which the cauldron is made is by no means a matter of small consequence. On this our author has the following observations. Their cauldrons in Languedoc are made of fine tin. They are also used by several dyers at Paris; but Mr Julienne, whose scarlet is very highly esteemed, makes use of brass cauldrons. These are also used in the dyeing manufactory of St Dennis. Mr Julienne is careful only to suspend a large pack-thread net, with pretty small meshes, in his cauldron, to prevent the stuff from touching. At St Dennis, instead of a net they use a large open wicker basket; but this is less convenient than the net, because it requires a man at each side of the copper to keep it even, and to prevent it, when loaded with the stuff, from rising to the surface of the liquor.

45 Experiment of M. Hellot on this subject.

"This practice, so different with regard to the materials of the cauldron, determined me to make an experiment. I took two ells of white Sedan cloth, which I dyed in two cauldrons, one of copper, furnished with a pack-thread net, and another of tin. I weighed the cochineal, the composition, and other ingredients, with as much accuracy as possible. They boiled exactly the same time. In short, I was sufficiently attentive to make the operation the same in every particular; that in case of any perceptible difference it could only be attributed to the different materials of the cauldrons. At the first boiling, the two patterns were absolutely alike except that the piece done in the tin cauldron was rather more marbled, and not quite so even as the other; but this in all probability might be occasioned by their not having been equally cleansed at the mill. I finished each piece in its proper cauldron, and they were both of them very beautiful. Nevertheless, it was very evident that the cloth which had been dyed in the tin was more fiery and the other rather more crimsoned. They might have been easily brought to the same shade; but this was not my object. From this experiment, it appears that, with a copper cauldron, the quantity of the composition should be increased; but then the cloth grows harsh to the feel. Those who dye in copper, to prevent this evil add a little of the turmerick, which is a drug only used for false colours, and therefore prohibited by the regulations to dyers in grain, but which gives scarlet that dazzling fiery colour so much the fashion at present. It is, however, if you have any suspicion, easy to discover the deception, by cutting the pattern with a pair of scissars. If it has no turmerick, the cut edge will appear white, otherwise it will be yellow. When the close texture is equally dyed with the superficies, let the colour be what it will, they say the colour *cuts*, and the contrary when the middle of the texture remains white. Legitimate scarlet never cuts. I call it *legitimate*, and the other false, because that with the addition of the turmerick is more liable to fade. But as the taste for colours is so variable, as the bright scarlets are at present the mode, and as it is necessary, in order to please the buyer, that it should have a yellow cast, it were better to authorise the use of the turmerick, though a a false colour, than to allow too large a quantity of the composition, by which the cloth is injured, being more liable not only to dirt, but also to tear, as the fibres of the wool are rendered brittle by the acid.

"I must also add, that a copper cauldron should be kept extremely clean. I have myself frequently failed in scarlet patterns by neglecting to clean the cauldron. I cannot in this place forbear condemning the practice even of some eminent dyers, who at about six o'clock in the evening make their preparation in a copper cauldron; and, in order to gain time, keep it hot till day-light the next morning, when they dip their stuffs. The preparation must undoubtedly corrode the copper during the night; and consequently, by introducing coppery particles into the cloth, injure the scarlet. They will tell us that they do not put in the composition till immediately before the cloth is dipped: but this is no apology; for the cream of tartar added on the preceding evening being sufficiently acid to corrode the copper, forms a verdigris which dissolves, it is true, as soon as it is formed, but which nevertheless produces the same effect.

46 How to preserve a tin cauldron from melting.

"As tin is absolutely necessary in the scarlet dye, it were much better to have a cauldron of this metal, which would infallibly contribute to the beauty of the colour. But the price of these cauldrons, if sufficiently large, is an object of consideration, especially as they may melt in the first operation if not carefully attended to by the workmen. Besides, it would be very difficult to cast a vessel of so large a size without flaws that would require to be filled. It is absolutely necessary that they be made of block tin. If the flaws should be filled with solder, which contains a mixture of lead, many parts of the cauldron will retain the lead; which being corroded by the acid composition will tarnish the scarlet. Hence there are inconveniences in every particular: nevertheless, if it were possible to procure a skilful workman capable of casting a cauldron of the Melac tin without flaw, it were certainly preferable to every other; for though the acid of the composition should in some parts corrode it, the detached particles will do no harm, as I have already observed.

"There is no danger of melting a tin cauldron, but when it is emptied in order to fill it with a fresh liquor. I shall therefore add the precautions necessary to prevent this evil. In the first place, the fire should be taken entirely from the furnace, and the remaining embers quenched with water. Part of the liquor should then be taken out with a bucket, while the remainder should be dashed about with a shovel by another person, in order to keep the upper part of the cauldron continually moist, at the same time cooling what remains in the cauldron with cold water. In this manner it should be continued till you can touch the bottom without being burnt. It should then be entirely emptied, and all the sediment taken up with a moist spunge. This attention will preserve your cauldron.

47 Why wool in fleece is never dyed scarlet.

"Woollens are never dyed scarlet in the fleece, for the two following reasons: The first is, or ought, to regard all stuffs of simply one colour; those of many colours are called *mixed stuffs*. These kind of stuffs are never dyed in the wool, especially when the colours are bright and fine; because, in the course of the fabrication, the spinning, twisting, or weaving, it would be almost impossible to prevent some white or other coloured wool from mixing, which though ever so trifling would injure the stuff. For which reason, reds, blues, yellows, greens, or any of those unmixed colours, should not be dyed till after they have been manufactured. The second reason is peculiar to scarlet, or rather to the cochineal, which being heightened by an acid, cannot stand the fulling without losing much of its colour, or being at least excessively crimsoned. For the soap which contains an alkaline salt destroys the vivacity produced by the acids. Hence it is evident that neither cloth nor stuffs should be dyed scarlet till they have been fulled and dressed.

"To dye different pieces of cloth at the same time, the directions already given do not entirely answer.

48 Directions for dyeing different pieces of cloth at the same time.

"For example, in order to dye five pieces of Carcassionne cloth at the same time, each piece five quarters broad, and fifteen or sixteen ells in length, it is necessary to observe the following proportions: You begin by making the composition in a very different manner from the preceding process, *viz.* twelve pounds of aquafortis put into a stone jar or glazed vessel, with twenty-four pounds of water, and one pound and an half of tin grains added. The solution goes on more or less slow according to the acidity of the aquafortis, and should stand for twelve hours at least. During this time a kind of blackish dirt falls to the bottom; the top should be then drained off the sediment: this liquor is of a clear lemon colour, and is preserved by itself. This process evidently differs from the first by the quantity of water mixed with the aquafortis, and by the small portion of tin, of which scarce any remains in the liquor; for the aquafortis not being in itself a solvent for tin, only corrodes and reduces it to a calx, provided neither saltpetre nor sal ammoniac be added, which would convert it into an aqua regia. The effect of this composition is not, however, different from others, and is perceptible to those who from experience are competent judges of this colour. The composition without sal ammoniac has been for a long time used by the manufacturers of Carcassionne, who doubtless imagined that its effect was owing to a supposed sulphur of tin, and may be preserved from putrefaction for thirty hours in winter and only twenty four in summer. It then grows turbid, forms a cloud which falls to the bottom of the vessel in a white sediment. This sediment is a small portion of the tin, which was suspended in an acid not prepared for the solution. The composition, which ought to be yellow, becomes clear as water; and if employed in this state never succeeds, but produces the same effect as if it had been milky.

"When the composition is prepared, as I have now described, according to M. de Fondieres, you put, for the quantity of cloth last mentioned, about sixty cubic feet of water into a large copper; when the water grows warm, you add a sackful of bran: it is sometimes necessary to use sour water; they will either of them do, as they say, to correct the water, *viz.* to absorb the terreous and alkaline substances, which crimson the tinge of the cochineal. We should be well informed concerning the nature of the water employed, in order to know whether these correctives be necessary.

"Be

" Be it as it may, when the water is a little more than warm, you add ten pounds of cryſtals or cream of tartar pulveriſed, that is to ſay, two pounds to each piece of cloth. The liquor ſhould be then violently ſtirred; and, when rather hot, you ſhould put into it half a pound of the powder of cochineal, mixing it well together, and immediately afterwards you pour into it twenty-ſeven pounds of the compoſition, very clear, which alſo requires to be well ſtirred. As ſoon as it begins to boil, the cloth being immerſed, ſhould boil very faſt for two hours, and during that time ſhould be kept in continued motion on the wynch, and when taken out paſſing it through the hands by the liſting, in order to open and give it air. It is afterwards carried to the river and well waſhed.

49
Method of ſtirring the cloth.

" In order perfectly to underſtand the method of ſtirring the cloth, it is requiſite to obſerve, that a kind of reel or wynch, with a handle for turning, ſhould be placed horizontally on the iron hooks which are fixed in the felloes that ſupport the edge of the cauldron. You firſt join the ſeveral ends of each piece of ſtuff to be dyed at the ſame time; and as ſoon as they are immerſed, you carefully keep the end of the firſt piece in your hand; you then lay it on the reel, which ſhould be turned till the end of the laſt piece appears. It is then turned the contrary way, and in this manner every piece will be dyed as even as poſſible.

" When the cloth has been well waſhed, the cauldron ſhould be emptied, freſh liquor prepared, to which you muſt add, if neceſſary, a ſack of bran or ſome ſour water; but if the quality of the water be very good, there is no occaſion for any addition. When the liquor is ready to boil, you put in eight pounds and a quarter of cochineal pulveriſed and ſifted. The whole is then mixed together as even as poſſible; but when you ceaſe to ſtir, you muſt mind when the cochineal riſes to the ſurface, forming a kind of ſcum of the colour of lees of wine. As ſoon as this ſcum begins to divide, you pour in eighteen or twenty pounds of the compoſition. You ſhould have a veſſel full of cold water near the cauldron ready to throw in, leſt after putting in the compoſition it ſhould riſe above the edge, as is ſometimes the caſe.

" When the compoſition is put into the copper, and the whole well mixed, you turn the wynch quick for two or three turns, that every piece may imbibe the cochineal equally. It is then turned more ſlowly, in order to let the water boil. It ſhould boil very faſt for two hours, conſtantly turning and keeping the cloth down with a ſtick. The cloth is then taken out, and paſſed through the hands by the liſting, in order to give it air and to cool it; it is afterwards waſhed at the river, dryed, and dreſſed.

" There is a conſiderable advantage in having a great quantity of ſtuff to dye at the ſame time; as for example, when the five firſt pieces are finiſhed there remains a certain quantity of the cochineal, which, ſuppoſing ſeven pounds at firſt, might amount to twelve ounces; ſo that cloth put into this ſecond liquor will imbibe the ſame ſhade of roſe-colour as if you had coloured a freſh liquor with twelve ounces of cochineal. The quantity remaining may, however, vary very much according to the quality of the cochineal, or according to the fineneſs of the powder. Though the quantity of colour remaining in the liquor may be very inconſiderable, it nevertheleſs deſerves attention on account of the dearneſs of this drug. Of this liquor, therefore, a preparation may be made for five pieces of cloth; and it will require leſs of the cochineal and leſs of the compoſition, in proportion, as near as you can gueſs, to the quantity remaining in the liquor. This is alſo a ſaving of fuel and time; but it is impoſſible to give poſitive directions concerning this manœuvre, which muſt be left to the ingenuity of the dyer; for having dyed roſe-colour after the ſcarlet, you may make a third preparation, which will dye a fleſh-colour. If there is not time to make theſe two or three preparations in 24 hours, the liquor ſpoils: ſome dyers put Roman alum into the liquor to prevent it from ſpoiling; but this changes it to a crimſon.

50
Scarlets crimſoned by alum.

" Scarlets thus crimſoned in the ſame liquor in which they had been dyed, are never ſo bright as thoſe done in a freſh liquor. Drugs which reciprocally deſtroy each other's effect are more efficacious when employed in ſucceſſion.

" When you dye cloth of different qualities, or any kind of ſtuffs, the beſt method is to weigh them, and for every hundred pound to allow about ſix pounds of cryſtals or cream of tartar, eighteen pounds of the compoſition in the preparation, the ſame quantity in the completion, and in each of them ſix pounds and a quarter of cochineal. For the accommodation of thoſe who would make ſmall experiments, the whole may be reduced, viz. one ounce of cream of tartar, ſix ounces of the compoſition, and an ounce of cochineal for every pound of ſtuff. Some of the Paris dyers ſucceed very well by putting two-thirds of the compoſition and a quarter of the cochineal in the preparation, and the remaining third of the compoſition, and the other three-quarters of the cochineal, to the completion.

" It is not the cuſtom to put cryſtal of tartars in the finiſh: I am however convinced by experience that it does no harm, provided that at moſt you put but half the weight of the cochineal; and in my opinion it made the colour rather more permanent. There have been dyers who have died ſcarlet at three times: in this caſe they had two preparations, and afterwards the finiſh; but they always uſed the ſame quantity of drugs."

We have already obſerved, that the kermes were ſo little uſed for brown or Venetian ſcarlets, that theſe kind of colours were made with cochineal. For this purpoſe the preparation is made as uſual; as for the dyeing they add to the liquor eight pounds of alum to every hundred weight of ſtuff. This alum is diſſolved in a ſeparate cauldron with a ſufficient quantity of water: it is thrown into the liquor before the cochineal. The remainder is done preciſely the ſame as in common ſcarlet: it gives the cloth the colour of Venetian ſcarlet; but it is not by any means ſo permanent as the colour obtained from kermes.

There are no alkaline ſalts that do not crimſon ſcarlet; but it is more generally the cuſtom to uſe alum, becauſe theſe alkaline ſalts are no addition to the permanency of the colour, and may poſſibly injure the ſtuffs, becauſe all animal ſubſtances are diſſolved by fixed alkalies. The alum, by being deprived of its phlegm by calcination, will more certainly crimſon. The liquor which had been uſed for crimſoning is red,

and

and ſtill redder in proportion as the ſcarlet is more crimſoned, ſo that the colours part with much of their baſis in the liquor by which they are darkened. It is, however, impoſſible to darken in grain without ſalts. The late Mr Barron, in a memoir which he preſented to the Royal Academy of Sciences 12 or 15 years ago, remarks, that he ſucceeded better with the ſalt of urine, than with any other ſalt, for uniting the colour and preſerving its brightneſs and fulneſs; but as he obſerved, it is very inconvenient to make any quantity of this ſalt.

51 Quality of the water uſed in ſcarlet of great importance.

It has been obſerved, that the choice of the water for dyeing ſcarlet was of importance; the greateſt part of the common waters ſadden, becauſe they almoſt always contain a quantity of ſtony or calcareous earth, and ſometimes of ſulphureous or vitriolic acid. Theſe are commonly called hard waters; by this term they mean water that will not diſſolve ſoap, and in which it is not eaſy to dreſs vegetables. By abſorbing or precipitating theſe heterogeneous ſubſtances, all waters are rendered equally good. If the matter be alkaline a little ſour water will produce this effect. Five or ſix cubic feet of this ſour water, added to 60 or 70 cubic feet of other water before it has boiled, will cauſe the alkaline earth to riſe in a ſcum which may be eaſily taken off the liquor. A ſack full of any kind of white mucilaginous root cut in ſmall bits, or, if dry, powdered, will alſo, if the ſack be left to ſoak in the water for a half or three-quarters of an hour, correct a doubtful water; bran, as we have ſaid above, will alſo anſwer the ſame end tolerably well.

52 Of gum-lac ſcarlet.

The ſcarlet produced by gum-lac, though leſs bright than cochineal, has the advantage of being more permanent. The lac moſt eſteemed for dyeing is of a branched form. The colour is that of an animal, like that of cochineal and kermes, and the branched kind has moſt of the animal particles in it. The beſt kind is of a blackiſh brown colour on the outſide, and red within; and from ſome experiments made by M. Geoffroy, it appears to be a kind of comb, ſomewhat reſembling that made by bees or other inſects of that kind. Dyers ſometimes uſe it when pulveriſed, and tied up in a bag; but to this M. Hellot objects, becauſe ſome of the gum-reſin being melted by the heat of the boiling liquid, eſcapes through the cloth, and adheres to it ſo cloſely, that it muſt be ſcraped off with a knife when cold. Others endeavour to extract the colour by boiling it in water after it has been reduced to powder, and then letting it ſtand to ſettle, and pouring off the coloured liquid; but in this way it often turns putrid.

43 M. Hellot's method of extracting the colour of gum-lac.

M. Hellot, therefore, after ſeveral unſucceſsful trials to extract all the colour readily, had recourſe at laſt to mucilaginous roots; which, without communicating any colour of their own, retained that of the lac ſo effectually as to remain with it upon the filtre. Comfrey-root was that with which he ſucceeded beſt. For extracting the colour, he uſed it dried and powdered, in the proportion of half a drachm to a quart of water. In this it is to be boiled for a quarter of an hour; then ſtrained through a linen cloth, and poured while quite hot upon the gum-lac powdered and ſifted through an hair-ſieve. By this it immediately acquires a fine crimſon colour; after which the whole is ſet to digeſt in a moderate heat for twelve hours, ſtirring the gum which remains at the bottom ſeven or eight times. The water thus impregnated with the colour is afterwards decanted into a veſſel large enough to contain four times the quantity, which is then to be filled with cold water. A ſmall quantity of ſtrong ſolution of Roman alum is then added; the coloured mucilage ſubſides; and if any colour remains in the liquor, it may be precipitated by the addition of ſome more alum, until at laſt the water will be left entirely colourleſs. After the crimſon mucilage is entirely ſunk to the bottom, the clear water is drawn off with a ſyphon, and the remainder put upon a filtre, to let the liquid ſlowly drop off or evaporate. If the whole of the colour be not extracted from the lac by one operation, it is to be repeated till no more appears, and the reſiduum becomes of a pale ſtraw-colour. The beſt lac, detached from its branches, does not yield more than one-fifth of its weight in colour; and hence there is no great advantage to be made by ſubſtituting it in place of cochineal for the ſcarlet dye.

54 Method of uſing the extract of gum-lac.

For dyeing ſcarlet with this extract of gum-lac, the requiſite quantity of it, dried and powdered, is to be put into an earthen or block-tin veſſel. Some hot water is then to be poured upon it; and, when well moiſtened, add the proper quantity of the ſcarlet compoſition, ſtirring the mixture with a glaſs peſtle. By this means the powder, which before was of a dark dirty purple, acquires an exceedingly bright ſcarlet. The ſolution in which the cryſtals of tartar had been previouſly diſſolved is then to be poured into the liquor; and as ſoon as the latter begins to boil, the cloth is to be dipped into it, turning it over and over according to the common method. The remainder of the operation is to be performed in the ſame manner as if cochineal were uſed. The extract, in our author's opinion, afforded about a ninth part more colour than cochineal.

55 Of dyeing crimſon.

Crimſon is the colour produced by cochineal with alum and tartar only, without any ſolution of tin. For this colour two ounces and an half of alum, with an ounce and an half of white tartar, are to be taken for every pound of wool. Theſe being put into a cauldron with a proper quantity of water, are to be made to boil before the ſtuff is put in. As ſoon as the liquor begins to boil, the wool is to be put into the cauldron, and the boiling continued for two hours; after which it is to be taken out, gently ſqueezed, rinſed in water, and put into a bag, which is alſo neceſſary to be done with the preparations for every other colour. A freſh liquor muſt be prepared for the dye, in which an ounce of cochineal is to be put for every pound of wool. When it begins to boil, the wool is to be put in, and managed as already directed for ſcarlet. For the fineſt crimſon, the ſtuff, after the common proceſs is finiſhed, ſhould be dipped in a new liquor in which a ſmall quantity of ſal ammoniac is to be diſſolved, and an equal quantity of pot-aſh added after it is pretty hot.

A very beautiful crimſon is obtained by boiling the wool as for common ſcarlet, then making a ſecond preparation with two ounces of alum, and an ounce of tartar to every pound of wool. It ſhould remain an hour in this decoction. A freſh liquor is then to be prepared immediately; in which to every pound of wool you put ſix drachms of cochineal. When it has remained an hour in this liquor, it is taken out and immediately dipped in a ſolution of barilla and ſal ammoniac;

moniac; and in this manner a great number of very beautiful shades of crimson may be prepared by diminishing the quantity of cochineal. In this process it is necessary that the mixture of alkaline salt and sal ammoniac should not be too hot, as this would cause the volatile spirit evaporate too quickly, and the crystals of tartar also, being neutralised, would lose their effect.

56
Of dyeing silk of a crimson colour.

For dyeing silk of a fine crimson with cochineal, M. Macquer recommends only 20 pounds of soap to 100 of silk; "because (says he) the little natural yellow still remaining in the silk, after only this quantity of soap, is favourable to the colour.

"Having washed and beetled the silk at the river to discharge it well of the soap, it is put into a very strong solution of alum, where it should remain generally from night till the next morning, about seven or eight hours. The silk is then washed and twice beetled at the river; during which time the following liquor is thus prepared:

"You fill a long boiler about one-half or two-thirds full of river water; when this water boils, you throw in some white nut-galls pounded, letting it boil a little longer, about a quarter of an ounce to two ounces for every pound of silk. If the nutgalls are well pounded and sifted, they may be put in at the same time with the cochineal.

"The silk being washed, beetled, and distributed upon the rods, you throw into the liquor the cochineal, carefully pounded and sifted; it must be then well stirred with a stick, and afterwards boiled. You may put from two to three ounces for every pound of silk, according to the shade required. For the most common crimson colours, two ounces and an half is sufficient, it being seldom necessary to use three ounces except for some particular match.

"When the cochineal has boiled, you add to the liquor for every pound of cochineal about an ounce of the solution of tin in aqua regia; it is called *composition*, and made in the following manner:

"One pound of the spirit of nitre, two ounces of sal ammoniac, and six ounces of fine tin in grains: the two last are put into an earthen pot of a proper size; twelve ounces of water is then poured on it, the spirit of nitre afterwards added, and the whole left to dissolve.

"This composition contains much more tin and sal ammoniac than is used for the scarlet of cochineal on wool; it is however absolutely necessary.

"This quantity of the composition should be well mixed and stirred in the liquor, and the copper then filled with cold water, about eight or ten quarts to every pound of fine silk; coarse silk requiring less, as it occupies less space. The liquor is then fit to receive the silk which is immersed, and returned till it appears uniform, generally requiring about five or six returns. The fire is then stirred; and whilst the liquor is boiling, which it should do for two hours, the silk is returned from time to time. The fire is then taken from under the copper, and the silk put to soak in the same manner as for aluming. It should remain for five or six hours, or even, if the liquor be ready at night, till the next morning. It is then taken out, washed at the river, twice beetled, wrung as usual, and put on the perches to dry.

"To sadden the grain of scarlets, the silk when taken out of the cochineal liquor is washed and twice beetled at the river; the water-liquor is then prepared, in summer as it is, but in winter a little warmed, adding a solution of copperas, more or less according to the darkness of the shade required. The silk should be returned in this liquor, in small hanks, till it becomes very even; and when the shade is equal to expectation, should be taken out, wrung and put to dry without washing if you like, because the copperas liquor is little more than clean water. The copperas gives the cochineal a violet tinct, depriving it of its yellow. If, however, it should appear to lose too much of its yellow, it may be preserved by adding to the copperas liquor a little of the decoction of fustic. Nothing but copperas will sadden grain scarlets; the logwood being quite useless for this purpose, copperas alone will suffice, as it darkens greatly with the nut-galls used in grain scarlets.

"The process just related for producing this colour is the most in use at present; as it gives a more beautiful shade than can be obtained by any other method. Nevertheless, as many dyers proceed in the old way, we shall describe it here.

"For these grain scarlets, the round paste, as imported from the Indies, is added in the boiling of the silk. When the soap boils, about an ounce of rocou is bruised in the cullender, in the same manner as described for orange-colours. It should be pounded as fine as possible, lest any lumps should remain and stick to the silk.

"This small quantity of rocou, in the boiling of the silk, has the same effect as the composition, yellowing a little. The remainder of this process is just the same as the preceding; but without the addition of either composition or tartar.

"The silk dyers are accustomed to use only the finest cochineal, and even always prefer the prepared cochineal, which is cleansed from all its impurities, sifted and picked. This is certainly commendable, considering that the cochineal not prepared being less pure, the more of it must be added, and that the dregs remaining in the liquor may injure the colour. The white tartar used in grain scarlets serves to exalt and yellow the colour of the cochineal, producing this effect by its acidity, all acids having the same effect; we must, however, observe, that tartar is preferable, as it gives a more beautiful tinct. But, notwithstanding the quality of the tartar, it is still incapable of exalting the colour of the cochineal sufficiently to produce a grain scarlet, whatever quantity may be added if employed by itself: for if the dose of this ingredient be moderate, it will not yellow enough; and if too large, it destroys and degrades the colour, without any good effect. In order to assist the tartar, it will be necessary to add some of the composition, which, as we have seen, is nothing more than a solution of tin in aqua regia. This solution with cochineal, when used for dyeing of worsted, has a considerable effect, changing it from a crimson, its natural colour, to a prodigious bright fire colour; and produces only a crimson when applied to silk: but it gives this colour a very beautiful tinct; for uniting with the tartar, it augments the effect without impoverishing the colour, saving the rocou ground, as we have before observed.

"As

57 Use of nutgalls in dyeing silk of a crimson colour.

" As to nutgalls, they produce no good effect with regard to colour: on the contrary, if you use too much, they tarnish to a degree, entirely spoiling the colour; nevertheless, it is always the custom to put the quantity we have specified.

" One might probably conjecture from the introduction of this practice, that scarlets were formerly produced with cochineal, without either tartar or composition, yellowing only with rocou: silk dyed in this manner, however, would have no rustling, so that it could not be distinguished from silk dyed with Brazil-wood. Nutgalls, on account of their concealed acid, having the property of giving the silk a great rustling, are therefore added with cochineal; by which means these scarlets are distinguished by the feel from the scarlet of Brazil-wood: for we must observe, that the Brazil dye cannot stand the action of the nutgalls, by which it is entirely destroyed.

" But besides giving this rustling to the silk, it has at the same time the singular and very remarkable quality of adding to its weight very considerably; so that by putting one ounce of nutgalls to every pound of silk, you add two or two and a half *per cent.* to the weight: by this means some silk-dyers add even seven or eight *per cent.* They are so much accustomed to this advantage in weight, owing to the nutgalls, that even when this drug becomes useless by the addition of the tartar and composition, which produces the same rustling, they make it still necessary on account of the weight, which is not proportionably increased by the other acids. White nutgalls are always preferable to the black, as they injure the colours much less. We may, however, hence conclude, that for grain scarlets nutgalls are not only useless but very prejudicial; and serving only as an imposition, is a blameable practice, and injurious to commerce.

" The silk is thus suffered to remain in the liquor, in order to make it wholly imbibe the cochineal. During this repose it takes a good half-shade; and the colour yellowing in proportion, gives it a much finer cast.

" One would be apt to believe, that leaving the silk to boil in the liquor for a longer time would have the same effect; but experience proves the contrary: besides, it would be more expensive, considering that it would be necessary to continue the fire.

" The cochineal leaves on the silk, when taken out of the liquor, a kind of scale, or rather the skin of the insect, which always contains a portion of the colouring juice. In order, therefore, to cleanse the silk perfectly from this kind of bran, it is twice beetled when washed at the river. By this means the colour becomes more brilliant, clearer, and fuller.

" The two beetlings before dyeing are necessary, because the silk having been strongly alumed for this colour, and intended to boil in the dyeing liquor for a great while, would, without this precaution, yield a certain quantity of the alum, which not only injures the colour, but likewise prevents the perfect extraction of the cochineal; for generally all neutral salts added to the dyeing liquor have more or less this inconvenience.

' The grain, or cochineal crimson, such as described, is not only a very beautiful, but may be considered as a most excellent colour: it is the most permanent of all dyes for silk. It perfectly resists the boiling with soap, and evidently suffers no alteration from either the sun or the air. Silk stuffs of this colour, commonly used in furniture, are sooner worn out than faded. It is frequently seen that the colour of this grain crimson in furniture, though more than 60 years old, is scarce impaired. The only observable difference occasioned by time is, that by losing the yellow cast it becomes rather darker, approaching nearer to the violet."

58 Of dyeing cotton of a red colour.

The dyeing of cotton red is attended with much more difficulty than any of the substances hitherto mentioned; and indeed to produce a good scarlet or crimson upon it has hitherto been a desideratum in the art. The following are M. Apligny's directions for dyeing such reds as are commonly in use. " It is necessary, previous to the dyeing of cotton thread, to cleanse it from that unctuous matter by which the dye is prevented from penetrating its pores. For this purpose they make use of sour water; which is prepared by throwing some handfuls of bran into hot water, and letting it stand 24 hours, or till the water becomes sour, when it is fit for use. These sour waters, however, cleanse the cotton but very imperfectly, carrying off only the superficial part of the unctuous matter, which river water would do as well. The lixiviums of ashes are more effectual; and therefore all fixed alkalies, particularly kelp, or even the ashes of new wood, are, for the reason I have already given, generally preferred for this operation. The salts are extracted in the same manner as by the bleachers; and the cotton is then steeped in these lixiviums, which, like the silk, is inclosed in a clean linen pocket or sack, to prevent the skeins from tangling: it should boil for a couple of hours: when perfectly cleansed, the pockets sink to the bottom of the liquor, because the impeding matter being removed, the water penetrates the pores. The pocket is then taken out of the copper, the skeins separated from each other, and washed at the river. They are afterwards wrung on the peg, and again rinsed till the water comes off clear. The skeins are then spread on the perches to dry.

" To dye cotton red requires three preparations, viz. cleansing, galling, and aluming. The operation of cleansing as above.

" With regard to the galling, any kind of galls may be used in case of necessity; or even tan may be substituted; but that requiring more, it would not answer the purpose so well. The black Aleppo galls, because less suffices, are preferable to the white galls, which though cheaper make the expence come nearly equal. The Aleppo galls are, however, liable to dull the colour, which though easily revived, the white not producing this inconvenience, are generally preferred by most dyers. It requires nearly five quarts of liquor to drench one pound of cotton; so that for 20 pounds, five pounds of pounded galls are boiled in about 120 quarts of water; it should boil for two hours, or till by pressing it between the fingers it breaks easily.

This liquor is drawn off clear, and poured into a tub, into which, when cold, or even whilst warm, the cotton, which was before divided into hanks of about eight ounces each, and tied with a thread to prevent them from tangling, is dipped. Suppose, for example, that having about 40 of these hanks, and 100 quarts of the gall liquor, a part of it necessarily evaporating

rating in the boiling, five quarts of this liquor is taken out of the tub and put into a trough, into which you dip two ſkeins at once, carefully working them till they are ſoaked. They are then taken out and laid in an empty tub, pouring over them the remainder of the liquor in which they had been ſoaked: five quarts more are then taken out of the tub containing the gall water, poured into the trough, and two more hanks dipped into it, and ſo on ſucceſſively till the whole is galled. The gall liquor ſhould be ſtirred in the tub every time you take out, that the whole of the cotton may be galled equally, which it would not be were the grounds to ſettle at the bottom. This operation finiſhed; if any of the liquor remains, it is poured on the galled cotton, being orderly ranged in the tub; where, after remaining 24 hours, it is taken out ſkein by ſkein, gently wrung, and then put to dry.

"The aluming for the cotton conſiſts of about four ounces of Roman alum for every pound of the ſubſtance. Having pounded the proper quantity of alum, it is diſſolved over the fire in a copper containing a ſufficient quantity of water, taking care not to let it boil, otherwiſe it would loſe its ſtrength. The liquor is immediately poured into a tub or trough of cold water, proportioned to the quantity of the cotton, ſo as that the whole of the liquor may be as that of the galling, 100 quarts for every 20 pounds of cotton. It is the cuſtom to add to this alum liquor a ſolution partly compoſed of arſenic and white tartar, with one part of the lixivium of kelp. The firſt ſolution conſiſts of one grain of arſenic and two grains of white tartar, in two or three quarts of water. When the water in the copper boils, the arſenic and tartar, well pounded, is put into it, and kept boiling till the liquor is reduced to about half. When cold, it is ſtrained and put into bottles or veſſels, which ſhould be ſtopped and kept for uſe.

"The kelp lixivium is made with about half a pound to a quart of water. You will know if this lixivium be ſufficiently ſtrong, when by putting an egg into it the point only appears on the ſurfaee.

"You then add to the alum liquor for this ſuppoſed 20 pounds of cotton, 20 quarts of the ſolution, and three quarts of the ſaid lixivium, obſerving nevertheleſs that the whole of the water uſed in mixing the alum and other ſubſtances be always in the proportion of five quarts of liquor to every pound of cotton. The 20 pounds of cotton are then plunged into this aſtringent pound by pound, in the ſame manner and with the ſame precaution as in galling; it is afterwards wrung, but without being too much ſqueezed, and then ſlowly dried.

"Some dyers never uſe the ſolution of tartar and arſenic with the alum, rationally ſuppoſing that theſe ſubſtances, as they ruſt and yellow the red colours, would be prejudicial to the dye: the red furniſhed by madder, being already too much inclined to this ſhade, requires rather to be ſaddened; and for this reaſon partly the kelp lixivium is added to the aluming. Several therefore, uſe ſix quarts of this lixivium inſtead of three; and theſe ſix quarts containing the ſalts of about three pounds of kelp, which by ſuppoſing the kelp aſhes to contain a quarter of its weight of ſalt, is in proportion of half an ounce to every quarter of a pound of alum.

"Inſtead of the ſolution of tartar and arſenic, others make uſe of a ſolution of ſugar of lead, prepared ſeparate. It ſhould be obſerved in this particular, that when the ſugar of lead is diſſolved in common water, it becomes turbid and whitiſh, becauſe plain water not diſſolving this perfectly, a kind of partial ſeparation of the calx of lead takes place; but by mixing a ſufficient quantity of diſtilled vinegar with the water, the calx entirely diſappears and the ſolution is complete.

"When the cotton is taken out of the aſtringent, it is lightly wrung on the peg, and dried. The more ſlowly it dries, and the longer before it is maddered, the brighter the colour. Twenty pounds of cotton are generally dyed at the ſame time; but it were ſtill more advantageous to dye only 10, becauſe when there are too many hanks to work in the copper, it is very difficult to dye them equally, the hanks firſt immerſed having time to take a great deal of colour before the laſt are put in; for as the firſt cannot be returned upſide down till after the laſt are plunged, it is morally impoſſible that the dye ſhould be even.

"The copper in which theſe ten pounds of cotton are dyed ſhould contain about 240 quarts of water,—that is, 20 quarts of water for every pound of cotton; its ſhape ſhould be an oblong ſquare, and about two feet deep. It ſhould be alſo wider at top than at bottom; the difference, however, ſhould not be too great, becauſe in that caſe the hanks laid ſlanting on the ſides would be liable to ſpot. As ſeveral dyers have erred for want of knowing how much water the copper ſhould contain reſpecting its dimenſions, and as the greater part of the braziers are likewiſe ignorant in this particular, it may not be amiſs, in this place, to add a ſhort and eaſy method of finding the contents of a veſſel.

59 Ready method of finding the contents of a veſſel.

"In the firſt place, ſuppoſe the veſſel round or cylindrical, you begin by meaſuring the diameter; you then ſeek the circumference, afterwards the ſurface; and at laſt, by multiplying the ſurface by the perpendicular height, the product is the cube ſought for, and determines the contents of the veſſel.

"For example, a copper 22 inches deep by 30 diameter; to find the ſurface, take the proportion of the diameter to the circumference, which is as 7 to 22: ſtate as in the Rule-of-Three, the firſt number 7, the ſecond 22, and the third 30; the fourth number will be the circumference. This fourth number is found by multiplying the two middle numbers, 22 and 30, by each other, and dividing the product 660 by 7, the firſt number; the quotient 94 is the circumference ſought for. If a ſquare or oblong veſſel, as in the preſent caſe, you have the circumference by adding the length of the four ſides.

"Multiply afterwards the half of the circumference by the radius, that is 47 by 15, the product 705 is the number of ſquare inches, and conſequently the ſurface of your veſſel.

"At laſt multiply 705 by 22, which is the perpendicular height, the product 15510 is the number of cubic inches your veſſel contains. If it is larger at top than at bottom, it is neceſſary, in order to determine the circumference, to take a middle number between the breadth of the top and the breadth of the bottom, as if the copper be 33 inches at the top and at bottom 27, the middle number and real diameter is 30.

"Having multiplied the ſurface by the perpendicular height, you muſt reduce the inches to feet. Now the

the ſquare foot being equal to 144 ſquare inches, and the cubic foot to 1728 cubic inches; you muſt therefore in this example divide 15510 by 1728, the quotient $9\frac{1}{11}$ will be about the number of cubic feet in the copper; and as a cubic foot contains 35 quarts, conſequently the copper contains 318 quarts Paris meaſure. (The Paris pint is our quart.) To madder 10 pounds of cotton, a copper containing 248 quarts of water is made hot. When it is rather too hot for the hand, ſix pounds and a quarter of good Dutch grape madder is put into it, and carefully opened and diffuſed in the liquor. When it is well mixed, the cotton, which had been previouſly paſſed on the rods and ſuſpended on the edge of the cotton, is dipped into it hank by hank. When it is all dipped, the hanks on each rod are worked and ſucceſſively turned upſide down, beginning from the firſt that was put in, and ſo proceeding to the laſt; returning to the firſt, and thus continuing without intermiſſion for three quarters of an hour, always maintaining an equal degree of heat, but without boiling. The cotton is then raiſed and drawn out upon the edge of the copper, and about a pint of the kelp lixivium poured into the liquor. The rods are then paſſed through the threads by which each hank is bound, and the cotton put back into the copper and boiled for about 12 or 15 minutes, keeping it entirely immerſed during that time. It is at laſt raiſed, gently drained, wrung, waſhed at the river, and wrung a ſecond time on the peg.

"Two days afterwards the cotton is a ſecond time maddered, about eight ounces of madder to every pound; that is, five pounds of madder added to the dyeing liquor. The cotton is then worked in it in the ſame manner as in the firſt maddering, with this difference, that none of the lixivium is added, and that the liquor is made of well-water. This maddering being finiſhed, and the cotton cooled, it is waſhed, wrung, and dried.

"To brighten this red, you put into a copper or trough a quantity of warm water ſufficient to drench the cotton, pouring into it about a pint of the lixivium. In this liquor you immerſe the cotton pound by pound; leaving it in for an inſtant only, when it is taken out, wrung, and dried.

"On this operation it ought to be obſerved, that the method of dyeing in two liquors has no advantage. For, beſides that it conſumes more time and wood, the ſecond maddering cannot furniſh much dye, conſidering that the aſtringent ſalts are exhauſted by the boiling of the firſt maddering; conſequently that the cotton, when deprived of theſe ſalts, cannot take the dye. I propoſe therefore another method now purſued with ſucceſs by ſeveral dyers: it conſiſts in giving the cotton two aluminings, and afterwards dyeing in one liquor only. By this means it takes the dye much better, and acquires more depth, becauſe the whole of the madder turns to advantage. With reſpect to brightening, it is a needleſs operation for red cotton deſtined for the fabrication of callico; becauſe the colour is brightened after it is woven, by dipping in warm water ſharpened with a little of the lixivium. When the cotton is taken out of this water, if waſhed at the river and ſpread on the graſs, the red brightens much better than by any other operation.

"The reds hitherto mentioned are vulgarly called *madder reds*, though thoſe I am going to deſcribe are equally obtained from a ſpecies of madder coming from the Levant. The latter, however, commonly called *lizary*, furniſhes a dye incomparably finer than that produced by the beſt Zealand madder: it is, however, the faſhion to call the red of madder the firſt dye, and the Adrianople red the ſecond. The proceſs of the latter I ſhall give in this place.

"When you have 100 pounds of cotton to dye, you put 150 pounds of Alicant ſoda, incloſed in clean linen, into a tub. This tub ſhould be full of holes at the bottom, that the liquor may run into another tub underneath. The 150 pounds of ſoda being in the upper tub, is covered with 300 quarts of river-water, meaſured by wooden pails containing each 25 quarts. The water that paſſes from the firſt tub into the ſecond is again poured over the ſoda at different times, till it has extracted all the ſalt. This lixivium may be tried with oil: if it uniformly whitens, and mixes well with the oil without any appearance of ſeparation at the ſurface, it is then ſufficiently ſaturated with the ſalt. It may be alſo tried with a freſh egg, as I have ſaid above. You again pour 300 quarts of water over the ſoda contained in the ſuperior tub, in order to extract the whole of the ſalt. Two ſimilar lixiviums are afterwards made, each with the ſame quantity of water as had been uſed for the ſoda, *viz.* 150 pounds of freſh wood-aſhes, and the other with 75 pounds of quicklime. Theſe three lixiviums being clarified, 100 pounds of cotton are put into a tub, and watered with each of theſe lixiviums in equal proportion. When it has perfectly imbibed theſe ſalts, it is put into a copper full of water without being wrung, and boiled for three hours: it is afterwards taken out and waſhed in running water. This operation being finiſhed, the cotton is then dried in the air.

"A quantity of the abovementioned lixiviums is then poured into a tub in equal portions, ſo as to make 400 quarts. In a part of this liquor, 25 pounds of ſheep's dung, with ſome of the inteſtine liquor, is well diluted by means of a wooden peſtle, and the whole ſtrained through a hair-ſieve. Twelve pounds and a half of good olive-oil poured into this mixture, when finiſhed inſtantly forms a ſoapy liquor. In this the cotton ſhould be dipped, hank by hank, ſtirring every time, and with the ſame precautions I have already recommended in the aluming of cottons deſtined for the madder red. The cotton having remained 12 hours in this ſoapy water, is then taken out, lightly wrung and dried. This operation is repeated three times. The liquor that runs from the cotton when wrung falling again into the trough where the cotton was laid is called *ſickiou*, and ſhould be kept for brightening.

"When the cotton has been three times dipped in this ſoapy water, and afterwards dried, it is again dipped three times in another compoſition, made in the ſame manner as the firſt, with 400 quarts of lixivium and 12½ pounds of oil, but without the ſheep's dung: the remainder of this liquor is alſo preſerved for brightening. The cotton having been dipped in this liquor three times with the ſame precautions, and left in it the abovementioned time, it is then carefully waſhed at the river to diveſt it entirely of the oil, without which the aluming would not take effect. Having been waſhed,

washed, it should be as white as if it had been bleached.

"When dry, you proceed in the aluming, which is done twice successively; but it is needless to give a detail of what has been sufficiently explained in the article upon madder red. It is enough in this place to say, that the galls, about a quarter of a pound to every pound of cotton, should be pulverized; that six ounces of alum should be put to the first aluming; for the second four ounces; and at last, that an equal quantity of the lixivium be added to the alum-water. We must also observe, that it were best to make an interval of three or four days between each aluming; and that no other astringent be added, all metallic salts being in general injurious to the beauty of the colour.

"Some days after the last aluming, you proceed to dyeing in the same manner as above, only using two pounds of lizary in powder for every pound of cotton; and, before you dye, adding to the liquor about 20 pounds of liquid sheep's blood. It should be well struck into the liquor, which should be carefully skimmed.

"In order to brighten the colour, the cotton is dipped in a lixivium of fresh wood ashes, dissolving in it five pounds of the best white Marseilles soap; the water should be warm before the soap is put into it. In this mixture the 100 pounds of dyed cotton is immersed, and worked till it becomes perfectly penetrated. Six hundred quarts of water are then put into another copper; and when warm, the cotton, without squeezing it out of the first, is put into the second, and boiled for three, four, five or six hours, over a very slow fire, but as equal as possible, carefully covering the liquor to keep in the vapour, that none may escape but what passes through a funnel of small reeds.

"Some pieces of the cotton are taken out from time to time; and when sufficiently revived and washed thoroughly, the red is perfect. The cotton may be also brightened in the following manner: when washed and dried immediately after dyeing, it should be soaked in the sickiou for an hour, well squeezed, and also dried. When dry, you dissolve for every 100 pounds of cotton 5 pounds of soap in a quantity of water sufficient to cover the cotton. When the water is warm, the cotton is immersed; and having well imbibed, is put into a copper with 600 quarts of water. The whole is boiled very slowly during four or five hours, keeping the copper covered to prevent the steam from going off. This second method makes the red much brighter than the finest Adrianople carnation.

60 Difficulty in producing a good red by this process.

"The process just described was practised at Darnetal, and in other manufactories of France, according to instructions communicated by a person who had seen this process in Turkey. But whether his observations were inaccurate, whether he concealed a part of the mystery, or whether the success of the operation depended on the concurring circumstances accompanying the various mixtures, I know not. Few, however, by closely observing this process, have hitherto obtained a red either so permanent or so beautiful as the red of Adrianople, and those who have succeeded think it but just to reap the advantage of their secret. On this subject, however, several not unuseful reflections may be advanced.

61 Observations of M. de Apligny upon it.

"First, the manner of purging the cotton indicates that this process is capable of damaging considerably, and of rendering the cotton very brittle, owing to the sharpness of the lixivium in which it is steeped, so burning in its nature as to make holes in the legs of the workmen who tread it with their feet. It is therefore more simple and less dangerous to cleanse the cotton in six quarts of lixivium to every pound of substance, and containing only six ounces of kelp for every six quarts; to boil the skeins in it afterwards, inclosed in clean linen pockets.

"By this method the cotton would be sufficiently cleansed without being spoiled; the kelp may be even reduced to half the quantity, substituting in its place double its weight of fresh wood ashes, which would answer quite as well.

"Secondly, that the failure of many dyers is owing to their not sufficiently divesting the cotton of the oil, which prevents both the galling and aluming from taking effect. The mixture of the lixivium and oil not being well made, or the lixivium being too weak, the oil forms with it but an imperfect combination. This oil, therefore, separating and swimming on the surface of the lixivium, sticks to the cotton, which it greases, and by obstructing the pores prevents the gall from penetrating. Great attention therefore should be given to the lixivium, in order to extract all the salt of the kelp, and to use quicklime, which is absolutely necessary to render this lixivium caustic; a quality without which the oil cannot possibly form a combination with the alkali, consequently can make no soap.

"In Europe the oil of olives is substituted instead of the oil of sesamum, which is used in the East-Indies and in Turkey, but the nature of these oils makes no difference in the operation. The oil of sesamum differs from the oil of olives only because it is thicker, consequently nearer to the nature of animal fat or wax; but the conclusion resulting from this difference is, that less of it may be required than of the oil of olives. Were the oil of sesamum absolutely necessary, it might have been easily procured. The sesamum is a species of fox-glove that grows in the Indies; but is cultivated in Italy, and especially in Sicily, where it is called *giurgulena*. The same kind of oil may be obtained from plants analogous; such as the gratiole, the henbane, &c. but the plant whose seed resembles it most is the convolvulus or lizeron.

"It is certain that the process brought from Adrianople might be greatly abridged; but we must leave the secret to those to whom it belongs: and I am besides convinced, that a memoir on this subject will be presented to the Academy of Sciences, and therefore will not anticipate.

"With regard to the sheep's dung and intestinal liquor, it is of no use in fixing the colour. But we know, that these substances contain a large quantity of volatile alkali quite developed, which has the property of rosing the red colours. If the bones of animals owe to their tenacious gluten the faculty of retaining so strongly the madder colour, the vivacity of this colour may be attributed, as from experience we learn,

learn, to their volatile alkali. It were absurd to imagine that the Europeans only had discovered this phenomenon; as it may be rationally supposed that the Indians, having perceived it by accident, sought to imitate what chance had brought to their knowledge. It is certain, that in the red dye of the Maroquins, the process of which was brought from the Levant, they prepared the goat skins for dyeing with dog's excrement, having found it effective in exalting the dye of the lac.

"In the dyeing of cotton thread, it is common to mix the sheep's dung with a lixivium of fixed alkali; by which the volatile principle of the dung is retained, and consequently putrefaction prevented. By dipping the cotton several times in this soapy liquor, it is impregnated with the predominating alkaline principle; and we know by experience, that substances once impregnated with volatile alkali, for example chemical vessels used in extracting it for a long time, retain a smell very like the smell of musk, even after having been well scrubbed with sand, ashes, soap, &c. Every time the cotton is dried when taken out of this liquor, the evaporation of the aqueous particles (the alkaline principles being changed into earth) produces a stronger adhesion in the pores of the cotton. From the union of this earth with a portion of the oil employed, a mastic is the result, which is afterwards completed by the alum; and this, in a word, is the theory of the fixity of this colour.

62
Of the dyeing of linen.

"Linen thread may be dyed in the same manner; only that, previous to its being purged like the cotton thread, it is usual to boil it in water, adding for every pound of thread a quarter of a pound of chopped sorrel. Oil of vitriol is, however, more convenient and better than sorrel. But I refer my reader to what I have already said upon the article of thread; observing only, that by this process the linen thread always takes less dye than the cotton, owing to the difference of their pores."

63
Method of dyeing crimson in the Eastern countries.

The following processes were taken from the manuscripts of M. Hellot. "According to the letters of M. Grainge, correspondent of the Royal Society, who died at Schiras in Persia, June 1737, the dyers of the city of Damas dyed their crimson colour, so beautiful and so much esteemed in the east, in the following manner: Take ten *rottes* (a rotte weighs five pounds) of silk in skeins; wash it well in warm water; then let it soak in a sufficient quantity of hot water during half an hour; squeeze, out the water; dip it afterwards, but once only, in a hot lixivium, made with a sufficient quantity of water, half a *rotte* of kelp ashes for every rotte of silk, which is immediately drained on rods, taking care not to leave the silk longer in the lixivium than is necessary for its being well soaked, lest the alkali should corrode it.

"Whilst the silk drains, they prepare another liquor cold with ten ounces of the pulp of yellow melon, very ripe, which is uniformly diffused in a sufficient quantity of water. They steep in this liquor the ten *rottes* of silk for twenty-four hours; they increase or diminish the quantity of the above drugs in proportion to the quantity of the silk to be dyed. The silk having remained one day in this melon liquor, is several times washed in fresh water till it becomes perfectly clean; they then hang it to dry. Mean while the workmen fill a large pan of water, adding a half *rotte* of alum powdered for every *rotte* of silk. The pan is then suspended over a hot furnace, and the liquor boiled during twenty minutes; after which the fire is taken from the furnace. The silk is then dipped in this alum solution, moderately hot, and again taken out as soon as it is perfectly wet. They then put it into another pan, pouring over it the alum solution, in which it remains four or five hours, but no longer. It is then taken out and several times washed in fresh water.

"Whilst the silk is washing, a workman fills a large pan with water, adding an ounce of *baisonge* (a fungus), finely powdered, for every rotte of silk; when this new decoction has boiled for half an hour, they add ten ounces of *oudez* (cochineal), very finely powdered, for every rotte of silk; that is, six pounds four ounces of cochineal for ten rottes of silk. As soon as this cochineal is added, the fire is taken from the furnace. The liquor is then gently stirred round with a stick; and when the mixture is perfectly made, they pour gently and by inclination a little fresh water into the middle of the pan. The water thus added not only cools the dye, but makes it much more lively. They then immediately dip the silk four or five times, wringing after every dip. This tincture is afterwards boiled again for about a quarter of an hour, and the fire is then taken from the furnace as before. When the liquor is a little cool they dip the silk, still observing to wring after every dip. This done, they put the silk into an empty kettle, pouring over it the remainder of the dye, in which it is left to soak for twenty-four hours. It is then well washed in clean water, dried in the shade, and when very dry wove into stuffs. This crimson is much superior to all the French and Italian crimsons; because the silk was never boiled in the dye.

"The dyers of Damas and Diarbequir say, that they could not accomplish this dye without the pulp of the yellow melon in the preparation, or without the *baisonge* used with the cochineal in the dye. According to M. Grainge, we have this melon in France; but he doubts concerning the *baisonge*, which is a species of fungus growing on trees in some parts of Persia, from whence it is brought to Damas, and might also be sent into France by the way of Aleppo, were we desirous of imitating this excellence in the crimson dye.

"To avoid mistakes in the quantity of different ingredients employed in this process, it may be necessary to repeat, that a rotte of silk weighs five French pounds, and that the ten rottes of silk, produced as an example in this memoir, should also serve as a standard with regard to the quantities of the other ingredients.

"As to the water necessary for the preparation of the silk with the kelp, melon, and the alum for the dye, it requires no more than a sufficient quantity for wetting the silk, namely, about a fingers's breadth over it, differing from the tincture, which as the skeins are dipped in this liquor at least ten or a dozen times, should be fuller in the kettle.

"The kali used in the preparation of the silk is nothing more than the ashes of a plant called by the Arabs

Arabs *kalbou*. These are preferable to the ashes made from the *rouquet*, or those made in Egypt.

" The frames used for these silks are similar to the frames used at Lyons.

64 Genoese method of dyeing crimson.

" At Genoa the silks designed for crimson are boiled in a much less quantity of soap than those intended for any other colour, 18 or 20 pounds serving for a hundred pounds of silk in the crimson dye; for any other colour, the Genoese use 40 or 50.

" When the silk is boiled, it is dipped in the alum liquor; and to a quantity of raw silk, weighing 72 pounds, they put from 16 to 18 pounds of roch alum, finely powdered, into a copper full of cold water. When the alum is perfectly dissolved, the silk is put to soak in it for near four hours: it may remain longer without any inconvenience, silk intended for crimson requiring more alum than for any other colour. When taken out of the alum liquor, it is shook and dressed on the pegs, but without wringing. One of the dyers being questioned why the silk was not wrung when taken out of the liquor? answered, that it would purge it too much from an impregnation so absolutely necessary for its taking the crimson dye.

" Of the 72 pounds of silk already mentioned, 32 pounds is *organzine*, and the remaining woof. At Genoa it is the custom to allow two ounces of cochineal to twelve of *organzine*, if designed for the warp of damask furniture, and for the same silk an ounce and three quarters of cochineal for 12 ounces of the woof, supposing it necessary to the beauty of the silk that the warp should be fuller than the woof; and to bring the colour of the damask to still more perfection, they add to the *organzine* a quarter of an ounce of cochineal, that is, instead of two ounces they add two ounces and a quarter, adding no more to the woof than one ounce and three quarters.

" As the above 32 pounds of *organzine* should be of the finest colour, they allow two ounces and a quarter of cochineal to every pound of silk; so that upon the whole they use 142 ounces of cochineal, or 11 pounds 10 ounces, Genoa weight; namely, 32 pounds of *organzine* to two ounces and a quarter of cochineal, making 72 ounces; 40 pounds of woof to one ounce and three quarters, making 70 ounces. Total 142 ounces.

" In order to dye this 72 pounds of silk, alumed as above, they make use of an oval copper containing when full 200 quarts of water; they fill this copper two-thirds full of clean fountain water, adding afterwards the following drugs pounded and sifted. Two ounces of tartar, two ounces of *saffranum*, and two pounds and a half of the Levant galls.

" They wait till the drugs have boiled two minutes in this liquor; after which they add the 11 pounds 10 ounces of cochineal finely powdered and sifted; and whilst one of the workmen by degrees makes it sink to the bottom, another keeps violently stirring the liquor with a stick to promote the solution.

" This done, they fill the vessel with clean water to about a foot of the edge, immediately afterwards dipping the 32 pounds of *organzine*, divided on 14 rods. They let it remain till the vessel which they fill with clean water, and under which they put a large fire, is ready to boil; they then, to make the silk take the colour more evenly raise the rods without ceasing, one after another, that each may alternately reach the bottom of the copper, which being but two-thirds full, the upper part of the silk would else remain out of the liquor, the rods being supported on the edge of the copper.

" When the liquor was ready to boil, the forty pounds of woof, divided on 18 rods, were dipped; they still continuing to raise the rods, one after another for half an hour, both the organzine and the woof, that each may alternately reach the bottom; so that when the workman came to the last he returned to the first, and so on successively.

" After the first half hour, they stopped for a quarter of an hour between every operation, the workmen still raising the rods from the first to the last, five or six times repeated in the space of an hour and an half; all the time keeping a good fire under the copper. The *organzine* was then steeped in this liquor two hours and a quarter, and the woof only two hours. The fire was then taken from under the copper; and the workman taking out one dip of the *organzine* and another of the woof, he wrung and dried them as much as he could to see if the colour was what he wished; if not sufficiently deep for the purpose, he let them both remain in the liquor something less than half an hour whilst the liquor was growing cold. He then took out all the silk, wrung it on the peg, then washed it several times in clean water, changing the water every time. This done he wrung it again on the pegs, and so finished the operation.

" It must be observed with regard to the *organzine* and woof, that though dyed in the same liquor, they were not however of the same shade at the conclusion of the operation; the organzine was deeper, having been a quarter of an hour longer in the cochineal liquor, during which time it was impregnated with the more subtle colouring particles of the cochineal.

" At Genoa it is not the custom to wash the silk out of the cochineal with soap water; on the contrary, they are persuaded that this practice dulls the brightness of the colour, and that the water, both for the cochineal liquor and for washing afterwards, should be the finest spring-water: for they remark, that the crimson dyed in summer with cistern water, is by no means so bright as the crimsons dyed at other seasons when the fountains are full.

" According to the dyers of Genoa, there is a kind of cochineal which though apparently beautiful, is not so in effect; that in using this cochineal it is necessary to alum the silk as much as possible, and to add to it more tartar than before mentioned. It is, however, impossible to give any certain rules concerning this matter, the dyer himself will judge of the quality of the cochineal fit for use. He should however use the best; for were it even a fact that the inferior kind, with the assistance of a greater quantity of alum and tartar, gives a colour equal to the best, the silk thus weakened by alum would necessarily be always less perfect. The Genoese manufacturers are so well convinced of this, that they themselves furnish their dyers with cochineal in proportion to the silk given to be dyed."

 After

65 Analysis of the sediment remaining after dyeing scarlet or crimson.

After the operations of dyeing scarlet and crimson already mentioned, there always remains a brown sediment in the bottom of the liquor, which is thrown out as useless. This, on being examined by M. Hellot, was found to be a precipitated calx of tin, as he has ascertained by reviving the metal from it, though not without great trouble, so that there can be no advantage in repeating his experiments. The remainder of this sediment was composed of the dregs of the cream of tartar united with the gross animal particles of the cochineal. These last being washed over with water, and thus separated from the earthy and metallic parts, were dried separately, and afterwards bruised with an equal weight of crystals of tartar; after which they were ground to an impalpable powder, and boiled with a little alum. Thus they communicated a fine crimson colour to a pattern of white cloth; from which our author is of opinion, that the custom of reducing cochineal to powder and only sifting it, does not give an opportunity of sufficiently extracting the colour from this valuable material; he therefore gives the following recept for doing so in a more perfect manner.

66 How to extract all the colour from cochineal.

"To an ounce of cochineal powdered and sifted as usual, he adds a fourth part of its weight of very white, clean, and dry cream of tartar. These being ground together on a marble stone to an impalpable powder, are used both in the preparation and in the dye, omitting the small quantity of crystals of tartar formerly directed for the preparation." The quantity here directed to be put to the cochineal, he thinks, evidently renders the colour more fixed.

For madder red the preparation is pretty much the same as for kermes, and is always made with alum and tartar. Dyers are not agreed with regard to the proportions. M. Hellot puts five ounces of alum and one of red tartar to every pound of worsted; adding likewise about a twelfth part of four water, and boiling the wool in this solution for two hours. Worsted is to be kept for seven or eight days moist with this solution; but cloth is finished in four days. A fresh liquor is prepared for dyeing this wool; and when the water is sufficiently hot to bear the hand in it, you must throw in, for every pound of wool, half a pound of the finest madder, carefully stirring and mixing it well in the copper before you put in the wool, which is to be kept in for an hour; but without letting it boil, as that would tarnish the colour. Nevertheless, for the dyer's security, it may boil for three or four minutes at the end of the operation; but the more that madder is boiled, the worse is the colour it yields.

67 Of dyeing yellow.

The third primitive colour spoken of among dyers is that of yellow: and for this M. Hellot observes, that there are ten different ingredients fit for the purpose, though only five of them yield a good and permanent dye. These are weld, savory, green-wood, yellow-wood, and fenugreek.

"Weld or wold generally yields the truest yellow, and is therefore preferred to all the others. Savory and green-wood, being naturally greenish, are the best for the preparation of wool to be dyed green; the two others yield different shades of yellow.

"The shades of yellow, best known in the art of dyeing, are straw colour, pale yellow, lemon colour, and full yellow. The common orange colours are not simple, and therefore we shall not speak of them at present.

68 Worsted or woollen stuffs.

"For dyeing worsted and stuffs yellow, you make use of the usual preparation, viz. of tartar and alum. You allow four ounces of alum to every pound of wool, or 25 pounds to every 100. With regard to the tartar, one ounce to every pound is sufficient for yellow, though it requires two for red. The method of boiling is similar to the preceding. For the welding, that is to say for yellowing, when the wood or stuff has boiled, you make a fresh liquor, allowing five or six pounds of weld to every pound of stuff; some inclose the weld in a clean woollen bag to prevent it from mixing in the stuff; and to keep the bag down in the copper they put on it a cross of heavy wood. Others boil it in the liquor till it has communicated all its colour, and till it falls to the bottom; the stuff is then suspended in the net, which falls into the liquor; but others, when it has boiled, take out the weld with a rake, and throw it away. They sometimes mix yellow wood with this weld; and some dyers mix any of the other ingredients before specified, according to the shade required. By varying the proportions of the salts for the preparation, the quantity of the colouring ingredients, and the time of boiling, it is possible to produce an infinite variety of shades.

"For regular shades of light yellows you proceed as for all other regular shades, only that light yellows require a weaker preparation. For example, 12 pounds and a half of alum to 100 pounds of wool is sufficient. The tartar should also be diminished, because the wool is always wasted a little by the preparation, and that when you require only light shades they may be as easily obtained by a weaker preparation; thus you save also in the expence of the salts. But these light shades do not so well stand the test as the darker shades, which are dyed with the full proportion of tartar. Some dyers suppose that by letting their wool and stuff remain longer in the dye, they remedy this evil; because they imbibe the colour more slowly in proportion to the weakness of the decoction: if you put wool into the dye, differently prepared, it will in the same time imbibe different shades. These weaker preparations are called *half preparations* or *quarter preparations*, and require great attention, especially for light shades of wool when dyed in the fleece for the manufactory of cloth and mixt stuffs, because the wool is harder and more difficult to spin in proportion to the quantity of alum in the preparation; the stuff is consequently less fine. This observation is not, however, of much importance with regard to worsteds for tapestry, neither with respect to stuffs; but it is not much amiss were it only to show that the quantities of the ingredients used in the preparation are not so very exact; but that they may be varied without any risk, whether to give to the same shades to wool prepared in different preparations, or whether to make but one preparation, if more convenient for different shades.

"In order to dye with yellow wood, it should be split, or rather shaved with a joiner's plane: by this means it is more divided, consequently yields better, so that a smaller quantity will do. Prepare it as you will, it should always be tied up in a bag, to prevent it from mixing with the wool, and from tearing the stuff.

ſtuff. The ſavory and green-wood, when uſed inſtead of weld, in order to vary the ſhade, ſhould be incloſed in the ſame manner.

"To the abovementioned ingredients for dyeing yellow we may here add the root of dock, the bark of aſh, eſpecially the ſecond bark; the leaves of the almond tree, peach, and pear tree; in ſhort, all aſtringent leaves, barks, and woods. Theſe will produce good yellows, more or leſs fine according to the time they have boiled, and in proportion as the alum or tartar predominates in the preparation. A larger quantity of alum makes it almoſt as fine as the yellow of weld; if the tartar prevails the yellow has more of the orange; but if theſe roots, barks, or leave, boil too much, the yellow terminates in ſhades of fawn colour.

"Though ſeveral dyers are accuſtomed for the good dye to uſe turmeric, a root imported from the Eaſt Indies, and which produces an orange yellow, it is however blameable; becauſe the colour very ſoon fades, at leaſt if not fixed with marine ſalt, as practiſed by ſome dyers who carefully conceal this art. Thoſe who uſe it for common ſcarlet, in order to ſave cochineal, and to give a lively orange red, are alſo reprehenſible; for ſcarlets dyed in this manner very ſoon loſe their bright orange caſt, which darkens by the air. We are, however, obliged in ſome degree to tolerate the deception; for this flaming colour being ſo much in vogue, it were impoſſible to produce it otherwiſe but by increaſing the quantity of compoſition, the ſuperabundant acid of which conſiderably injures the cloth."

69
To dye ſilk of a yellow colour.

For dyeing ſilk of this colour it ſhould have about 20 pounds of ſoap for every 100 of ſtuff; and after boiling with this ingredient, it ſhould be waſhed, alumed and waſhed again (which is called *refreſhing*), when it is to be put upon the rods in hanks of about ſeven or eight ounces, and then dipped and returned in the yellow liquor. The fineſt yellow for ſilk is weld; and the proceſs, as delivered by M. Macquer, is as follows:

"A copper is prepared with about two pounds of weld to every pound of ſilk; and that all the weld may be well ſoaked, it is loaded with a large piece of wood. When it has boiled a good quarter of an hour, the bunches are puſhed to the far end of the copper, or rather, if you pleaſe, taken out; and by means of a bucket or ladle all the liquor may be taken out of the copper and ſtrained into a copper or wooden trough; that is, by putting a ſieve or linen cloth acroſs a trough; by which means the liquor is cleanſed from all the grain and little ſtraws left by the weld in boiling. The liquor thus ſtrained is left to cool till you can bear your hand in it: the ſilk is then dipped and returned till the colour becomes uniform. If this boiling does not make ſufficient to fill the trough, it muſt be ſupplied with water, which ſhould be added before the liquor is cold, that the degree of heat already mentioned may be preſerved. In general, all dyeing veſſels ſhould be full, that the ſilk when dipped may be only two inches from the edge.

"During this operation the weld is a ſecond time boiled in freſh water; and when it is boiled, the ſilk ſhould be raiſed at one end of the trough, either upon a kind of barrow, or upon the edge of the trough. Half the liquor is then thrown away and repleniſhed by adding of the ſecond boiling as much as was taken from the firſt, obſerving to rake and mix the liquor well: ſuch is generally the method when any new addition is made; at leaſt if the contrary is not particularly ſpecified. This new liquor may be uſed rather hotter than the firſt; it ſhould nevertheleſs be always of a moderate heat, becauſe otherwiſe it would deſtroy a part of the colour which the ſilk had already taken, probably owing to the ſilk being deprived of part of the alum by the heat of the liquor. The ſilk is returned in this freſh liquor as at firſt; mean while you prepare a ſolution of pearl-aſh in proportion of about one pound to every twenty pounds of ſilk.

"For this purpoſe the pearl-aſh is put into a copper, and the ſecond liquor, quite boiling, poured on it, ſtirring in order to aſſiſt the diſſolving of the ſalt. This ſmall liquor is left to ſubſide, and the ſilk is a ſecond time raiſed on the barrow or trough, throwing into the liquor about two or three ladles of the cleareſt of the ſolution. The liquor is then well raked, the ſilk replunged, and again returned. This alkali developes and brightens the yellow of the weld. After ſeven or eight returns, one hank is wrung to try if the colour be full enough and ſufficiently bright; if deficient, a little more of the ſolution of the aſhes muſt be added, and the remainder of the ſilk done in the ſame manner till it has taken the ſhade required. The lixivium, ſeparately prepared, may be added, if you will, at the ſame time with the ſecond boiling of the weld-liquor; care ſhould be taken however that the liquor be not too hot. This operation is only for yellows, nor would the liquor do for greens.

"For yellow ſtill fuller, approaching to jonquil, when the pearl-aſh is added, it may be alſo neceſſary to add ſome rocou, in proportion to the ſhade required.

"For the light ſhades, ſuch as pale lemon or Canary-bird, they ſhould be boiled in the ſame manner as for blues, theſe ſhades being much more beautiful and tranſparent when dipped in a clear ground. To do this, when the weld is ready to boil, ſome of the liquor ſhould be taken out and mixed with a little clean water and a little of the liquor of the vat if boiled without azure. The ſilk is then dipped as uſual; and if deficient in ſhade, the weld liquor muſt be re-added, and the dipping repeated, if neceſſary, to complete the ſhade required.

"For deeper lemon colours the weld ſhould boil as for yellows, adding only a certain quantity with clean water, according to the fulneſs of the ſhade required: ſome of the liquor of the vat may alſo be added if neceſſary; but theſe dark lemon colours may be boiled in the common way as for yellows. It muſt be obſerved, however, that the blue of the vat is never added to theſe colours but when it is intended to give them a greeniſh caſt.

"Theſe very pale yellow ſhades are rather difficult as they are very frequently liable to be affected by the air, and to deepen too much while drying. This happens when alumed in the common way, which is too much; but this inconvenience may be avoided, if inſtead

ſtead of aluming as for other yellows, a ſeparate liquor is prepared, or even without any particular preparation, only a little alum put into the liquor of the weld.

"In manufactories where they cannot eaſily procure weld, they make uſe of the grains of Avignon, and preciſely in the ſame manner; but it gives a leſs permanent colour."

70 To dye cotton yellow. Cotton to be dyed of a yellow colour ſhould be firſt well cleanſed in a lixivium of freſh wood aſhes, and afterwards well waſhed and dried. Another liquor is then prepared by diſſolving in the water, when ready to boil, about a quarter the weight of the ſubſtance to be dyed of Roman alum. The ſkeins are plunged into this alum liquor, returning them on the rods for ſome minutes. When equally penetrated throughout, the threads by which the ſkeins are tied being paſſed on the rods, the hanks are laid on the trough containing the alum liquor. The copper or trough is then covered, it being ſufficient to keep the liquor hot without boiling. The cotton, having been thus infuſed for 24 hours, is then dried, but without waſhing. We muſt obſerve, that the longer it remains dry, the better it takes the colour, and that the waſhing may be even diſpenſed with previous to the yellow dye.

A ſtrong weld liquor is afterwards prepared, adding for every pound of the ſubſtance to be dyed a pound and a quarter of weld. The cotton or thread, having been previouſly alumed, is then immerſed; the boiling checked with cold water, and the ſubſtance worked till it has taken the ſhade required.

The whole when dyed is plunged into a very hot liquor, but not boiling, made of blue vitriol, a quarter of a pound for every pound of the ſubſtance. When it has remained for about an hour and an half, the whole, without waſhing, is thrown into another liquor compoſed of about a quarter of a pound of white ſoap for every pound of the ſubſtance. Having been well worked and the threads opened, it ſhould boil for three hours or more if you think proper. The ſoap might be diminiſhed to half the quantity, but the full proportion does better. This operation finiſhed, the whole is well waſhed and dried.

If you deſire a dark or jonquil yellow, neither the linen nor cotton ſhould be alumed; but for every pound of thread ſhould be added two pounds and a half of weld. When it has been dipped and well worked in this liquor till it has taken the colour equally, it is raiſed above the liquor, and half a pint of the kelp lixivium poured into it, made as directed in the article upon *red*. The thread is then returned upon the rods, dipped in this liquor; where having remained for a full quarter of an hour, it is taken out, wrung, and dried.

The lemon yellow is done after the ſame manner, only that for every pound of thread you put but one pound of weld, diminiſhing the verdigris in proportion, or even omitting it entirely by ſubſtituting in its place the alum liquor. By this means the yellow ſhade may be varied *ad infinitum*, and without any difficulty; in brightening and fixing the colour, however, the above method muſt always be obſerved.

Cotton-velvet is dyed with the root of a plant called *cureum* or *terra merita*, a ſpecies of ruſh which comes from the Eaſt Indies. It gives a beautiful yellow colour; but if dyed in the common manner has but little ſolidity. The colour, according to M. de Apligny, may be fixed upon cotton or linen thread by dipping them in a ſolution of ſulphur of antimony in the kelp lixivium already mentioned. When treated in this manner it is very beautiful as well as permanent. 71

Of fawn or root colour. The fourth primitive colour ſo called among the dyers, is that which bears the appellation of *fawn* or *root* colour. It is however a kind of brown, and has the name of *root-colour* from being an ingredient in a great number of others. The proceſs for dyeing it is different from thoſe lately deſcribed; the wool requiring no other preparation than that of being ſoaked in water, as already directed for blue. The materials for dyeing it are the green ſhell of the walnut, the root of the walnut tree, the bark of the alder, ſantal, ſumach, roudoul or fovic, and ſoot.

The green ſhells of the walnut, collected when the nuts are perfectly ripe, and put into tubs or caſks, and afterwards filled with water, are in this manner preſerved till the year following. The ſhells are alſo uſed before the nuts are ripe; but theſe ſhould be ſaved apart, in order to be firſt uſed; becauſe as the ſoft ſhell which adheres putrifies, it will keep but for two months only

The ſantal or ſaunders is a hard wood imported from the Indies, generally ground into a very fine powder, and preſerved in bags; becauſe it is ſuppoſed to ferment, by which it is thought to be greatly improved; but our author has never obſerved any difference. This ground wood is generally uſed with one-third of cariatour wood; by which, in the opinion of thoſe who prepare it for ſale, it is much improved. It is however nothing like ſo good as the walnut ſhells; becauſe, if uſed in too large a quantity, it ſtiffens conſiderably, and thereby injures the wool; hence it were beſt not to uſe it, either for wool or fine ſtuffs, except in the ſlighter ſhades, where it would not have ſo bad effect. It is generally mixed with galls, alder bark, and ſumach, as by this means only you can obtain its colour when not mixed with the cariatour. It yields but very little with the preparation of alum and tartar, eſpecially if it be not chipped; but notwithſtanding theſe defects, it is uſed on account of the ſolidity of its colour, which is naturally a yellow red brown. The air makes it deeper, and ſoap lighter. It loſes but little by a trial of alum, and ſtill leſs by tartar.

Of all the ingredients for dyeing fawn colours, the walnut rind is the beſt. Its ſhades are finer, its colour ſolid; and by making the wool flexible, renders it leſs difficult to work. It is prepared in the following manner. You fill a cauldron half full of water, and when it grows warm, you add rinds in proportion to the quantity of ſtuffs to be dyed and to the colour required. It is then boiled; and when it is boiled for a quarter of an hour, the ſtuffs, having been previouſly moiſtened with warm water, are dipped; they are then turned and well ſtirred, till they have imbibed the colour deſired. If for worſteds, requiring an exact aſſortment of ſhades, you put leſs walnut rinds, and begin with the lighteſt ſhades. You put more walnut rinds in proportion as the colour is exhauſted, and then dip the darkeſt ſhades. With regard to ſtuffs, you ge-

generally begin with the deepest, and as the colour of the dye diminishes, you dip the lightest. They are aired as usual, dried, and dressed.

The root of the walnut tree is, next to the husk, the best dye for fawn colour: it also gives a very great number of shades nearly resembling those of the husks; hence they may be substituted for each other, but the root requires a different process. You fill your cauldron three quarters full of river water, putting in the root, cut small, in proportion to the quantity of wool to be dyed, and to the shade required. When it is very hot, you dip the wool or stuff, turning and returning it as before, remembering to air it from time to time; and, if stuff, to draw it through the hands in order to shake off the small bits of the root, which might else spot the stuff. To avoid these spots, the root should be tied in a bag. You afterwards dip the lighter stuffs, and so on, till the colour of the root is exhausted. If worsted, you always begin with the lightest, as for other colours; but of all things you must be careful to keep your liquor from boiling at the beginning, as in that case the first piece of stuff would imbibe all the colour.

72 **Precautions to be used in dyeing with roots.**

The method of dyeing with roots is not very easy; for if you are not very attentive to the degree of heat, to turning and returning of the stuffs or worsteds, so as to dip them equally, you run a risk of their being either too dark or spotted, for which there is no remedy. In this case, the only rescource is to dye them marone, prune, or coffee colour. In order to avoid this evil, you must keep the stuffs continually turning on the reel, and dip them only piece by piece, nor let the liquor boil till the root has yielded all its colour. The worsteds or stuffs dyed in this manner, should be aired, well washed, and dried.

Nothing more can be said concerning the bark of alder, than what has been already observed with respect to the root of the walnut tree, only that letting it boil at the beginning is not of so much consequence, because it yields its colour less freely. It is generally used for worsteds and colours darkened with copperas. It nevertheless produces a good effect on wool not intended for colours extremely dark, and perfectly withstands the power of the air and sun.

Sumach is nearly of the same nature, and is used in the same manner as the husks: its colour is not so deep, and is rather greenish. It is for dark colours frequently substituted for nut galls; but a greater quantity is requisite. Its colour is also perfectly solid and permanent. These different substances are sometimes mixed together; and as they are equally good, and produce nearly the same effect, there is no great difficulty in obtaining certain shades. We must, nevertheless, be directed by custom in the production of these fawn colour shades, which absolutely depend upon the eye, and which are not difficult to manage.

With regard to the mixing of these ingredients with ground santal, you put four pounds of the latter into the copper, half a pound of nut galls pounded, twelve pounds of alder bark, and ten pounds of sumach (these quantities will dye 25 or 27 ells of cloth). The whole is boiled; and having checked the boiling with a little cold water, you immerse the cloth, turning and restirring it for two hours: it is then taken out, aired, and washed in the river. You afterwards dip some more stuff in the same decoction, if you want a lighter shade; and in this manner you may contrive as long as the liquor retains any colour. The quantities of these ingredients are augmented or diminished in proportion to the depth of the shade required, letting the wool or stuff boil accordingly.

Here we shall describe also the manner of dyeing with soot, though it has less solidity than the others, and has also the property of hardening the wool, and giving the stuff a very disagreeable smell. 73 **Of dyeing with soot.**

The soot and water is generally put into the copper at the same time, and the whole well boiled. The stuff is then immersed, and more or less boiled according to the shade required; it is afterwards taken out and cooled, and those intended for the lightest shade are then put in; they are afterwards well washed and dried. But the best method is to boil the soot in the water for two hours, to let it stand afterwards, and then to empty the liquor into another copper, without mixing the soot. The wool and stuffs are then dipped in the liquor, and are thereby less hardened than if they had been mixed with the soot: but this does not render the colour more permanent; and indeed it were better never to make use of this ingredient, except for stuffs of little value, especially as it can be supplied by other ingredients already mentioned, and which give a better and more lasting colour, and are besides more softening to the wool. In the dye they frequently employ the green walnut shell, and the root of the walnut tree for their fawn colours. These two substances are useful both for the greater and lesser dye; there are, however, places where it is difficult to meet with them, and where they are therefore obliged to make use of saunders and even of soot.

The last of the primitive colours so called by the dyers, is black; which includes a vast number of shades, from the lightest grey or pearl-colour to the deepest black. Hence it is ranked among the primitive colours in dyeing; for among dyers the word *primitive* does not denote *simplicity*, but only being the original colour from whence a number of others are derived. In order to dye woollen stuffs of a good black, they should first be dyed of a mazareen blue as deep as possible; which is called the *basis* or *ground*, and is to be performed in the manner already directed. The stuff ought to be washed well in running water as soon as it comes out of the vat; and afterwards scoured at the fulling mill; which operation is of the utmost consequence, because without it the subsequent colour will be greatly injured by the lime in the liquor for dyeing blue. This being done, the colour is finished in the following manner. For 100 pounds of cloth put into a cauldron of a moderate size, ten pounds of logwood, cut into chips, and ten pounds of Aleppo galls pulverised, the whole enclosed in a bag: these ingredients are boiled in a sufficient quantity of water for 12 hours. A third part of this liquor is emptied into another cauldron, with two pounds of verdigris; the stuff is then entered and turned for two hours without ceasing. It is necessary to observe that this liquor should boil very slowly, or it is still better to keep it very hot without boiling. The stuff is then taken out, and the second third of the liquor thrown into the copper to the first third, with the ad- 74 **Of dyeing black.**

addition of eight pounds of copperas. The fire under the cauldron is diminiſhed, and the copperas left to diſſolve for half an hour, letting the liquor, cool, after which the ſtuff is kept turning an hour; it is then taken out and cooled. The reſt of the liquor is then mixed with the two firſt thirds, carefully ſqueezing the bag well. To this is added 15 or 20 pounds of ſumach: you give it another boil, and then cool it with a little water; having previouſly added two pounds more of copperas, you again turn the ſtuff for two hours: it is then taken out, cooled, and again put into the cauldron, turning it conſtantly for an hour longer. After this it is carried to the river, well waſhed and ſcoured at the fulling mill. When it is thoroughly ſcoured, and the water comes out of it clear, you prepare a freſh liquor with as much weld as you think proper; you give it one boil, cool it, and dip the ſtuff. This laſt decoction ſoftens and confirms it a very fine black. For the moſt part, however, they do not take ſo much pains; but are ſatisfied, when the cloth is blue, to dip it in a decoction of nutgalls, and to let it boil for two hours. It is afterwards waſhed, and ſome copperas and logwood added to the liquor; after which the ſtuff is again dipped for two hours, and then waſhed and ſcoured.

It may be alſo dyed in the following manner: for 15 ells of cloth, previouſly dyed blue, M. Hellot had a pound and a half of yellow wood, five pounds of logwood, and 10 pounds of ſumach, put into a cauldron. In this the cloth boiled for three hours; after which it was taken out, and 10 pounds of copperas thrown into the copper. When the copperas was diſſolved and the liquor cooled, the cloth was put into it for two hours; it was then taken out and cooled, after which it was again immerſed for an hour, and then waſhed and ſcoured: it was tolerably fine, but not ſo velvety as the preceding.

75
Experiments to determine whether maddering be an advantage in this colour.

It was commanded by the ancient French regulations, that ſtuffs ſhould be maddered after they had been blued, and before they were dyed black. Deſirous of aſcertaining the advantage reſulting from this proceſs, our author took a bit of cloth which had been dyed blue; this being divided, one half was boiled with alum and tartar, and afterwards maddered. It was then blackened in the ſame liquor with the other half which had not been maddered, conformable to the firſt of the two methods juſt deſcribed. They were each of them a very beautiful black; it neverthleſs appeared that the maddered ſtuff had a reddiſh caſt: the other black was certainly more beautiful, more velvety, and much finer. There is, indeed, leſs danger of the maddered ſtuffs ſoiling the hands and linen, becauſe the alum and tartar of the preparation had carried off all the looſe particles. This advantage is not however ſufficient to make amends for the inconvenience of maddering, as the ſtuff is always in ſome degree injured by the alum and tartar, and as the madder gives it a reddiſh caſt diſagreeable to the eye, and beſides this operation raiſes the price of the dye to no purpoſe.

Some dyers, to avoid theſe inconveniences in part, madder their cloth without having previouſly boiled it in alum and tartar. But madder uſed in this manner has no permanency.

Black is ſometimes dyed without having given it the blue ground; and this method of dyeing is uſed for light or thin ſtuffs of inferior value, conſequently not conſiderable enough to bear the expence of a deep blue previous to their being dyed black. It is however proper at the ſame time to give theſe ſtuffs a ground of the green walnut ſhell, or of the root of the walnut-tree, to avoid the neceſſity of blackening them with too great a quantity of copperas.

This proceſs is attended with no manner of difficulty. The cloth is prepared with the green walnut ſhell, and afterwards blackened in the manner already deſcribed, or as near it as poſſible. For with black, as with ſcarlet, moſt dyers ſuppoſe that they are poſſeſſed of a ſecret for dyeing a much finer black than any of their fraternity; this, however, conſiſts in augmenting or diminiſhing the quantities of the ſame ingredients, or in ſubſtituting others which produce the ſame effect. M. Hellot has tried ſeveral methods; but ſuppoſes that what is ſtrictly meant by ſucceeding to perfection, depends rather on the manner of working, handling, and airing the ſtuff properly, than upon the exact quantity of the ingredients.

76
Why it is neceſſary previouſly to dye the ſtuffs blue.

It may not, in this place, be improper to explain the reaſon of the neceſſity of giving ſtuffs a blue, or at leaſt a root colour ground, previous to their being dyed black; and why the dyeing white black is expreſsly prohibited in France; becauſe in that caſe it is neceſſary to uſe a much greater quantity of nutgalls: this would indeed be no great evil, as nutgalls of themſelves do not injure the wool; but in order to overcome this gall, according to the workmens phraſe, that is, to blacken it, or properly ſpeaking rather to form an ink on the ſtuff, it requires a greater quantity of copperas, which not only hardens the ſtuff, but, from the acidity impreſſed on the fibres of the wool by this ſalt, makes it brittle: on the contrary, when the ſtuff has had a ground, that is to ſay, a ſtrong layer of ſome deep colour, there is much leſs occaſion for either.

Blue is preferable to any other colour; firſt, becauſe it is the neareſt to black, which is in fact only a deep blue; and, ſecondly, as there is no occaſion for any other preparation than previouſly boiling the wool, the ſtuff is in no reſpect injured. For the ſame reaſon, viz. the preſervation of the wool, the root colour is ſubſtituted for inferior ſtuffs inſtead of the blue, which would enhance the price; it is therefore neceſſary that this root-colour ground ſhould be as deep as poſſible; becauſe the darker it is, there is occaſion for leſs copperas to complete the black.

It alſo frequently happens, that when ſtuffs of any colour are badly dyed or ſpotted, they are dipped in black: it is however adviſible to dip them firſt in blue, unleſs the colour be very dark, in which caſe they would take a very fine black; but this is the laſt reſource. Theſe ſtuffs are not commonly dyed black if it be poſſible to make them any other colour; becauſe, having been prepared with alum and tartar for the firſt colour, the copperas requiſite for the black would conſiderably injure and greatly diminiſh their quality.

77
How to dye grey.

The ſhades of black are greys, from the darkeſt to the lighteſt. They are of great uſe in the art of dyeing, as well for their own colours ſimply as when ap-

plied

plied to other colours, which is called *darkening*. At preſent we ſhall mention two methods of producing them. The firſt and moſt general is to boil ſome pounded nutgalls with a proper quantity of water for two hours; at the ſame time diſſolving ſome copperas in a little water ſeparately. Having prepared a cauldron of liquor ſufficient for the quantity of wool or ſtuff to be dyed, you add to it, whilſt the water is too hot for your hand, a little of the decoction of the nutgalls with the ſolution of copperas. The ſtuff intended for the lighteſt grey is then dipped. When ſufficiently coloured according to your deſire, you add ſome freſh decoction of nutgalls with ſome of the infuſion of the copperas, and then dip the next ſhade. In this manner you proceed to the darkeſt ſhade, conſtantly adding theſe liquors, from tawny grey even to black; but it is much better to give the tawny grey and the extreme dark ſhades a blue ground, more or leſs as you like, for the reaſon abovementioned.

The ſecond method for producing grey ſeems to be preferable; becauſe the juice of the galls is better incorporated with the wool, and you are thereby ſure of uſing no more copperas than is abſolutely neceſſary. It even appears that the greys are more beautiful and the wool brighter. It alſo appears to be equally ſolid; for they are both of them equally proof againſt the air and ſun. The ſecond method is much leſs prejudicial to the quality of the wool, and is attended with no more difficulty than the firſt.

You boil a ſufficient quantity of nutgalls, well pounded and incloſed in a clean linen bag; you afterwards put the wool or ſtuff into this liquor, letting it boil for an hour, moving and ſtirring it about, after which it is taken out. You then add to the ſame liquor a little copperas diſſolved in a part of the ſolution, and then dip the woollens intended for the lighteſt ſhade. You again add a little of the copperas ſolution continuing in this manner as in the firſt operation till you come to the darkeſt ſhades. In either proceſs, if not reſtrained by patterns, you may catch the preciſe ſhades, beginning with the dark and finiſhing with the light, in proportion as the liquor becomes exhauſted of its ingredients; keeping the pieces of ſtuff or wool immerſed for a longer or ſhorter time, till the ſtuff takes the colour deſired.

It is as impoſſible to determine the quantity of water neceſſary for theſe operations, as it is to ſpecify the quantity of the ingredients, or the time for letting the wool remain in the liquor. The eye muſt judge of theſe things. If the liquor be ſtrongly impregnated with colour, the wool will imbibe the ſhade in a ſhort time; but, on the contrary, it muſt remain longer if the liquor be exhauſted. When the wool is not dark enough, it is dipped a ſecond time, a third, or even more, till it is of a ſufficient colour; the only neceſſary attention is to prevent the water from boiling. If it be by chance too deep, the only remedy is to dip the ſtuff in a freſh warm liquor, adding to it a little of the decoction of nutgalls. This liquor carries off a part of the precipitated iron of the copperas; conſequently the wool or ſtuff becomes lighter.

But the beſt way is to take it out of the liquor from time to time, not leaving it in long enough to imbibe more of the colour than required. It may alſo be dipped in a ſolution of ſoap or alum; but theſe correctives deſtroy a great part of the colour, ſo that it is often neceſſary to darken it again; by this means the wool, which ſuffers greatly by the reiterated action of theſe ingredients, is injured. All greys, however dyed, ſhould be well waſhed in a large ſtream, and the darkeſt even ſcoured with ſoap.

Theſe dingy ſhades, from the lighteſt to the darkeſt, are produced by the ſame operation from which common ink is obtained. The green vitriol contains iron; were it blue, it would contain copper. Pour a ſolution of this green copperas into a glaſs, holding it in the light and dropping into it ſome of the decoction of nutgalls. The firſt drops that fall into this limped ſolution of ferruginous ſalt produces a reddiſh colour, the next turns it bluiſh, then a duſky violet colour, and at laſt it becomes a dark blue, almoſt black, which is called ink. To this ink add a quantity of pure water; let the veſſel reſt for ſeveral days, and the liquor by degrees becomes clearer and clearer, till it is almoſt as limpid as common water, and at the bottom of the veſſel you will perceive a black powder. Having dried this powder, put it into a crucible; calcine this, and put to it a little ſuet or any other fat, you will obtain a black powder which may be attracted by the loadſtone. This, therefore, is iron; this is the metal which blackens the ink; and this, when precipitated by the nutgalls, lodges in the pores of the fibres of the wool, dilated by the heat of the liquor, and contracted when the ſtuff is expoſed to the air. Beſides the ſtyptic quality of the nutgalls, by which they have eminently the property of precipitating the iron of the copperas and producing ink, they alſo contain a portion of gum, as may be aſcertained by evaporting the filtered decoction. This gum being introduced into the pores with the ferruginous atoms ſerves to retain them; but this gum being eaſily ſoluble, it has not the tenacity procured from a ſalt more difficult of ſolution; therefore theſe dark colours have not the ſolidity of other ſolid colours prepared in a boiling ſolution of alum and tartar, and therefore plain greys have not been ſubmitted to the uſual trial.

78 How to dye ſilk of a black colour.

It is by no means eaſy to produce a good black colour on ſilk, though the baſis is undoubtedly the ſame, viz. iron diſſolved by acids, and precipitated on the cloth by a vegetable aſtringent. The following proceſs is given by M. Macquer. "Twenty quarts of vinegar are put into a trough with one pound of black nutgalls pounded and ſifted, and five pounds of freſh iron-filings. While the infuſion is making, you clean out the copper in which you put the black ground, with the following drugs pounded, viz.

8 lb. of black nutgalls	3 lb. of agaric
8 — of common	2 — of *coque de Levant*
4 — of ſumach	10 — of buckthorn
12 — of pomegranate rind	6 — of linſeed.
4 — of bitter apple	

"Theſe ſeveral drugs are put into a copper, containing half the quantity of the veſſel uſed for the black ground, and filled with water. Twenty pounds of Campeachy or logwood chips are afterwards incloſed in a linen bag, for the conveniency of taking them out of of the liquor, unleſs you chooſe to take them out with a pierced ladle, or any other means, becauſe theſe muſt boil a ſecond time as well as the other drugs.

"When the logwood has boiled for about a quarter of an hour, it is then taken out and properly preſerved. The abovementioned drugs are then put into the logwood decoction, and alſo boiled for about a quarter of an hour, carefully checking with cold water as often as it ſeems ready to boil over.

"This operation being finiſhed, the liquor is ſtrained through a linen ſtrainer into a trough, and then left to ſettle, carefully preſerving the grounds which muſt be again boiled.

"The cold infuſion of the vinegar with the nutgalls and iron filings is then put into the copper intended for the black ground. The fire is afterwards put under it, and the following ingredients immediately added, viz.

20 lb. of gum arabic pounded	2 lb. of green copperas
3 — of realgar or red arſenic	2 — of the ſcum of ſugar candy
1 — of ſal ammoniac	10 — of powder ſugar
1 — of ſal. gem.	4 — of litharge pounded
1 — of mineral cryſtal	5 — of antimony
1 — of white arſenic pounded	2 — of orpiment
1 — of corroſ. ſublimate	2 — of plumbago.

Theſe ſeveral drugs ſhould be pounded and ſifted, except the gum arabic, which is only broken.

79 How to uſe the native gums in this operation. "Inſtead of gum arabic the native gums may be uſed, and diſſolved in the following manner: Some of the logwood decoction is put into a boiler; when hot, you put into it a copper ſtrainer, made in the ſhape of an egg, and open at the largeſt end. The gum is put into this ſtrainer, and diſſolves as the liquor heats; it muſt be ſtirred with a wooden peſtle, that it may paſs through the holes. When it is entirely paſſed, you introduce another copper ſtrainer, with holes ſtill ſmaller than the former, to prevent the impurities of the gum from eſcaping. The liquor of the gum already diſſolved is poured into this ſtrainer, and again paſſed as before by the help of the peſtle. This operation is made more eaſy, by now and then taking out the ſtrainer and reſting it on a croſs ſhelf or plank, ſuſpended on the peg over the copper uſed for wringing the black. The gum muſt be ſqueezed pretty hard with the peſtle to force it through the holes of the ſtrainer.

"The gum would diſſolve with more facility if previouſly ſteeped for three or four days in the logwood decoction, eſpecially if you are careful to pour it on very hot.

"When the above ingredients are put into the black ground, you muſt remember to keep the liquor hot enough to diſſolve the gum and the ſalts, but it ſhould never be ſuffered to boil; and when it is therefore ſufficiently hot, the fire is taken away, and the freſh iron-filings ſprinkled over it in a proper quantity to cover the liquor.

"The next morning the fire is again put under the copper, the drugs boiled, and the logwood a ſecond time boiled. It is then taken out, and the following drugs added to this ſecond decoction, viz.

2 lb. of black nutgalls pounded	6 lb. of pomegranate rinds pounded
4 — of ſumach	1 — of bitter apple
4 — of cummin	2 — of agaric pounded
5 — of buckthorn berries	2 — of *coque de Levant*
	5 — of linſeed

Theſe drugs are boiled, the liquor ſtrained and poured on the black ground as we have already ſaid, and the grounds preſerved. You then put a little fire under the copper as at firſt, and the following drugs are immediately added, viz.

8 oz. of litharge pounded	8 oz. of rock ſalt
8 — of antimony pounded	8 — of fenugreek
8 — of *plumb de mer*, alſo pounded	8 — of corroſive ſublimate
8 — of white arſenic pounded	8 lb. of copperas
8 — of cryſtal mineral	20 — of gum arabic, prepared as above.

"When the liquor is hot enough, you take away the fire, ſtrewing over the liquor with the iron-filings, and letting it ſtand for three or four days.

"Two pounds of verdigris are then pounded and diſſolved with ſix quarts of vinegar in an earthen pot, adding to it about an ounce of cream of tartar. The whole ſhould boil for a full hour, taking care to check the boiling with cold vinegar that it may not boil over. This preparation ſhould be kept ready to be added to the black ground when you are going to dye.

"For the black dye the ſilk is boiled as uſual; having waſhed and beetled according to cuſtom, you give the gall liquor for heavy blacks twice, but for light blacks only once. Theſe two blacks are alike both in beauty and ſhade, differing only in the weight of the ſilk: the light black has, however, rather more luſtre.

"The nutgall liquor is made as follows: For every pound of ſilk you muſt have three-quarters of a pound of light nutgalls, adding the ſame quantity of Aleppo. Theſe galls are pounded together, and boiled for two hours in a quantity of water ſufficient for the whole of the ſilk to be galled. As the liquor waſtes a great deal in the boiling, it is, after the firſt hour, filled again, and after two hours the fire is taken away; the liquor is then left to depoſit, and the galls taken out with a pierced ladle; about an hour afterwards the ſilk is put into it, prepared as above.

During this operation the ſilk is drained and very lightly ſqueezed: it is then immerſed in the gall liquor, on cords one above another, taking care to keep it near the ſurface of the liquor, but ſufficiently covered. In this manner it ſhould remain 12 or 15 hours; it is then taken out, waſhed at the river, and if intended for heavy black, is a ſecond time galled in a freſh galling like the firſt; the grounds are generally uſed for the firſt galling; but for the ſecond a liquor of freſh drugs.

"Some dyers gall the heavy blacks but once, by boiling the old grounds, taking them out immediately, and afterwards adding freſh galls; for every pound of ſilk a pound of light gall and half a pound of fine Aleppo. The freſh galls they boil for two hours or more, and when the grounds are taken out they put the

the silk in the fresh gall liquor, where they let it remain a day and a night.

"This method, they say, is the best; because, were the gall grounds to remain in the liquor, they would re-imbibe part of the substance which they had before given to the water.

"When the silk is galled, a little fire is put under the black ground; while it is heating, the silk is wrung out of the galling, and beetled at the river.

"When washed it is drained on the pegs, passing a thread round every hank, each hank as large as for common colours: it is then immediately put on the rods.

"While the black liquor is heating, it should be stirred with an iron rake or paddle, to prevent the grounds from sticking to the bottom of the copper. You then dissolve some French gum by the method above described, till it rises on the top in a kind of scum covering the surface of the liquor; afterwards you throw into it two or three handfuls of linseed. You then add half of the vinegar and verdigris preparation with about four or five pounds of copperas; this should be punctually repeated at every heating.

"Care should be taken while the fire is under the copper to rake; and, to try if it be hot enough, the rake is moved round at the bottom of the copper; if the gum sticks to the rake, and the liquor does not appear through the middle of the gummy scum, it shows that it is hot enough: the fire is then taken away, because, as we have before observed, it should not boil. The rake is then also taken out, and the liquor covered with iron-filings in the same manner as before; after this it is suffered to subside for about an hour, when the surface of the liquor is again stirred, in order to precipitate the filings to the bottom.

"Before we explain the manner of dipping silk in the black liquor, it is proper to observe that silk-dyers never dye black but by coppers, that is when they have a sufficient quantity of silk for three dips, if for heavy black; but if light black only two dips, which is done in the following manner:

"If heavy black, a third of the silk is put upon the rods, and three times returned in the black ground; it is afterwards wrung on the peg over the copper; this is done by giving it three twists: in this manner three hanks may be wrung at once, because it should be done gently, and only to drain; it is again put on the rods, and suspended between two perches to air.

"While the first silk is airing, the second third part is dipped in the same manner, and afterwards the third third part, always in the same manner. It must be remembered, that while the silk is on the rods it should be turned from time to time to give it air.

"When the last third part is wrung, the first part is put in, and then the two others successively for three times, always airing at each time. This is commonly called giving the three wrings, and these three wrings are called one fire or heating.

"The light blacks should also have three wrings to one fire.

"After each fire the black ground is again heated, adding copperas and gum as before. This operation is thrice done for the heavy blacks, that is three fires, each fire consisting of three wrings; but for light blacks only twice, each also consisting of three wrings.

"It must be observed, that at every reheating it is requisite to change the order of dipping, in such a manner that each may in its turn have the first of the liquor. If the black dye is strong and good, the heavy blacks may be done with two fires only; and for the light blacks one wringing less may do for each heating.

"When blacks are finished they are returned in a trough of cold water by dips one after another, called by the French dyers *disbroder* or rinsing; they are then twice or thrice beetled at the river. When washed you put them on the cords, only taking care not to press them too much.

"The silk when taken out of the black dye is extremely harsh, which is by no means wonderful, considering the number of acids and corrosives in the composition. It is therefore necessary to soften it in the following manner:

80 **To soften black silk.**

"Dissolve about five pounds of soap in two buckets of water; and while the soap is dissolving, throw in a handful of aniseed or any other aromatic plant. It should boil till the soap is entirely dissolved. In the mean time a trough should be provided full of cold water, and large enough to dip all the silk at the same time. The soap-water should be strained through linen, the whole mixed well together, and the silk put in, where it should remain a full quarter of an hour. It is then taken out, wrung on the peg, and dried as usual. As the quantity of soap can do no harm, too much is better than too little. This softening is very necessary in order to divest the silk of that rustling and stiffness so prejudicial in the manufacture of black goods.

81 **To dye black in the raw.**

"To dye black in the raw, the silk should be galled in a cold liquor of fresh galls, which had been previously used for the boiled silk. The natural yellow of the silk is preferable for this dye, because the white takes a less beautiful cast.

"Having untied the silk and divided it into hanks of the common size, it is dipped with the hands into the gall liquor. When soaked and a little squeezed, it is strung on cords, eight or ten hanks together.

"They are afterwards put into the cold gall-liquor, one above another, letting even the cords sink in the liquor, where they may remain for six or seven days. They are then taken out and once beetled at the river. As to time, it should remain in the galling according to the strength of the liquor and the quantity of the silk put into it; but however strong it may be, and however small the quantity of silk, it should remain two or three days at least.

"When the silk is washed, it is again strung on the cords and left to drain, after which the cords are put one over the other into the rinsing or black wash, which is of itself sufficient to dye; it will, however, require more or less time according to the strength of the rinsing wash, generally about three or four days. Whilst the silk is thus immersed in the rinsing water, it should be raised with sticks three or four times a-day; it is then drained over the liquor, and when drained put on the ground in a proper place, where it is spread and aired, but not dried. This is absolutely necessary to produce the black, else the silk might take a black-grey; this grey would, however, blacken in the air: nevertheless you are thereby enabled to judge how much of the colour it has taken, and how much it may still want. Should the silk be suffered to dry, it must be again wetted before it is re-dipped, which would be an additional and unnecessary trouble.

"This operation of washing and drying must be successively continued till the silk is sufficiently black.

"The silk in this situation is carried to the river, and twice beetled; after which it is drained on the cords, and then put on the perches to dry without wringing, which would soften it too much: for as this kind of silk is designed for gauzes and black lace, care should be taken to preserve its natural stiffness as much as possible.

"To produce black in the raw in the quickest manner, the silk when washed from its galling should be put on the rods and three times returned in the blacking ground; it is then taken out, and put to drain over the vessel containing the black liquor, and then cooled on the rods.

"When drained, it is again twice dipped in the black liquor, drained, and each time cooled as at first. When drained it is again washed; and the procedure is then the same as for those which had been dyed in the rinsing. This is not, however, the usual method of dyeing black in the raw; because it consumes the black liquor too soon, considering with what avidity the raw silk takes any colour whatever; and besides that a good rinsing is sufficiently strong for dyeing this colour.

"The black dye is weakened and becomes exhausted in proportion to the silk it has dyed; it is therefore necessary to strengthen and replenish, from time to time, by an addition of proper drugs, which is called giving the *brevet* or *composition*.

"This composition is made by putting four or five buckets of water into a copper, and then boiling it with about four pounds of logwood chips. The logwood is then taken out, and four pounds of black buckthorn berries is added with two pounds of pomegranate rind, two pounds of sumach, two pounds of *Coque de Levant*, two pounds of coliquinte, two pounds of linseed, and four pounds of cummin.

"These drugs are boiled together for about three quarters of an hour; the fire is then put under the black liquor, when a little more than half boiled, and whilst hot the following drugs are added, viz.

2 lb. of realgar	1 lb. of white arsenic
4 — of antimony	1 — of corrosive sublimate
1 — of gold litharge	1 — of orpiment
1 — of silver litharge	1 — of powder sugar
1 — of sal ammoniac	1 — of fenugreek
1 — of rock salt	4 — of copperas.
1 — of crystal mineral	

"These drugs, when all pounded, are thrown into the black ground, remembering to stir. When the composition is sufficiently boiled, it is strained in a trough and left to settle; the grounds having subsided, the clear part is added to the black ground. The same grounds are again boiled and preserved for some other time.

"The composition being added to the black liquor, and sufficiently hot, the fire is taken away. The liquor is then strewed over with the iron filings, and left to settle for two days.

"When the black ground has had a certain number of additions, and a quantity of sediment collected at the bottom, part of the grounds should be taken out in order to clear the liquor. Thus frequently replenishing, the foundation is always preserved; so that the liquor is never entirely new, but having been once set in a dye-house is set for ever. These liquors are never liable to putrefaction, owing to the great quantity of nutgalls and martial vitriol in the composition, two of the most powerful antiseptics known.

"The most material observation concerning the black dye is, that in general it greatly injures the goods in such a manner that stuffs of this colour, though not inferior in other respects, wear out much sooner than those of any other. This defect may be attributed to the vitriolic acid of the copperas, which is but imperfectly saturated with the iron. Iron combined with any, even vegetable, acid, is capable of producing black with vegetable astringents. It is therefore most probable that this inconvenience might possibly be removed, by substituting other combinations of this metal for the copperas, if it were worth while to make the attempt."

82 Of dyeing silks grey.

All kinds of grey, excepting black grey, are produced upon silk without aluming. The silk being washed from the soap and drained on the peg, a liquor is made of fustic, logwood, archil, and copperas. Fustic gives the ground; archil the red; logwood darkens, and the copperas softens all these colours, turns them grey, and at the same time serves instead of alum in extracting them. As there is an infinite variety of greys without any positive names, and produced by the same methods, it would be endless to enter into a detail that would prolong this treatise to so little purpose.

Suffice it to remark here, that in producing a reddish grey the archil should predominate; for those more grey, the logwood; and for those still more rusty and rather greenish, fustic.

In general, when obliged to complete the colour with logwood, it should be used rather sparingly, because it is apt in drying to darken too much, differing in this particular from all other colours.

To give an example of the manner of producing these colours we shall take the nut-grey.

The fustic decoction, archil, and a little logwood, is put into water moderately hot. The silk is then returned, and when the liquor is exhausted it is taken out; and to soften the colour the copperas solution is added. Some dyers, for this purpose, add the black wash instead of the copperas; the silk is again returned; and if the colour does not appear sufficiently even, some red spots still remaining, it may be concluded that it requires a little more copperas.

It must also be remembered, that as copperas is the general base of all greys, if deficient in quantity, the colour will be apt to change in drying, and to become rough and uneven.

To try if the colour be sufficiently softened, it should be examined; and if it wets easily, after having been wrung on the peg, it wants copperas; but if on the contrary it soaks with a little difficulty, the colour is enough softened.

On the other hand, too much copperas stiffens the silk considerably, making it harsh, and even depriving it of a great part of its lustre. To remedy this, the

silk

silk when taken out of the liquor should be wrung on the peg, and then immediately washed at the river, which carries off the superfluous copperas.

The black greys, because alumed and welded, make a separate class. When the silk is alumed and cooled at the river, and the weld liquor prepared as for yellows, the silk is returned; and when the liquor is exhausted, a part of it is thrown away, and the logwood decoction substituted in its place. The silk is again returned in this liquor; and when the logwood is exhausted, some copperas may be added in a sufficient quantity to blacken the colour. The silk is then washed, wrung, and finished as usual.

For iron grey, it is necessary to boil the same as for blues. This colour is much more beautiful when laid on a very white ground. It is more used in the manufacturing of stockings then any other colour, therefore generally wrought in shades; that is, many different shades made at the same time.

When the silk is washed and prepared as usual, you make the liquor of river or well water, no matter which; but either must be cold.

If river water, the logwood decoction made with river water is added, sufficient to produce the dark shade required; the silk is then dipped, and when finished it is wrung and hung up. A part of the liquor is then thrown away and replenished with water for the following shades, and so on to the lightest, carefully dividing; that is, preserving an equal distance between the shades.

When all is finished with the logwood, the dark shades are put again on the rods, to be dipped in a new liquor with the addition of copperas; the remaining lighter shades are then dipped in the same liquor, but without the copperas addition: if, however, the second shade is not enough softened, a little copperas must be added. This defect is easily perceived in the dipping, as we have before observed.

When arrived at the lightest shades, care should be taken that the liquor be not overcharged with copperas, which is easily perceived by its having a reddish cast; in which case some of the liquor should be thrown away and replenished with water, too much copperas producing the same effect with regard to these shades as the preceding.

When the liquor is made with well water, the logwood decoction should also be made of well water. This being added to the liquor, the darkest shades are first dipped as in the preceding process. When the silk has sufficiently drawn, it is taken out, and the following shades are then dipped, but without replenishing, the colour being much better and clearer without the river water.

When all the shades are complete, you soften with copperas, in the same manner as above described; the silk is afterwards washed, and if necessary beetled.

83 To discharge grey colours from silk.

To discharge greys, that is when the shades are too dark and too full, you put some tartar pounded in a mortar and sifted into a bucket or small trough; you then pour over it some boiling water. The clearest of this liquor is afterwards put in a trough, and the silks returned in it; by which operation a part of the colour is immediately discharged.

If the silk does not instantly take an equal colour, a little more tartar must be added as abovementioned.

The silk thus discharged of its superfluous colour is once beetled at the river, and afterwards dipped in hot water, without any other addition. This last operation restores in part what it had lost by the tartar; but to try the colour it should be wrung on the peg.

The tartar always destroying some part of this colour, it should be restored with a fresh liquor made for the purpose, and then softened with copperas as usual.

If the silk has been alumed, then the hot water may be omitted after the beetling; the hot water is, however, always of use in removing the harshness occasioned by the tartar.

To discharge iron greys when too dark, they should be sulphured, afterwards beetled at the river, and then again dipped in a fresh liquor similar to the first.

This method of discharging iron greys is perferable to either tartar or lemon juice, these ingredients giving them a ground that does not easily yield even to the boiling with soap, which consequently spoils the colour; whereas the sulphuring almost entirely whitens the silk by totally destroying the logwood.

For greys in the raw, the silk should be as white as for common colours, except the black grey, for which the natural yellow would be no disadvantage. Having soaked the raw silk, the process is then the same for producing these shades as on boiled silk.

84 Of dyeing cotton or linen black.

Cotton or linen receive a black colour with still more difficulty than silk. "The various processes (says M. de Apligny) for dyeing black, agree in the sole intention of introducing within the pores of the stuff ferruginous particles dissolved in different menstrua, and of precipitating them on the stuff by means of astringent substances furnished with phlogiston capable of colouring iron black. The best method therefore of succeeding, is to choose a solvent capable of dividing the particles so minutely that the calx may not injure the stuff. Copperas or green vitriol are used in these processes; but the iron it contains is by no means in a state of perfect division, on account of the phlogiston obstinately retained by it, which facilitates its union with the acid without the iron being perfectly dissolved. It is for this reason, doubtless, that a solution of green vitriol in water deposits in lime a species of ochre; which, according to M. Geoffroy, seems to be an extraneous substance. For the same reason the spirit of nitre, saturated with iron, will dissolve still more, by abandoning the grosser particles of what is held in solution, and of which it retains only the phlogiston.

85 Cause of the rottenness frequent in black stuffs.

"This being the case, whenever copperas is used in dyeing of black, the stuffs dyed are generally harsh to the feel and considerably damaged; because the gross particles of the iron being only divided, and not dissolved by the vitriolic acid of the copperas, overfill the pores of the stuff into which they had entered, and by their hardness extending the partition of these pores, force them asunder. M. Hellot very well observes, that cloth dyed black without a blue or root ground requires a greater quantity of copperas, by which the stuff is rendered rotten. But I have also remarked, that when dissolving the rust of iron in vinegar, either for yellow or for the black of painted linens, it is apt to tear in the parts where these colours are applied, particularly if there has been no attention to take off the grosser earth by scumming the solution. To this

this earth therefore the rottenness of black stuff may be attributed; and not, as vulgarly imagined, to the salt of vitriol, nor to any other burning cause.

"And therefore, in order to render the colour more equal, and the stuffs less damaged, the best method for black is to use a solution of iron perfectly divided. Consequently, as experience daily teaches, those acids which attack the iron too rapidly are the least proper to produce a perfect solution of this metal. Weak acids are therefore preferable; which, notwithstanding

86 **Compositions for dyeing black improved by age.**

their slow operation, penetrate entirely, dividing it into impalpable particles. Black compositions also succeed much better in proportion as the black liquor is older, and consequently the solution of the iron more complete. The manufacturers in India are so truly sensible of this consequence, that many of them preserve their black vats for more than 20 years. In the states of Genoa, Florence, and Naples, every manufacturing city has a place of reserve, called the *Seraglio*, where at the public expence eight or ten vats are continually supported. These vats have been set from 300 to 400 years, more or less: that is, prepared for the dipping of silk designed for black, and requiring only to be supplied with proper drugs in proportion as they are diminished by use. The ground remaining always the same, forms a kind of leaven, by which the fermentation of the necessary additional drugs is assisted.

87 **Rouen process for dyeing cotton or linen black.**

"The process at Rouen for dyeing linen and cotton thread black, is first to give it a sky-blue ground, and then to wring and dry. It is afterwards galled, a quarter of a pound of galls for every pound of the substance (as for reds): having remained 24 hours in the gall liquor, it is again wrung and dried.

"About five quarts of the black liquor for every pound is then poured into a trough. The cotton is then dipped and worked with the hand, pound by pound, for about a quarter of an hour, then wrung and aired. This operation is twice repeated, adding each time a fresh quantity of the black liquor carefully scummed. It is again aired, wrung, washed at the river, well drained, and dried.

"When this cotton is to be dyed, about one pound of the rind of the alder-tree for every pound of thread is put into a copper and boiled in a sufficient quantity of water during one hour. About half the liquor that had been used for the galling is then added, with about half the weight of the rind of the alder of sumach. The whole is again boiled for two hours, after which it is strained through a sieve. When it is cold, the cotton is dipped in it on the rods, and worked pound by pound; from time to time airing, and returning it into the liquor; where having remained 24 hours, it is wrung and dried.

"For softening this cotton when too harsh, it is the custom to soak it in the remainder of the weld-liquor that had been used for other colours, adding a little of the logwood-liquor. It is then taken out, and instantly plunged into a trough of warm water, into which had been poured about an ounce of the oil of olives for every pound of substance: it is then wrung and dried.

88 **Process of the Abbé Mazéas.**

"M. l'Abbé Mazéas has given a process for the dyeing of linen and cotton thread black, by maddering after having prepared with the sickiou of the Adrianople red, galling and dipping in an astringent composed of lime-water and green copperas calcined. This process, though long and expensive, is in my mind no better than those I have just described. In order to obtain a permanent black, it is my opinion that we must still have recourse to the black resulting from a combination of the three primitive colours, until we discover feculæ capable of yielding a direct black. I shall now describe a process in which I myself have succeeded perfectly.

89 **Of M. de Apligny, by a combination of colours.**

"To dye linen and cotton thread black by a combination of colours, it is necessary to begin by cleansing the thread as usual by galling, in the same manner as mentioned in the article upon red, aluming afterwards, and then dipping in a weld-liquor. When taken out of this liquor, it must be dyed in a decoction of logwood, to which has been added a quarter of a pound of blue vitriol for every pound of the substance. It is then taken out, washed at the river, wrung, and washed several times, but not wrung hard. It is at last dyed in a madder liquor, about half a pound of this dye for every pound of the substance. It is needless to repeat here the manner of galling, aluming, and welding, &c. having described them above. By this process we may rest assured of obtaining a very beautiful and permanent black, that will not be liable to be discharged, provided that after having been dyed the thread be dipped in a boiling soap-liquor.

90 **Of dyeing cotton and linen of a grey colour.**

"Several different shades of grey are distinguished in the art of dyeing; *viz.* black-grey, iron-grey, slate-grey, thorn-grey, agate-grey, &c. It is easy to conceive, that grey in general, being a mixture of black and white, its different shades can be obtained only by introducing into the subject a small quantity of matter, by which the rays of light are absorbed in such a manner, that some of the pores not being occupied, reflect all the rays, and present to the eye a grey colour by means of the black particles contained in the intermediate pores. This operation in dyeing is therefore precisely the same as in painting, which produces grey by a mixture of lamp-black and of white lead.

"It would be too tedious, and even superfluous, to describe the different processes for the several greys just mentioned. The dyer will be better able to judge of these shades by his eye than by any particular rules. All that can be said is, that it is the common practice to give a blue ground to black-grey, iron-grey, and slate-grey; but to none of the others. These shades require aluming in proportion to the shade wanted, and are even frequently galled with liquors that had been previously used.

"The thread having been first galled, wrung, and dried, is dipped on the rods in a trough full of cold water, adding an arbitrary quantity of the black liquor and of the logwood decoction. The thread is then worked pound by pound, washed, wrung, and dried.

"It is possible to produce more permanent greys by the two following processes. First, by galling the thread, by dipping in a very weak black vat or liquor, and afterwards maddering. Secondly, by dipping the thread in a very hot solution of crystals of tartar, lightly wringing, and then drying. The thread is then dyed in a decoction of logwood. It appears black; but by dipping the thread, and working it attentively in a hot solution of soap, the superfluous dye being discharged,

ged, it remains a slate-grey, very pretty and very permanent."

91 Of compound colours.

Having described in such a particular manner the methods of dyeing the primitive colours, there can be very little difficulty in comprehending the management of those which proceed from a mixture of them. But though an infinite number of different shades may be formed from those already mentioned, we are not to imagine that a good colour will be produced by the mixture of any two at random. Thus, though you mix blue and scarlet together in any way you please in order to produce a purple, the colour will neither be good nor uniform, owing to the opposite action of the acid and alkaline ingredients by which these two primitive colours are struck. With crimson the case is altered: for, as we have already seen, that colour is produced in the greatest perfection where volatile alkali is concerned; and therefore the alkaline ingredients of the blue, which can only tend to heighten that property in the other colour, have no such pernicious tendency.

92 Purple, &c.

From a mixture of blue and crimson, therefore, are produced columbine, purple, amaranth, pensy, violet, with innumerable other shades, varying according to the depth of the original colours employed. In all these compound colours, it is necessary to dye the stuff completely of one colour, and then proceed with it for the other exactly as if it had been quite white. In the present case, you must begin with blue; because, though the indigo cannot be hurt by the ingredients necessary for dyeing crimson, yet the cochineal would be very considerably injured by the lime used for dissolving the indigo. Colours of an inferior kind are produced from madder.

93 Green.

Blue and yellow produce a green, which is always essentially the same; though there are also innumerable shades of it which go by different names, as yellow-green, pale-green, bright-green, grass-green, sea-green, olive-green, &c. &c. These are all dyed by the general method already mentioned, *viz.* a yellow dye superadded to a blue ground; though they differ in some particulars in respect to the various shades abovementioned.

For yellow-greens, M. Hellot directs the stuff to be a fine light blue, boiled with the common quantities of alum and tartar, and then dipped in the yellow dye in order to receive a strong colour, that the yellow may predominate. For those shades called *cabbage* and *parrot greens*, or any others more inclining to blue, it is requisite that the latter should be very deep and the yellow dye weak, or that a smaller quantity of salts should be used in the preparation. This last method, however, is not approved of by M. Hellot; and indeed it is natural to think, that a great quantity of colour with little of the preparation necessary to make it adhere and brighten it, must be much less durable, as well as less beautiful, than one where the colour and preparation are in due proportion to one another.

A very beautiful green will be produced by dipping a deep blue cloth in the decoction of the virga aurea Canadiensis, provided the stuff after being dyed blue has been boiled in a solution of three parts of alum and one of white tartar. This green is equally permanent with that dyed with weld. A very permanent green is also produced by the bark of the ash-tree, but less beautiful than the other. A duck's-wing green is produced by using the root of the sharp-pointed dock grossly powdered and in sufficient quantity. For this the stuff must be dyed first of a dark blue; then well scoured, and afterwards boiled in a solution of four parts of alum and one of tartar; and, lastly, it must be boiled full two hours with the other colouring ingredient the dock-root. By this root also many various shades of colour may be obtained from the palest yellow to a tolerable olive; so that our author thinks it is a considerable acquisition in the art of dyeing.

94 Dutch method of dyeing sea-green.

Sea-green is usually dyed, according to M. Hellot, with verdigris; and the following, he says, is the Dutch method of doing it, and which produces a more permanent colour than usually is obtained by means of that ingredient. "Two cauldrons are to be placed at a little distance from each other; in one of which you put two pieces of cloth of 40 or 50 ells in length, with eight or ten pounds of white soap shaved, and which must be perfectly dissolved. When the mixture is ready to boil, the stuff should be immersed, and suffered to boil a full half hour. In the other cauldron you must prepare another liquor; and when that is quite hot, you put into it a clean linen bag, containing eight or ten pounds of blue vitriol, and ten or twelve of lime, each of them well pulverized and mixed together; it being necessary that the mixture should be as accurate as possible. This bag should be moved about in the water, hot, but not boiling, till the vitriol is dissolved. A winch is then to be fixed on in the usual manner; but which ought to be carefully wrapped round with a clean linen cloth very tight and well sewed. One end of the cloth is fixed on the winch, which is then turned swiftly round, that the cloth may pass swiftly from the soap-cauldron into that with the vitriol; and here it is turned more slowly, that it may have time to imbibe the particles of the copper, which by means of the lime were diffused in the liquor by separating and precipitating them from the blue vitriol in which they were contained. The cloth is left in this liquor, which should never boil till the cloth has taken the sea-green colour desired. It is then to be taken out, drained on the winch, and aired by the listing. It should hang till it is perfectly cold before it be washed at the river. If it touches wood it will be spotted; for which reason, the winch, and every thing of wood over which it must pass, ought to be well covered with linen."

On examining this process by the principles of chemistry, it appears to be no other than impregnating the cloth with a solution of copper in fixed alkali. It is undoubtedly a mistake to say, that it is done by verdigris; for no verdigris can be formed from blue vitriol, lime, and soap. All that we can say of it is, that it is cloth impregnated with a combination of copper with fixed alkali; which being naturally extremely ready to unite with water, and having very little attraction for the cloth, the latter may be supposed to be painted rather than dyed with it. A much better method, therefore, seems to be that recommended by M. Hellot, of first dyeing the stuff a very light blue, and then giving the necessary yellow with virga aurea.

These receipts may serve as specimens of the methods of dyeing all kinds of mixed colours. There are, however, methods of producing both a blue and green from indigo itself, by dissolving it in acids; and the

95 **Saxon blue and green.** the colours ſo produced are called *Saxon blues* and *greens.* Being periſhable colours, they are now ſeldom uſed; though Mr Wolfe ſome time ago publiſhed a receipt in the Philoſophical Tranſactions for preparing them after an improved method. This method, for the blue, was to diſſolve indigo in concentrated oil of vitriol by digeſting them in the heat of boiling water inſtead of ſand, which had formerly been uſed, and was apt to ſpoil the colour. After the ſolution of the indigo, the liquor may be weakened at pleaſure; and any piece of cloth dipped in it will imbibe a dye deeper or lighter according to the quantity of colour it contains. This colour is very beautiful, but apt to prove unequal; and, as has been already ſaid, extremely periſhable. For the Saxon green it is neceſſary to have a yellow from indigo alſo, which is obtained by diſſolving it in ſpirit of nitre. Mr Wolfe recommends an ounce and an half of powdered indigo to be mixed with two ounces of ſpirit of nitre diluted with four times its quantity of water. The mixture is then to ſtand for a week, and at the end of that ſpace is to be digeſted in a ſand heat for an hour or more; after which four ounces more of water are to be added. The ſolution, when filtered, will be of a fine yellow colour. Strong ſpirit of nitre, when mixed undiluted with indigo, is apt to ſet fire to it; for which reaſon the water is added. Even in its diluted ſtate, it will froth and run over if the digeſtion be performed within 24 hours after the mixture; and on this account it is allowed to remain a week in the cold. One part of the ſolution of indigo in the acid of nitre, mixed with four or five parts of water, will dye ſilk or cloth of the paleſt yellow colour, or of any ſhade to the deepeſt, by letting them boil a longer or ſhorter time, adding water as the liquid evaporates. The addition of alum makes the colour more laſting. None of the colour ſeparates in the operation but what is imbibed by the cloth, and therefore this liquid goes very far in dyeing. That part of the indigo which remains undiſſolved in the vitriolic acid, when collected by filtration and diſſolved in ſpirit of nitre, will dye ſilk and wool of all ſhades of brown inclining to yellow.

96 **M. de Apligny's remarks on this proceſs.** On the proceſs for dyeing Saxon blue M. de Apligny obſerves, that there is no real ſolution of the indigo in the acid of vitriol, but that it is only divided into very fine particles and ſuſpended in the liquor; neither can any alteration be made in it by an alteration in the proceſs. Nor does this make any exception to the general rule in chemiſtry, that acids diſſolve and redden the blue colouring matter of vegetables; it not being their nature to act upon feculæ ſuch as indigo, but upon vegetable juices, the colour of which depends on the ſalts and eſſential oil of the plant. For the truth of his aſſertion he appeals to the appearance of the liquor prepared for dyeing Saxon blue.

97 **Materials for dyeing leſs numerous than might be ſuppoſed.** From the vaſt profuſion of colours which nature exhibits in the flowers which grow every where around us, it is natural to think that the materials for dyeing might be had in the greateſt plenty without any neceſſity of having recourſe to foreign countries. But this is far from being the caſe; for ſcarce one of our blue or red flowers can be made to communicate any durable colour to cloth; while, on the other hand, almoſt all the yellow ones can be made to do ſo. Numberleſs experiments have been made to determine the plants which might be really uſeful to dyers; and moſt that have yet been found fit for their purpoſe in Britain are comprehended in the following liſt.

YELLOWS.	
Bark of buckthorn,	*Rhamnus catharticus.*
berry-bearing alder,	——— *frangula.*
berberry,	*Berberis vulgaris.*
plum-tree,	*Prunus domeſtica.*
apple-tree,	*Pyrus malus.*
hornbeam,	*Carpinus betulus.*
Root of meadow-rue,	*Thalictrum flavum.*
common nettle,	*Urtica dioica.*
Herb, ſaw-wort,	*Serratula tinctoria.*
buſhy hawkweed,	*Hieracium umbellatum.*
hemp-agrimony,	*Bidens tripartita.*
gale, or Dutch myrtle,	*Myrica gale.*
ſweet willow,	*Salix pentandra.*
birch-tree,	*Betula alba.*
hedge-nettle,	*Stachys ſylvatica.*
ſpotted arſmart,	*Polygonum perſicaria.*
yellow looſeſtrife,	*Lyſimachia vulgaris.*
devil's bit,	*Scabioſa ſucciſa.*
kidney-vetch,	*Anthyllis vulneraria.*
common yellow liverwort,	*Lichen parietinus.*
Flowers of St John's wort,	*Hypericum perforatum.*
REDS.	
Roots of ladies bedſtraw,	*Galium verum.*
herb woodroof,	*Aſperula tinctoria.*
ſorrel,	*Rumex acetoſa.*
tormentil,	*Tormentilla erecta.*
purple cinquefoil,	*Comarum paluſtre.*
PURPLES.	
Herb, or tops of wild marjoram.	*Origanum ſylveſtre.*
BLUES.	
Bark of the aſh,	*Fraxinus excelſior.*
Flowers of larkſpur,	*Delphinium conſolida.*
bell-flower,	*Campanula rotundifolia.*
Berries of black heath,	*Empetrum nigrum.*
GREENS.	
Herb of ragwort,	*Senecio Jacobæa.*
cow-weed,	*Chærophyllum ſylveſtre.*
Panicle of brome-graſs,	*Bromus ſecalinus.*
common reed,	*Arundo phragmites.*
BLACKS.	
Bark of oak,	*Quercus robur*
Water horehound,	*Lycopus europæus.*

As it is often neceſſary to give another colour to ſtuffs which have been already dyed, it is plain, that it is as neceſſary for a dyer to know how to diſcharge colours as how to make the cloth imbibe them.—Concerning this, it is only neceſſary to obſerve, that alkaline ſalts are in general the beſt, and, where the colours are well dyed, the only means of diſcharging them. If a piece of cloth is dyed with logwood, and the colour ſtruck upon it with alum, that colour will be nearly diſcharged by oil of vitriol, or any other ſtrong acid; but if ſolution of tin has been employed in ſtriking the colour, acids have then no effect, and alkalies only can be employed. Neither will they diſcharge the colour totally, but the ſtuff muſt be bleached for ſome time to get out the remainder. If alkaline ſalts cannot be employed with ſafety to the ſtuff, it is then impoſſible to dye it any other colour than black; unleſs it be dyed 98 **How to diſcharge colours when dyed.**

a compound colour, of which the original one is a component part.

98 Weight added to silk by different substances. Concerning the weight that colours give to silk (in which it is most taken notice of, being sold by weight, and a commodity of great price), it is observed, that one pound of raw silk loseth four ounces by washing out the gums and the natural sordes; that the same scoured silk may be raised to above thirty ounces from the remaining twelve, if it be dyed black with some materials. Of all the materials used in dyeing, especially of black, nothing increases weight so much as galls, by which black silks are restored to as much weight as they lost by washing out their gum; nor is it counted extraordinary, that blacks should gain about four or six ounces in the dyeing upon each pound. Next to the galls, old fustic increases the weight about $1\frac{1}{2}$ in 12; madder, one ounce; weld, half an ounce; the blue vats in deep blues of the fifth stall gives no considerable weight; neither do logwood, cochineal, nor even copperas, where galls are not used.

Dyeing of Hats. See Hats.

Dyeing of leather. See Leather.

Dyeing, or *Staining*, of paper, wood, bone, marble, &c. See Bone, Marble, Paper, Wood, &c.

DYNASTY, among ancient historians, signifies a race or succession of kings of the same line or family. Such were the dynasties of Egypt. The word is formed from the Greek δυναστεια of δυναστευω, *to be powerful*, or *king*.

The Egyptians reckon 30 dynasties within the space of 36,525 years; but the generality of chronologers look upon them as fabulous. And it is very certain, that these dynasties are not continually successive, but collateral.

DYRRACHIUM (anc. geog.), a town on the coast of Illyricum, before called *Epidamnum*, or *Epidamnus*, an inauspicious name, changed by the Romans to *Durrachium*; a name taken from the peninsula on which it stood. Originally built by the Corcyreans. A Roman colony (Pliny). A town famous in story: its port answered to that of Brundusium, and the passage between both was very ready and expeditious. It was also a very famous mart for the people living on the Adriatic; and the free admission of strangers contributed much to its increase: A contrast to the conduct of the Apollonians; who in imitation of the Spartans, discouraged strangers from settling among them.

DYSÆ, in mythology, inferior goddesses among the Saxons, being the messengers of the great Woden, whose province it was to convey the souls of such as died in battle to his abode, called *Valhall*, i. e. the hall of slaughter; where they were to drink with him and their other gods *cerevisia*, or a kind of malt liquor, in the skulls of their enemies. The *Dysæ* conveyed those who died a natural death to *Hela*, the goddess of hell, where they were tormented with hunger, thirst, and every kind of evil.

DYSCRASY, among physicians, denotes an ill habit or state of the humours, as in the scurvy, jaundice, &c.

DYSENTERY, in medicine, a diarrhœa or flux, wherein the stools are mixed with blood, and the bowels miserably tormented with gripes. See Medicine-*Index*

DYSENTERIC fever. *Ibid.*

DYSERT, a parliament town of Scotland, in the county of Fife, situated on the northern shore of the frith or Forth, about 11 miles north of Edinburgh.

DYSOREXY, among physicians, denotes a want of appetite, proceeding from a weakly stomach.

DYSPEPSY, a difficulty of digestion.

DYSPNOEA, a difficulty of breathing, usually called *Asthma*.

DYSURY, in medicine, a difficulty of making urine, attended with a sensation of heat and pain. See Medicine-*Index*.

DYTISCUS, water-beetle, in zoology, a genus of insects of the order of the coleoptera; the antennæ of which are slender and setaceous, and the hind feet are hairy and formed for swimming. There are 23 species, distinguished by their antennæ, the colour of the elytra, &c.

The larvæ of the dytiscus are often met with in water. They are oblong, and have six scaly feet. Their body consists of eleven segments. The head is large, with four filiform antennæ and a strong pair of jaws. The last segments of their body have rows of hairs on the sides; and the abdomen is terminated by two spines charged with the like hairs, forming a kind of plumes. These larvæ are frequently of a greenish variegated brown: they are lively, active, and extremely voracious: they devour and feed upon other water-insects, and often tear and destroy each other. The perfect insect is little inferior to its larvæ in voraciousness, but it can only exercise its cruelty on the larvæ; the perfect insects, like himself, being sheltered by the kind of scaly cuirass with which they are armed. This creature must be touched cautiously; for besides its power of giving a severe gripe with its jaws, it has moreover, under the thorax, another weapon, a long sharp spine, which it will drive into one's fingers by the effort it makes to move backwards. The eggs of the dytisci are rather large, and are by them inclosed in a kind of silky duskish cod, of a strong and thick texture, in form round, and terminated by a long appendix or slender tail, of the same substance. These cods are often found in the water, and from them are brought fourth the eggs and larvæ of the dytisci. The strength of these cods probably serves the insect to defend their eggs from the voraciousness of several other aquatic insects, and even from that of their fellow-dytisci, who would not spare them.

Plate CLXIV.

Many species of the perfect insect are common in stagnated waters, which they quit in the evening to fly about. They swim with incredible agility, making use of their hinder-legs after the fashion of oars. The elytra of the females are in general furrowed, and those of the male plain: when they first arrive at their perfect state, their elytra are almost transparent, and in many species of a beautiful dun colour, mingled with shades of greenish brown. The best method of catching

Dyvour.

catching them is with a hand-net or sieve; for they are so nimble and exercise their defensive weapons so often, and with such painful success, to those who endeavour to catch them, that they are very often obliged to let them escape; the easiest way to kill them, is to let them fall into boiling hot water, which instantly destroys them.

DYVOUR, in Scots law; otherwise *Bare-man:* A person who, being involved in debt, and unable to pay the same,—for avoiding imprisonment and other pains, makes cession of his effects in favour of his creditors; and does his *devoir* and duty to them, proclaiming himself bare man and indigent, and becoming debt-bound to them of all that he has. The word is used in the same sense as BANKRUPT: see that article; and LAW N° clxxxv, 11, 12, clxxii. 10, 11, 12, &c.

E, Eachard.

E, THE second vowel, and fifth letter of the alphabet. The letter E is most evidently derived from the old character Ⅎ in the ancient Hebrew and Phœnician alphabet, inverted by the Greeks to this position E, and not from the Hebrew He ה. From the same origin is also derived the Saxon *e*, which is the first letter in their alphabet that differs from the Latin one. It is formed by a narrower opening of the larynx than the letter A; but the other parts of the mouth are used nearly in the same manner as in that letter.

It has a long and short sound in most languages. The short sound is audible in *bed, fret, den*, and other words ending in consonants: its long sound is produced by a final *e*, or an *e* at the end of words; as in *glebe, here, hire, scene, sphere, interfere, revere, sincere*, &c. in most of which it sounds like *ee*; as also in some others by coming after *i*, as in *believe, chief, grief, reprieve*, &c. and sometimes this long sound is expressed by *ee*, as in *bleed, beer, creed*, &c. Sometimes the final *e* is silent, and only serves to lengthen the sound of the preceding vowel, as in *rag, rage, stag, stage, hug, huge*, &c. The sound of *e* is obscure in the following words, *oxen, heaven, bounden, fire, massacre, maugre*, &c.

The Greeks have their long and short *e* which they call *epsilon* and *eta*. The French have at least six kinds of *e*'s: the Latins have likewise a long and short *e*; they also write *e* instead *a*, as *dicem* for *dicam*, &c. and this is no do doubt the reason why *a* is so often changed into *e* in the preter tense, as, *ago, egi; facio, feci*, &c.

As a numeral, E stands for 250, according to the verse.

E, *quoque ducentos et quinquaginta tenebit.*

In music it denotes the tone *e-la-mi*. In the kalendar it is the fifth of the dominical letters. And in sea-charts it distinguishes all the easterly points: thus, E alone denotes East; and E. by S. and E. by N. East by South, and East by North.

EACHARD (John), an English divine of great learning and wit in the 17th century, bred at Cambridge, author (in 1670) of *The Grounds and Occasions of the Contempt of the Clergy and Religion inquired into.* In 1675 he was chosen master of Catharine-hall upon the decease of Dr John Lightfoot; and the year following was created D. D. by royal mandate. He died in 1696.

Eachard. Eadmerus.

EACHARD (Laurence), an eminent English historian of the 18th century, nearly related to Dr John Eachard. He was the son of a clergyman, who, by the death of his elder brother, became master of a good estate in Suffolk. He was educated in the university of Cambridge, entered into holy orders, and was presented to to the living of Welton and Elkington in Lincolnshire, where he spent above 20 years of his life, and distinguished himself by his writings, especially his History of England, which was attacked by Dr Edmund Calamy and by Mr John Oldmixton. His "General Ecclesiastical History from the Nativity of Christ to the first Establishment of Christianity by human Laws under the emperor Constantine the Great," has passed through several editions. He was installed archdeacon of Stowe and prebend of Lincoln in 1712. He died in 1730.

EADMERUS, an esteemed historian, was an Englishman; but his parents, and the particular time and place of his nativity, are not known. He received a learned education, and very early discovered a taste for history, by recording every remarkable event that came to his knowledge. Being a monk in the cathedral of Canterbury, he had the happiness to become the bosom-friend and inseparable companion of two archbishops of that see, St Anselm and his successor Ralph. To the former of these he was appointed spiritual director by the Pope; and that prelate would do nothing without his permission. In the year 1120, he was sent for by king Alexander I. of Scotland, to be raised to the primacy of that kingdom; and having obtained leave of king Henry and the archbishop of Canterbury, he departed for Scotland, where he was kindly received by the king; and on the third day after his arrival, he was elected bishop of St Andrew's with much unanimity. But on the day after his election, an unhappy dispute arose between the king and him, in a private conference about his consecration. Eadmerus having been a constant companion of the late and of the present archbishops of Canterbury, was a violent stickler for the prerogatives of that see. He therefore told the king, that he was determined to be consecrated by none but the archbishop of Canterbury, who he believed to be the primate of all Britain. Alexander, who was a fierce prince,

prince, and supported the independency of his crown and kingdom with great spirit, was so much offended, that he broke off the conference in a violent passion, declaring, that the see of Canterbury had no pre-eminency over that of St Andrew's. This breach between the king and the bishop-elect became daily wider, till at length Eadmerus, despairing of recovering the royal favour, sent his pastoral ring to the king, and laid his pastoral staff on the high altar, from whence he had taken it, and abandoning his bishopric returned to England. He was kindly received by the archbishop and clergy of Canterbury, though they disapproved of his stiffness, and thought him too hasty in forsaking the honourable station to which he had been called. Nor was it long before Eadmerus became sensible of his error, and desirous of correcting it. With this view he wrote a long submissive letter to the king of Scotland, intreating his leave to return to his bishopric, promising compliance with his royal pleasure in every thing respecting his consecration, which was accompanied by an epistle to the same purpose from the archbishop. These letters, however, which were written A. D. 1122, did not produce the desired effect. But Eadmerus is most worthy of the grateful remembrance of posterity for his historical works, particularly for his excellent history of the affairs of England in his own time, from A. D. 1066 to A. D. 1122; in which he hath inserted many original papers, and preserved many important facts, that are no where else to be found. This work hath been highly commended, both by ancient and modern writers, for its authenticity, as well as for regularity of composition and purity of style. It is indeed more free from legendary tales than any other work of this period; and it is impossible to peruse it with attention, without conceiving a favourable opinion of the learning, good sense, sincerity, and candour of its author.

EAGLE, in ornithology. See FALCO.

EAGLE, in heraldry, is accounted one of the most noble bearings in armoury; and, according to the learned in this science, ought to be given to none but such as greatly excel in the virtues of generosity and courage, or for having done singular services to their sovereigns; in which cases they may be allowed a whole eagle, or an eagle naissant, or only the head or other parts thereof, as may be most agreeable to their exploits.

The eagle has been borne, by way of ensign or standard, by several nations. The first who seem to have assumed the eagle are the Persians; according to the testimony of Xenophon. Afterwards, it was taken by the Romans; who, after a great variety of standards, at length fixed on the eagle, in the second year of the consulate of C. Marius: till that time, they used indifferently wolves, leopards, and eagles, according to the humour of the commander.

The Roman eagles, it must be observed, were not painted on a cloth or flag; but were figures in relievo, of silver or gold, borne on the tops of pikes; the wings being displayed, and frequently a thunder-bolt in their talons. Under the eagle on the pike, were piled bucklers, and sometimes crowns. This much we learn from the medals.

Constantine is said to have first introduced the eagle with two heads, to intimate, that though the empire seemed divided, it was yet only one body. Others say, that it was Charlemagne who resumed the eagle as the Roman ensign, and added to it a second head; but that opinion is destroyed, by an eagle with two heads, noted by Lipsius, on the Antonine column; as also by the eagle's only having one head on the seal of the golden bull of the emperor Charles IV. The conjecture, therefore, of F. Menestrier appears more probable, who maintains, that as the emperors of the east, when there were two on the throne at the same time, struck their coins with the impression of a cross, with a double traverse, which each of them held in one hand, as being the symbol of the Christians; the like they did with the eagle in their ensigns; and instead of doubling their eagles, they joined them together, and represented them with two heads. In which they were followed by the emperors of the West.

F. Papebroche wishes that this conjecture of Menestrier were confirmed by ancient coins; without which, he rather inclines to think the use of the eagle with two heads to be merely arbitrary; though he grants it probable, that it was first introduced on occasion of two emperors in the same throne.

The eagle on medals, according to M. Spanheim, is a symbol of divinity and providence; and according to all other antiquities, of empire. The princes on whose medals it is most usually found, are the Ptolemies and the Seleucides of Syria. An eagle with the word CONSECRATIO, expresses the apotheosis of an emperor.

EAGLES, a name found very frequently in the ancient histories of Ireland, and used to express a sort of base money that was current in that kingdom in the first years of the reign of Edward I. that is, about the year 1272. There were, besides the eagles, lionines, rosades, and many other coins of the same sort, named according to the figures they were impressed with.

The current coin of the kingdom was at that time a composition of copper and silver, in a determined proportion, but these were so much worse than the standard proportion of that time, that they were not intrinsically worth quite half so much as the others. They were imported out of France and other foreign countries. When this prince had been a few years established on the throne, he set up mints in Ireland for the coining sufficient quantities of good money, and then decried the use of these eagles, and other the like kinds of base coins, and made it death, with confiscation of effects, to import any more of them into the kingdom.

EAGLE, in astronomy, is a constellation of the northern hemisphere, having its right wing contiguous to the equinoctial. See AQUILA.

There are also three several stars, particularly denominated among the Arab astronomers, *nasr*, i. e. "eagle." The first, *nasr sohail*, the "eagle of canopus," called also *sitareh jemen*, the star of Arabia Felix, over which it is supposed to preside; the second, *nasr althair*, the "flying eagle;" and the third, *nasr alvake*, the "resting eagle."

White EAGLE, is a polish order of knighthood, instituted in 1325 by Uladislaus V. on marrying his son

 Casimire

Casimire with a daughter of the great-duke of Lithuania.

The knights of this order were distinguished by a gold chain, which they wore on the stomach, whereon hung a silver eagle crowned.

Black Eagle, was a like order, instituted in 1701 by the elector of Brandenburgh, on his being crowned king of Prussia.

The knights of this order wear an orange-coloured ribbon, to which is suspended a black eagle.

Eagle, in architecture, is a figure of that bird anciently used as an attribute, or cognizance of Jupiter, in the capital and friezes of the columns of temples consecrated to that god.

Eagle-flower. See Balsamine.

Eagle-stone, in natural history, a stone, by the Greeks called *ætites*, and by the Italians *pietra d'aquila*, as being supposed to be sometimes found in the eagle's nest. It is of famous traditionary virtue, either for forwarding or preventing the delivery of women in labour, according as it is applied above or below the womb. Matthiolus tells us, that birds of prey could never hatch their young without it, and that they go in search for it as far as the East Indies. Bausch has an express Latin treatise on the subject. See Ætites.

EAGLET, a diminutive of eagle, properly signifying a young eagle. In heraldry, when there are several eagles on the same escutcheon, they are termed *eaglets*.

EALDERMAN, or Ealdorman, among the Saxons, was of like import with earl among the Danes.

The word was also used for an elder, senator, or statesman. Hence, at this day, we call those *aldermen* who are associates to the chief officer in the common-council of a city or corporate town.

EAR, in anatomy. See there, n° 141.

Several naturalists and physicians have held, that cutting off the ear rendered persons barren and unprolific; and this idle notion was what first occasioned the legislators to order the ears of thieves, &c. to be cut off, lest they should produce their like.

The ear has its beauties, which a good painter ought by no means to disregard; where it is well formed, it would be an injury to the head to be hidden. Suetonius insists, particularly, on the beauties of Augustus's ears; and Ælian, describing the beauties of Aspasia, observes, she had short ears. Martial also ranks large ears among the number of deformities.

Among the Athenians, it was a mark of nobility to have the ears bored or perforated. And among the Hebrews and Romans, this was a mark of servitude.

Loss of one ear is a punishment enacted by 5 and 6 Edw. VI. cap. 4. for fighting in a church-yard; and by 2 and 3 Edw. VI. cap. 15. for combinations to raise the price of provisions, labour, &c. if it be the third offence, beside pillory, and perpetual infamy, or a fine of 40l.

By a statute of Henry VIII. maliciously cutting off the ear of a person is made a trespass, for which treble damages shall be recovered; and the offender is to pay a fine of ten pounds to the king. 37. Hen. VIII. cap. 6. § 4. In the index to the Statutes at Large, it is said, that this offence may be punished as felony, by 22 and 23 Car. II. cap. 1. § 7. commonly called *Coventry's act*; but ear is not mentioned in that statute.

Ear of Fishes. See Comparative *Anatomy*, n° 167.

Ear, in music, denotes a kind of internal sense, whereby we perceive and judge of harmony and musical sounds. See Music.

In music we seem universally to acknowledge something like a distinct sense from the external one of hearing; and call it a *good ear*. And the like distinction we should probably acknowledge in other affairs, had we got distinct names to denote these powers of perception by. Thus a greater capacity of perceiving the beauties of painting, architecture, &c. is called a *fine taste*.

Ear is also used to signify a long cluster of flowers, or seeds, produced by certain plants; usually called by botanists *spica*. The flowers and seeds of wheat, rye, barley, &c. grow in ears. The same holds of the flowers of lavender, &c. We say the stem of the ear, i. e. its tube or straw; the knot of the ear; the lobes or cells wherein the grains are inclosed; the beard of the ear, &c.

Ear-Ach. See (the *Index* subjoined to) Medicine.

Ear-Pick, an instrument of ivory, silver, or other metal, somewhat in form of a probe, for cleansing the ear. The Chinese have a variety of these instruments, with which they are mighty fond of tickling their ears; but this practice, Sir Hans Sloane observes, must be very prejudicial to so delicate an organ, by bringing too great a flow of humours on it.

Ear-Ring. See Pendent.

Ear-Wax. See Cerumen, and Anatomy, p. 764, col. 1.

EARWIG, in zoology. See Forficula.

EARING, in the sea-language, is that part of the bolt-rope which at the four corners of the sail is left open, in the shape of a ring. The two uppermost parts are put over the ends of the yard-arms, and so the sail is made fast to the yard; and into the lowermost earings, the sheets and tacks are seized or bent at the clew.

EARL, a British title of nobility, next below a marquis, and above a viscount.

The title is so ancient, that its original cannot be clearly traced out. This much, however, seems tolerably certain, that among the Saxons they were called *ealdormen*, *quasi* elder men, signifying the same with *senior* or *senator* among the Romans; and also *schiremen*, because they had each of them the civil government of a several division or shire. On the irruption of the Danes they changed their names to *eorels*, which, according to Camden, signified the same in their language. In Latin they are called *comites* (a title first used in the empire), from being the king's attendants; *a societate nomen sumpserunt, regis enim tales sibi associant*. After the Norman conquest they were for some time called *counts*, or *countees*, from the French; but they did not long retain that name themselves, though their shires are from thence called *counties* to this day. It is now become a mere title: they have nothing to do with the government of the county; which is now entirely

Earl || Earth.

tirely devolved on the sheriff, the earl's deputy, or *vicecomes*. In writs, commissions, and other formal instruments, the king, when he mentions any peer of the degree of an earl, usually styles him "trusty and well-beloved *cousin*:" an appellation as ancient as the reign of Henry IV.; who being either by his wife, his mother, or his sisters, actually related or allied to every earl in the kingdom, artfully and constantly acknowledged that connection in all his letters and other public acts; whence the usage has descended to his successors, though the reason has long ago failed.

An earl is created by cincture of sword, mantle of state put upon him by the king himself, a cap and a coronet put upon his head, and a charter in his hand.

Earl-Marshal. See Marshal.

EARNEST (Arrhæ), money advanced to bind the parties to the performance of a verbal bargain. By the civil law, he who recedes from his bargain loses his earnest, and if the person who received the earnest give back, he is to return the earnest double. But with us, the person who gave it, is in strictness obliged to abide by his bargain; and in case he decline it, is not discharged upon forfeiting his earnest, but may be sued for the whole money stipulated.

EARTH, among ancient philosophers, one of the four elements of which the whole system of nature was thought to be composed. See Element.

Earths, in chemistry, are defined by Cronstedt to be such substances as are not ductile, mostly indissoluble in water or oil, and that preserve their constitution in a strong heat. Mr Bergman remarks that they are insipid, and not soluble in 1000 times their weight of boiling water; though, by augmenting the heat, as in Papin's digester, perhaps all the kinds we are yet acquainted with may be found capable of solution, especially when precipitated from some other menstruum; their surface being then greatly augmented. In the chain of nature they proceed by an insensible gradation towards the salts, so that they cannot be separated but by artificial limits. A moderate heat does not change their form, nor are they dissipated by a more violent one. Dr Black defines them to be such bodies as are not soluble in water, not inflammable; and their specific gravity not more than four times the weight of water. They are distinguished from the salts by their insolubility; from the inflammables, by their want of inflammability; and from the metals, by their deficiency in weight. Some objections have been made to this defintiion, as not being strictly applicable to those earths which are known to be soluble in water: but this objection may be accounted of little weight, when we consider the extreme disparity betwixt the solubility of the earths and salts, a few grains of the earths saturating some pounds of water; so that if they have any solubility, they must be allowed to possess but a very small share of it.

Another property, which is not usually taken into the definition, makes nevertheless a remarkable part of the character of earthy bodies, viz. their great fixedness in the fire. All the other classes of bodies show themselves volatile in more or less violent degrees of heat. All the salts can be made to evaporate; all the inflammable substances are volatile; all the metals, gold not excepted, have been converted into vapour; but the earths, as far as we know, have never been volatilized, excepting only two, the diamond and asbestos. Some phenomena attending the volatilization of the diamond give reason to suspect that it is not a pure earthy substance. There is an appearance of inflammation; and it seems to be a compound, having an earthy matter for its basis, and deriving its volatility from other matters. In general, therefore, the earths have been found fixed in any degree of heat of which we have had experience; though there is no doubt a possibility, that heat might be raised to such an intensity as to volatilize the most fixed body in nature; but till the means of doing so shall be found out, the earths may be considered as absolutely fixed.

Earth.

The earths called *primitive* or *simple*, because they cannot be decomposed by any method hitherto known, were by Cronstedt supposed to be nine; but later chemists have reduced them to five. Some reduce the number still farther; but Mr Bergman informs us that these "rest their opinions upon fanciful metamorphoses unsupported by faithful experiments. As experiments teach us that there are five primitive earths, it is evident that the species arising from their mixture cannot exceed 24, viz. ten double, consisting of two earths; six triple, three quadruple, and the five primitive earths. Even all these different mixtures have not been found, though they probably do exist in nature. The natural compositions of acids with the earths, forming substances not soluble in 1000 times their weight of boiling water, and which may be called *saline earths*, are undoubtedly chemical combinations. The five primitive earths are, terra ponderosa; calx or calcareous earth, capable of being reduced into quicklime; magnesia; argilla or argillaceous earth; and siliceous earths.

"But though we must consider these as the most pure of all the earthy bodies, they are never found native in a state of absolute purity; nor indeed can they be made perfectly pure even by artificial means. Water and aerial acid unite readily with the four first; and when expelled by fire, a little of the matter of heat is added, until driven out by a more powerful attraction. But in this state they possess a degree of purity not to be attained by any other known method. Therefore it is necessary to examine them when sufficiently burnt, in order to distinguish better what properties depend upon adhering heterogeneous matters."

Our author at first added the earth of gems to the five classes already mentioned; but he found afterwards that all kinds of gems are compounded of some of the five kinds already mentioned, particularly of the argillaceous kind, insomuch that they may be said almost entirely to belong to this class. Still, however, the earth of diamonds seems to possess properties essentially distinct from the five already mentioned, and therefore may not unjustly be reckoned a sixth class, though its characters have as yet been but very imperfectly examined.

I. *Terra Ponderosa*. This was discovered in Sweden about the year 1774, and is found in several different forms.

1. Combined with aerial acid, called by Dr Withering *terra ponderosa aerata*. This substance has been met

Earth. met with in England; and an account of it, with Dr Withering's analysis, is given under the article CHEMISTRY.

2. The spar-like gypsum, marmor metallicum, lapis bononiensis, phosphorus nativus, baro-selenite, &c. is of very considerable specific gravity, approaching to that of tin or iron; on which account it has been supposed to contain something metallic. But no experiments hitherto made have evinced the existence of any metal in it, excepting a few traces of iron, which are to be met with in all the gypsa. It is met with of two kinds, semitransparent and opaque; the latter being either of a white or reddish colour. The specific gravity is about 4,500, water being accounted 1000. It contains about 84 parts of ponderous earth, 13 of the most concentrated vitriolic acid, and three of water. The method of preparing the phosphorus from this substance is mentioned under the article CHEMISTRY; but Cronstedt observes, that the phosphorescent quality of these stones is different from that of the sparry fluors and limestones, which is only produced by their being slowly heated, and seems to arise from a phlogiston which is destroyed by a glowing heat. M. Scheffer, in the Stockholm Memoirs for 1753, relates some experiments on a stone of this kind from China, which show that it is exactly the same with the *petuntse* of that country, an ingredient in their porcelain manufactories. This stone does not burn into plaster as gypsum does, and is infusible by itself. It frequently contains calcareous earth, and sometimes is met with in the ores of metals, and it likewise forms the basis of some petrifications. Sometimes it contains one or two parts of iron in the hundred.

3. The marmor metallicum drusicum, or ponderous drusen spar, is found in the lead-mines at Alstonmoor in Cumberland, regularly crystallized in the form of alum, solid, and semitransparent. M. Magellan says that he was showed some fine specimens of this mineral by a Mr Thomson, who informed him that "it seems to affect the peculiarity of having its crystals laminated, as radiating from a centre; but that this radiation seldom amounts to a whole circle. The corners of these flat crystals are truncated like those of alum, and thicker on one side than the other of the parallelogram, in such a manner as to fit one another in the kind of arched vault which they form together, and have some small ones adhering to their sides like drusen spars, having internal angles, as the *macles* of the French, or the cruciform crystallizations." The specific gravity of these crystals were found by Mr Nicholson, with an instrument of his own invention, to be to water as 44,745 to 10,000. This species of crystals is found in Auvergne in France, and has been described by Mr Bayen, who supposed its basis to be calcareous. It was extremely refractory, and the surface of its crystals covered with ferruginous ochre. A variety of this is found jagged like cocks combs. This is met with in clifts and fissures, accreted on the surfaces of balls of the same substance. In Derbyshire this substance is called *cauk* or *calk*. M. Magellan was showed some specimens of it by Mr Whitehurst, which had not only convex but flat surfaces. These of the upper aggregated parts were rather like the edges of very thin flattish lenses put together, than like cocks combs. Varieties of it are also found of white and reddish colours. It is likewise met with of a fibrous texture in the form of zeolite or asbestos in filaments. M. Monnet is of opinion that these spars sometimes contain phlogiston, having observed that they become a liver of sulphur in a strong heat; but Mr Woulfe is of opinion that this gentleman was deceived by charcoal falling into his crucible.

4. The lapis hepaticus, or leberstein of the Germans and Swedes. Some specimens of this stone constantly smell like liver of sulphur, but others only when rubbed. It does not effervesce with acids, and according to M. Magellan is a medium between the gypsum and fetid calcareous stones with which it has generally been confounded; but it will not yield any lime, though the latter are more fit for the purpose than any other. Mr Kirwan informs us that this stone is generally compact, but not hard enough to strike fire; its texture is either equable or laminar, scaly or sparry; and it takes a polish like alabaster, does not effervesce with acids, and when calcined is partially reduced to a kind of plaster of Paris. According to the analysis of this stone given us by Professor Bergman, 100 parts of it contain 33 of baro-selenite, 38 of siliceous earth, 22 of alum, seven of gypsum, and five of mineral oil. Cronstedt denies that these stones contain any volatile alkali, though his assertion is contradicted by Wallerius, who affirms, that a volatile alkali certainly exists in them, and may be discovered by a chemical analysis.

"The method which nature takes to combine the ingredients of the lapis hepaticus (says Cronstedt), may be perhaps the same as when a limestone is laid in an heap of mundic while it is roasting; because there the sulphur unites itself with the limestone, whereby the latter acquires the smell of liver of sulphur, instead of which the vitriolic acid alone enters the composition of gypsum. How the sulphur combines itself may likewise be observed in the slate-balls or kernels from the Andrarum alum mines to be afterwards mentioned, where it sometimes combines with a martial earth with which this slate abounds, and with it forms pyrites within the very slate-balls. The fetid or swine stones, as well as the liver-stones, are, with regard to the structure of their parts, subject to the same varieties with the other kinds of limestones." This kind of stone is found, 1. Scaly, of which there are two varieties; one having coarse scales, the other of a whitish yellow colour. 2. With fine glittering scales. This is met with of a black colour at Andrarum in Sweden, in the alum slate abovementioned. Bergman says that this kind consists of a ponderous earth combined with a vitriolic acid, mixed with a rock oil, and with the calcareous, argillaceous, and siliceous earths. He adds, that by a chemical analysis one of these kernels gave 29 parts of caustic ponderous earth, 33 of siliceous, almost 5 of the argillaceous, and 3.7 of lime, besides the water and vitriolic acid which entered its composition.

II. *Calcareous Earths*, when freed from impurities as far as possible, have the following properties. 1. They become friable when burnt in the fire. 2. They more readily fall into powder by being thrown into water, or having it thrown upon them after calcination. 3. They cannot be melted by themselves into glass in close-

close veſſels. 4. They augment the cauſticity of alkaline ſalts by being mixed with them after burning. 5. They exhibit different phenomena in combination with the different acids. With the vitriolic they precipitate in the form of a gypſeous earth capable of ſhooting, by proper management, into ſelenitic cryſtals. With marine acid they form a deliqueſcent maſs called *fixed ſal ammoniac*, and which forms a kind of phoſphorus. With nitrous acid they combine into a glutinous deliqueſcent maſs, from which the acid may be partly driven off by fire; in which operation part of the earth itſelf is volatilized, and which, in a certain ſtate of calcination, produces Baldwin's phoſphorus. With the fluor acid they regenerate the ſpar from which this acid was procured. With phoſphoric acid they are ſaid to regenerate the earth of bones; though the experiments by which this is ſaid to be proved are, as we have often had occaſion to obſerve, by no means concluſive. With the acid of vinegar they cryſtallize into neutral ſalts, which do not deliqueſce in the air. 6. With borax they readily melt into a kind of glaſs which takes impreſſions in a degree of heat below ignition. 7. With the microcoſmic acid they likewiſe melt into glaſs with efferveſcence; a circumſtance likewiſe obſervable when borax is made uſe of; and both theſe glaſſes are quite colourleſs and tranſparent while hot, but become opaque as ſoon as they cool; but if the bead is thrown whilſt hot into melted tallow, or even in warm water or any other hot liquor, it preſerves its tranſparency. 8. With fluſs-ſpat they melt more readily than with any other into a kind of ſlag, by which crucibles are corroded. This, however, according to M. Magellan, is entirely to be attributed to the ſolvents. 9. In certain caſes they are likewiſe found capable of reducing ſome metallic calces, as thoſe of lead and biſmuth; ſometimes alſo thoſe of iron and copper are affected, though in a leſs degree. But on this Mr Kirwan remarks, that ſuch reductions take place only when the earth is combined with aerial acid: and that though calces of lead are in ſome meaſure reduced by chalk, they are not in the leaſt affected by lime; which evidently proves that they receive phlogiſton from fixed air, which is a compound of phlogiſton and dephlogiſticated air. 10. In this laſt inſtance, as well as in ſome others, they reſemble alkaline ſalts; whence they frequently take the title of alkaline earths. Mr Bergman obſerves, that as calcareous earth united to the aerial acid is found native, very little trouble is neceſſary to procure it in a ſtate of purity. For this purpoſe nothing more is requiſite than to boil ſelected pieces of chalk repeatedly in pure water, which diſſolves any calcined earth or *magneſia ſalita* that may be contained in it; after which operation it has no heterogeneous matter but what mechanically adheres to it, the quantity of which is generally extremely ſmall; and if we likewiſe deſire to have it abſolutely free of this, we muſt diſſolve in vinegar, precipitate it with mild volatile alkali, and dry it after carefully waſhing the precipitate. The ſpecific gravity of the precipitate thus carefully waſhed and dried is about 2.720. An hundred parts of it contain about 34 of aerial acid, 11 of water, and 54 of pure earth. Acids unite with it with efferveſcence, and the mixture produces heat. When burnt it loſes $\frac{45}{100}$ of its weight; and in this ſtate diſſolves in 700 times its weight of water, producing heat at the ſame time. If acids are poured upon it when in a calcined ſtate, a great degree of heat is produced; inſomuch that unleſs part of it be abſtracted by previouſly mixing the earth with water, the mixture will be made to boil. The pouring of water upon calcined earth of this kind likewiſe expels the atmoſpheric air from its pores. In this caſe, if nitrous or muriatic acid be added, no efferveſcence will enſue; the ſolution will proceed ſlowly, but the ſaturation becomes at length as perfect as if the earth had not been calcined. By this burnt earth the acid is expelled from ſal ammoniac, ſulphur is diſſolved, and other remarkable effects performed, of which an account is given under the articles CHEMISTRY, DYEING, CEMENT, MORTAR, &c.

The calcareous earth, according to Cronſtadt, is common to all the three kingdoms of nature; exiſting in the ſhells and bones of animals, the aſhes of vegetables; and conſequently, ſays he, it muſt have exiſted before any living or vegetable ſubſtance, and is no doubt diſtributed throughout the earth in a quantity proportioned to its general uſe.

The forms in which calcareous earth is ever met with are the ſhells of animals, chalk, limeſtone and marble; for an account of which ſee theſe different articles. Its uſes as a manure, and in building, are detailed under the articles CEMENT and AGRICULTURE. Meſſrs Sage, Rome de L'Iſle, &c. have ſuppoſed the exiſtence of a kind of earth called *abſorbent*, diſtinct from the calcareous; but M. Monnet has ſhown this to be truly calcareous.

III. *Magneſia*, called alſo *terra muriatica*, or magneſia alba. The nature and properties of this earth are deſcribed under the article MAGNESIA. It is found,

1. Combined with the vitriolic acid in the form of a bitter ſalt, called Epſom or Sedlitz ſalt. This is found in great plenty in the liquor which remains after the cryſtallization of ſea-ſalt.

2. With the marine acid; in which caſe it forms a ſalt likewiſe cryſtallizable, but of a very hot burning taſte, and emitting vapours of ſpirit of ſalt by diſtillation. This is known by the name of *magneſia ſalita*. and is likewiſe found in plenty in the liquor abovementioned.

3. It is contained alſo in freſh waters, where it is diſſolved by the the aerial acid.

4. Combined with the ſiliceous earth. This is commonly unctuous to the touch, and of different degrees of hardneſs, incapable of being diffuſed in water, and growing hard and very refractory in the fire. It is met with in various parts of the world, particularly in the eaſt, and is the ſubſtance of which the large Turkey tobacco-pipes are made. It is alſo called *French chalk*, and is met with in England about the Land's End of Cornwal, of a yellow colour, or red and white like Caſtile ſoap. It conſiſts, according to Mr Wiegleb, of equal parts of magneſia and ſiliceous earth. A mixture of this with calcareous earth and iron is found near Thionville in the French part of Luxembourg. It is of a blue colour, and contains the greateſt proportion of calcareous earth, with ſome clay and petrified matters. Another of an olive colour is found in the ſame place; but has no argillaceous earth in it, though they both

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both look like clay, and the last is used in pottery. A mixture of this earth with clay, talc, and iron, is found in Selisia. It is of a greenish yellow, is of a loose form and greasy feel. According to Mr Margraff it contains one-third of magnesia.

5. In steatites or soap-rock. See STEATITES.

6. In serpentine stone. See SERPENTINE.

IV. *Argillaceous Earths*. See CLAY.

V. *Siliceous Earths*. See CHEMISTRY, FLINT, GEMS, DIAMOND, EMERALD, SAPPHIRE, &c. also CHEMISTRY, n° 829, 847, 1074, and 1076.

EARTH, in astronomy and geography, one of the primary planets; being this terraqueous globe which we inhabit.

The cosmogony, or knowledge of the original formation of the earth, the materials of which it was composed, and by what means they were disposed in the order in which we see them at present, is a subject which, though perhaps above the reach of human sagacity, has exercised the wit of philosophers in all ages. To recount the opinions of all the eminent philosophers of antiquity upon this subject would be very tedious: it may therefore suffice to observe, that, ever since the subject began to be canvassed, the opinions of those who have treated it may be divided into two classes. 1. Those who believed the earth and whole visible system of nature to be the Deity himself, or connected with him in the same manner that a human body is with its soul. 2 Those who believed the materials of it to have been eternal, but distinct from the Deity, and put into the present order by some power either inherent in themselves or belonging to the Deity. Of the former opinion were Zenophanes the founder of the *eleatic* sect, Strato of Lampsacus, the Peripatetics, &c.

1 Different opinions respecting the cosmogony.

The second opinion, namely, that the substance of the earth or universe (for it is impossible to speak of the one without the other) was eternal, though not the form, was most generally held among the ancients. From their established axiom, that "nothing can be produced from nothing," they concluded that creation was an impossibility; but at the same time they thought they had good reason to believe the world had not been always in its present form. They who held this opinion may again be divided into two classes: first, those who endeavoured to account for the generation of the world, or its reduction into the present form, by principles merely mechanical, without having recourse to any assistance from divine power; and, secondly, those who introduced an intelligent mind as the author and disposer of all things. To the first of these classes belonged the cosmogony of the Babylonians, Phœnicians, and Egyptians; the particulars of which are too absurd to deserve notice. Of the same opinion also were most of the poets; the philosophers Thales, Anaximander, Anaximenes, Anaxagoras, &c. The latter attempted to reform the philosophy of his master Anaximenes by introducing an intelligent being into the world distinct from matter; thus making his intelligent principle, or God, the soul of the world. Diogenes of Apollonia supposed air, which he made the first principle of all things, to be endued with reason: His manner of philosophising differed very little from that of Des Cartes. "All things (says he) being in motion, some became condensed and others rarefied. In those places where condensation prevailed, a whirling motion or vortex was formed; which by its revolution drew in the rest, and the lighter parts flying upwards formed the sun."

2 Systems of Democritus and Epicurus.

The most remarkable of the atheistic systems, however, was the atomic one, supposed to have been invented by Democritus; though Laertius attributes it to Leucippus, and some make it much older. According to this system, the first principles of all things were an infinite multitude of atoms, or indivisible particles of different sizes and figures; which, moving fortuitously, or without design, from all eternity, in infinite space, and encountering with one another, became variously entangled during their conflict. This first produced a confused chaos of all kinds of particles; which afterwards, by continual agitation, striking and repelling each other, disposed themselves into a vortex or vortices, where, after innumerable revolutions and motions in all possible directions, they at last settled into their present order.

The hypothesis of Democritus agrees in the main with that of Epicurus as represented by Lucretius; excepting that no mention is made of those vortices, which yet were an essential part of the former. To the two properties of magnitude and figure which Democritus attributed to his atoms, Epicurus added a third, namely, weight; and, without this, he did not imagine they could move at all. The system of Democritus necessarily introduced absolute fatal necessity; which Epicurus not choosing to agree to, he invented a third motion of the atoms, unknown to those who had gone before him. His predecessors allowed them to have a perpendicular and reflexive motion: but Epicurus, though he allowed these motions to be absolutely necessary and unavoidable, asserted that the atoms could also of themselves decline from the right line; and from this declination of the atoms he explained the free will of man.—The most material difference between the two systems, however, was, that Epicurus admitted no principle but the atoms themselves; whereas Democritus believed them to be animated.

3 Of Pythagoras, Plato, and Aristotle.

Of those who held two distinct and coeternal principles, *viz.* God and Matter, we shall only take notice of the opinions of Pythagoras, Plato, and Aristotle, as being the most remarkable.

Pythagoras is said ao have asserted two substantial self-existent principles: a *monad*, or unity; and a *dyad*, or duality. The meaning of these terms is now somewhat uncertain. Some think, that by the monad he meant the Deity, and by the dyad matter. Others think, that the Pythagoric monads were atoms. The dyad is sometimes thought to signify a demon or evil principle; but Porphyry's interpretation, which seeems the most probable, is as follows. The cause, says he, of that sympathy, harmony, and agreement which is in things, and of the conservation of the whole, which is always the same and like itself, was by Pythagoras called *unity*; that unity which is in the things themselves being but a participation of the first cause: but the reason of difference, inequality, and constant irregularity in things, was by him called a *dyad*. This philosopher held *numbers* to be the principles

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ciples of all things; and from them he accounted for the production of the world in the following manner. He supposed that the monad and dyad were the two sources of numbers, from whence proceeded points; from points, lines; from lines, plane figures; from planes, solids: from solids, sensible bodies. The elements of sensible bodies are four; but, besides these, there was a fifth (never yet discovered). The four elements which manifest themselves to our senses are, fire, air, earth, and water. These are in a perpetual change, and from them the world was formed; which is animated, intelligent, and spherical; containing, in the midst of it, the earth, a globose and inhabited body. The world, he said, began from fire and the fifth element; and that as there were five figures of solid bodies, called mathematical or regular, the earth was made of the cube, fire of the pyramid or tetrahedron, the air of the octahedron, water of the icosahedron, and the sphere of the universe of the dodecahedron.—This method of philosophising, which has no manner of foundation in nature, was adopted by Plato and Aristotle; and hence proceeded all the absurdities concerning ideas, forms, qualities, &c. with which the Aristotelian philosophy was loaded.

For a long time, however, the philosophy of Aristotle prevailed, and the world was thought to be upheld by forms, qualities, and other unintelligible and imaginary beings.—At last the French philosopher Des Cartes superseded the Aristotelian, by introducing the atomic or Democritic, and Epicurean philosophy *. The Cartesian system was quickly superseded by the Newtonian; which still continues, though considerably different from what it was left by that great man.—His opinions, indeed, concerning the cosmogony seem to have been in a fluctuating state; and hence he delivers himself in such a manner, that he hath often incurred the charge of contradicting himself.—He maintained, for instance, that matter was infinitely divisible; and the mathematical demonstrations of this proposition are well known. Notwithstanding this, however, when he comes particularly to speak of the original construction of the world, he seems to retract this opinion, and adopt the atmotic philosophy. He tells us, that it seems probable, that in the beginning God formed matter in *solid, massy, impenetrable* particles, &c. †; and that of these particles, endowed with various powers of attraction and repulsion, the present system of nature is formed. His primary laws of nature are only three in number, and very simple. The first is, that all matter has a tendency to continue in that state in which it is once placed, whether of rest or motion. If it is at rest, for example, it will continue at rest for ever, without beginning motion of itself; but if it is once set in motion by any cause whatever, it will for ever continue to move in a right line, until something either stops it altogether, or forces it to move in another direction. 2. That the change of motion is always equivalent to the moving force employed to produce it, and in the direction of the right line in which it is impressed; that is, if a certain force produces a certain motion, double that force will produce double that motion, &c. 3. Reaction is always contrary and equal to action; or the actions of two bodies upon one another are always equal and contrary to one another.

* See *Astronomy*, n° 252.

4 Newtonian system supersedes the Aristotelian and Cartesian.

† See *Cohesion*, n° 2.

5 Three laws of nature laid down by Sir Isaac.

From these three laws, together with the two contrary forces of attraction and repulsion, Sir Isaac Newton and his followers have attempted to explain all the phenomena of nature. When they come to explain the nature of the attractive and repulsive forces, however, they are exceedingly embarrassed. Sir Isaac hath expressed himself in two different ways concerning them. In his Principia, he pretty positively determines them to be owing to a cause that is not material; and in his Queries, he supposes they may be effects of some subtile matter which he calls *ether*. This disagreement with himself hath produced no small disagreement among his followers. One party, laying hold of his assertions in the Principia, determine the world to be upheld by *immaterial* powers; while the other, neglecting the Principia, and taking notice only of the Queries at the end of the Optics, strenuously maintain, that attraction and repulsion are owing to the action of some exceedingly fine and subtile ether.—The first of these suppositions, it is argued, necessarily involves us in one of the following dilemmas. 1. If the attractive and repulsive forces are not material, they must either be occasioned by spiritual beings, or they must be *qualities* of matter. If they are occasioned by the action of immaterial beings, these beings must either be created or uncreated. If they are produced by the action of created beings, we run into the supposition of some of the ancient heathens, that the world is governed by demons or subordinate intelligences; and thus may make an easy transition to polytheism. If attraction and repulsion are the immediate action of the Deity himself, we run into the doctrine of making God the soul of the word.—This last hypothesis hath been most strenuously adopted by Mr Baxter in his treatise of the Immateriality of the human Soul. Mr Boscovich, Mr Mitchel, and Dr Priestley, have likewise adopted the hypothesis of immaterial powers to such a degree, that, according to them, the whole world consists of nothing else but *attractions* and *repulsions* surrounding *physical points* †. 2. If we suppose the attractive and repulsive powers to be only *properties*, *qualities*, or *laws*, impressed on matter by the Deity, we might as well have been contented with the occult qualities of Aristotle.—If attraction and repulsion are occasioned by the action of mere matter, and all the powers in nature are only material, the charge is incurred of making nature direct itself in such a manner, that there is no occasion for the interposition, or even the existence, of a Deity at all.

6 Disagreement among his followers.

7 Mr Mitchel, Boscovich, and Dr Priestley's opinions.

† See *Cohesion*, n° 8.

Thus we see, the Newtonian cosmogony must incline either to the Platonic and Aristotelian, or to the Atomic or Epicurean; according to the hypothesis we lay down concerning the nature of attraction. Des Cartes's system was plainly a revival of that of Democritus and Epicurus, with some corrections and improvements. It was farther improved and corrected by Mr Hutchinson, who added to it the anthority of Revelation. The created agents he chose in his cosmogony were fire, light, and air. These, we see, have indeed a very considerable share in the operations of nature; but unless we explain the manner in which they operate our knowledge is not at all increased, and we might as well have been contented with the Newtonian attraction and repulsion, or even the occult qualities of Aristotle. Attempts have indeed been made to solve the phenomena

8 Mr Hutchin's system.

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phenomena of nature, from the action of these three agents, both by Hutchinson himself and many of his followers.—These attempts, however, have always proved unsuccessful. Some phenomena indeed may be explained pretty plausibly from the known action of these three; but when we come to speak of what may be called the *nicer operations* of nature, such as the growth of plants and animals, we are utterly at a loss.

9
A deficiency of active principles in all the theories yet invented.

The manifest deficiency of active principles in all the theories of the earth that have yet been invented, hath occasioned a constant search after others which should be able, by their superior activity, to fill up the blank which necessarily remained in the system.—Pythagoras, Plato, and Aristotle, being unable to account for the formation of the earth from their four elements, called in the assistance of a *fifth*, which was never yet discovered. Epicurus, finding the motions attributed to his atoms by Democritus to be insufficient, had recourse to an imaginary, and on his own principles *impossible*, declination of the atoms. Des Cartes, finding the atoms themselves insufficient, asserted that they were not atoms, but might be broken into smaller parts, and thus constitute matter of various degrees of subtility. The Newtonian philosophers have found Des Cartes's system insufficient; but being greatly distressed in their attempts to solve all the phenomena of nature by mere attraction and repulsion, have been obliged to call in the action of *mind* to their assistance. The Hutchinsonians were hardly put to it in accounting for every thing by the action of fire, light, and air, when luckily the discoveries in electricity came to their assistance. It must be owned, that this fluid does indeed come in like a kind of fifth element, which in many cases appears to be the animating principle of nature. For some time past, almost all the remarkable phenomena in nature have been explained by electricity, or the action of the electric fluid. But unless this action is explained, we are got no farther than we were before. To say that any thing is done by electricity, is not more intelligible than to say that it was done by attraction. If we explain an effect by a material cause, it ought to be done upon mechanical principles. We ought to be sensible how one part of matter acts upon another part in such a manner as to produce the effect we desire to explain. The electrical philosophers, however, have not yet been able to investigate the manner in which this subtile fluid operates; and hence the many discoveries in electricity have not contributed to throw that light on the theory of the earth, which perhaps they may do hereafter. With some philosophers, however, the electric fluid itself, and indeed all the powers of nature, were in danger of being superseded by a principle, lately very little known, called the *phlogiston*.—Thus, Mr Henly tells us *, that Mr Clarke, an ingenious gentleman in Ireland, hath discovered all the different kinds of air produced from metals, &c. by Dr Priestley, to be only *phlogistic vapours* arising from these substances. Dr Priestley himself supposes, that the electric light is a modification of *phlogiston*; and consequently thinks it probable, that all light is a modification of the same. Fire or flame is thought to be a chemical combination of air with the phlogiston: and phlogiston is thought to give the elasticity to air, and every other elastic fluid, &c. Another party, seemingly jealous of the powers of this new principle, have denied its existence altogether, and in its stead introduced another equally insufficient, called the *oxygenous principle*. Others have reduced all nature to the two principles called *principium sorbile* and *principium proprium*. All these, however, are shown, in other parts of this work, to be more inactive substances; the phlogiston, common charcoal; the oxygenous principle, water deprived of the quantity of phlogiston it usually contains; the principium sorbile, the same; and the principium proprium, a name for the particular modification of the *atoms*, or what we please to call the invisible essence of matter which distinguishes one body from another, and which must be for ever unknown to all human creatures.—Be this as it will, the late discoveries in electricity have tended very much to change the form of the Newtonian philosophy, and to introduce that *materialism* into our theories of the natural phenomena which is by some people so much complained of.

* *Phil. Transf.* Vol. 67.

10
Little progress as yet made in true philosophy.

From this general history of the different agents which philosophers have chosen to account for the original formation of the earth, and for its preservation in the present form, it appears, that scarce any advance in true knowledge hath yet been made. All the agents have been prodigiously defective; electricity itself, as far as yet known, not excepted. But before we enter into a particular consideration of those theories which seem most worthy of notice, it will be necessary to point out the principal difficulties which stand in the way of one who attempts to give a complete theory of the earth.

11
Difficulties which occur in forming a theory of the earth.

1. The earth, although pretty much of a spherical figure, is not completely so; but protuberates considerably about the equatorial parts, and is proportionably flattened at the poles, as is undeniably proved by the observations of modern mathematicians †. The question here is, Why the natural cause which gave the earth so much of a spherical figure, did not make it a complete and exact sphere?

† See *Geography*.

2. The terraqueous globe consists of a vast quantity of water as well as dry land. In many places, such as the Isthmus of Darien, a narrow neck of land is interposed betwixt two vast oceans. These beat upon it on either side with vast force; yet the Isthmus is never broke down or diminished. The case is the same with the Isthmus of Suez which joins Asia and Africa, and with that which joins the Morea or ancient Peloponnesus to the continent. The difficulty is, By what natural power or law are these narrow necks of land preserved amidst the waters which threaten them on both sides with destruction?

3. The surface of the earth is by no means smooth and equal; but in some places raised into enormous ridges of mountains, and in others sunk down in such a manner as to form deep valleys. These mountains, though they have been exposed to all the injuries of the weather for many thousand years, exhibit no signs of decay. They still continue of the same size as before, though vast quantities of earth are frequently washed down from them by the rains, which together with the force of gravity, tending to level and bring them on an equality with the plains on which they stand, we might reasonably think, ought by this time to have rendered them smaller than before. It must therefore

therefore by inquired into, By what natural cauſe the mountains were originally formed, and how they come to preſerve their ſize without any remarkable diminution?

4. The internal parts of the earth are ſtill more wonderful than the external. The utmoſt induſtry of man, indeed, can penetrate but a little way into it. As far as we can reach, however, it is found to be compoſed of diſſimilar ſtrata lying one upon another, not commonly in a horizontal direction, but inclined to the horizon at different angles. Theſe ſtrata ſeem not to be diſpoſed either according to the laws of gravity or according to their denſity, but as it were by chance. Beſides, in the internal parts of the earth are chaſms and vacuities. By what means were theſe ſtrata originally depoſited, the fiſſures and chaſms made, &c.?

5. In many places of the earth, both on the ſurface and at great depths under it, vaſt quantities of marine productions, ſuch as ſhells, &c. are to be met with. Sometimes theſe ſhells are found in the midſt of ſolid rocks of marble and limeſtone. In the very heart of the hardeſt ſtones, alſo, ſmall vegetable ſubſtances, as leaves, &c. are ſometimes to be found. The queſtion is, By what means were they brought thither?

Theſe are ſome of the moſt ſtriking difficulties which preſent themſelves to one who undertakes to write a natural hiſtory or theory of the earth. The moſt remarkable attempts to produce a theory of this kind are the following.

12 Dr Burnet's theory.

I. According to Dr. Burnet, the earth was originally a fluid maſs, or chaos, compoſed of various ſubſtances differing both in denſity and figure. Thoſe which were moſt heavy, ſunk to the centre, and formed there a hard ſolid body: thoſe which were ſpecifically lighter remained next above; and the waters, which were lighteſt of all, covered the earth all round. The air, and other ethereal fluids, which are ſtill lighter than water, floated above it, and ſurrounded the globe alſo. Between the waters, however, and the circumambient air was formed a coat of oily and unctuous matter lighter than water. The air at firſt was very impure, and muſt neceſſarily have carried up with it many of thoſe earthy particles with which it was once blended: however, it ſoon began to purify itſelf, and depoſit thoſe particles upon the oily cruſt abovementioned; which, ſoon uniting together, the earth and oil became the cruſt of vegetable earth, with which the whole globe is now covered. His account of the deſtruction of the primeval world by the flood, by the falling down of the ſhell of earth into the waters of the abyſs, is given under the article Deluge. It only remains then to give his account of the manner in which he relieves the earth from this univerſal deſtruction; and this he does as follows. Theſe great maſſes of earth, ſays he, falling into the abyſs, drew down with them vaſt quantities alſo of air; and by daſhing againſt each other, and breaking into ſmall parts by the repeated violence of the ſhock, they at length left between them large cavities filled with nothing but air. Theſe cavities naturally offered a bed to receive the influent waters; and in proportion as they filled, the face of the earth became once more viſible. The higher parts of its broken ſurface, now become the tops of mountains, were the firſt that appeared; the plains ſoon after came forward; and at length the whole globe was delivered from the waters, except the places in the loweſt ſituations; ſo that the ocean and ſeas are ſtill a part of the ancient abyſs, that have had no place to which they might return. Iſlands and rocks are fragments of the earth's former cruſt; continents are larger maſſes of its broken ſubſtance; and all the inequalities that are to be found on the ſurface of the preſent earth are effects of the confuſion into which both earth and water were at that time thrown.

13 Dr Woodward's.

II. Dr Woodward begins with aſſerting, that all terrene ſubſtances are diſpoſed in beds of various natures, lying horizontally one over the other, ſomewhat like the coats of an onion: that they are replete with ſhells and other productions of the ſea; theſe ſhells being found in the deepeſt cavities, and on the tops of the higheſt mountains. From theſe obſervations, which are warranted by experience, he proceeds to obſerve, that theſe ſhells and extraneous foſſils are not productions of the earth, but are all actual remains of thoſe animals which they are known to reſemble; that all the ſtrata or beds of the earth lie under each other in the order of their ſpecific gravity, and that they are diſpoſed as if they had been left there by ſubſiding waters. All this he very confidently affirms, tho' daily experience contradicts him in ſome of them; particularly, we often find layers of ſtone over the lighteſt ſoils, and the ſofteſt earth under the hardeſt bodies. However, having taken it for granted, that all the layers of the earth are found in the order of their ſpecific gravity, the lighteſt at top, and the heavieſt next the centre, he conſequently aſſerts, that all the ſubſtances of which the earth is compoſed were originally in a ſtate of diſſolution. This diſſolution he ſuppoſes to have taken place at the flood: but being aware of an objection, that the ſhells, &c. ſuppoſed to have been depoſited at the flood are not diſſolved, he exempts them from the ſolvent powers of the waters, and endeavours to ſhow that they have a ſtronger coheſion than minerals; and that while even the hardeſt rocks are diſſolved, bones and ſhells may remain entire.

14 Mr Whiſton's

III. Mr Whiſton ſuppoſes the earth to have been originally a comet; and conſiders the Moſaic account of the creation as commencing at the time when the Creator placed the comet in a more regular manner, and made it a planet in the ſolar ſyſtem. Before that time, he ſuppoſes it to have been a globe without beauty or proportion; a world in diſorder, ſubject to all the viciſſitudes which comets endure; which, according to the preſent ſyſtem of philoſophy, muſt be alternately expoſed to the extremes of heat and cold. Theſe alternations of heat and cold, continually melting and freezing the ſurface of the earth, he ſuppoſes to have produced, to a certain depth, a chaos reſembling that deſcribed by the poets, ſurrounding the ſolid contents of the earth, which ſtill continued unchanged in the midſt; making a great burning globe of more than 2000 leagues in diameter. This ſurrounding chaos, however, was far from being ſolid: he reſembles it to a denſe, though fluid atmoſphere, compoſed of ſubſtances mingled, agitated, and ſhocked againſt each other; and in this diſorder he ſuppoſes the earth to have been juſt at the eve of the Moſaic creation. But upon its orbit being then changed, when it was more regularly wheeled round the ſun, every thing took its proper place, every part of the ſurrounding fluid then

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fell into a certain situation according as it was light or heavy. The middle or central part, which always remained unchanged, still continued so; retaining a part of that heat which it received in its primeval approaches towards the sun; which heat he calculates may continue about 6000 years. Next to this fell the heavier parts of the chaotic atmosphere, which serve to sustain the lighter: but as in descending they could not entirely be separated from many watery parts with which they were intimately mixed, they drew down these also along with them; and these could not mount again after the surface of the earth was consolidated: they therefore surrounded the heavy first-descending parts in the same manner as these surrounded the central globe. Thus the entire body of the earth is composed next the centre of a great burning globe: next this is placed an heavy terrene substance that encompasses it; round which is circumfused a body of water. Upon this body of water is placed the crust of earth on which we inhabit: so that according to Mr Whiston, the globe is composed of a number of coats or shells, one within the other, all of different densities. The body of the earth being thus formed, the air, which is the lightest substance of all, surrounded its surface: and the beams of the sun darting through, produced the light, which, we are told by Moses, first obeyed the divine command.

The whole economy of the creation being thus adjusted, it only remained to account for the risings and depressions on the surface of the earth, with the other seeming irregularities of its present appearance. The hills and valleys are by him considered as formed by their pressing upon the internal fluid which sustains the external shell of earth, with greater or less weight: those parts of the earth which are heaviest sink the lowest into the subjacent fluid, and thus become valleys: those that are lightest rise higher upon the earth's surface, and are called *mountains*.

Such was the face of nature before the deluge: the earth was then more fertile and populous than it is at present; the life of men and animals was extended to ten times its present duration; and all these advantages arose from the superior heat of the central globe, which has ever since been cooling. As its heat was then in its full power, the genial principle was also much greater than at present; vegetation and animal increase were carried on with more vigour; and all nature seemed teeming with the seeds of life. But as these advantages were productive only of moral evil, it was found necessary to destroy all living creatures by a flood; and in what manner this punishment was accomplished, according to Mr Whiston, is particularly taken notice of under the article of DELUGE.

15
Mr Buffon's theory.

IV. M. Buffon's theory differs very widely from the foregoing. He begins with attempting to prove, that this world which we inhabit is no more than the ruins of a world. "The surface of this immense globe (says he) exhibits to our observation, heights, depths, plains, seas, marshes, rivers, caverns, gulfs, volcanoes; and on a cursory view, we can discover in the disposition of these objects neither order nor regularity. If we penetrate into the bowels of the earth, we find metals, minerals, stones, bitumens, sands, earths, waters, and matter of every kind, placed as it were by mere accident, and without any apparent design. Upon a nearer and more attentive inspection, we discover sunk mountains, caverns filled up, shattered rocks, whole countries swallowed up, new islands emerged from the ocean, heavy substances placed above light ones, hard bodies inclosed within soft bodies: in a word, we find matter in every form, dry and humid, warm and cold, solid and brittle, blended in a chaos of confusion, which can be compared to nothing but a heap of rubbish, or the ruins of a world."

When taking a particular survey of the external surface of the globe, he begins with the ocean, and the motion communicated to it by the influence of the sun and moon which produces the tides.—"In examining the bottom of the sea (says he), we perceive it to be equally irregular as the surface of the dry land. We discover hills and valleys, plains and hollows, rocks and earths of every kind; we discover likewise, that islands are nothing but the summits of vast mountains, whose foundations are buried in the ocean. We find other mountains whose tops are nearly on a level with the surface of the water; and rapid currents which run contrary to the general movement. These currents sometimes run in the same direction; at other times their motion is retrograde; but they never exceed their natural limits, which seem to be as immutable as those which bound the efforts of land-rivers. On one hand we meet with tempestuous regions, where the winds blow with irresistible fury; where the heavens and the ocean, equally convulsed, are mixed and confounded in the general shock; violent intestine motions, tumultuous swellings, water-spouts, and strange agitations produced by volcanoes, whose mouths, tho' many fathoms below the surface, vomit forth torrents of fire; and push, even to the clouds, a thick vapour, composed of water, sulphur, and bitumen; and dreadful gulphs or whirlpools, which seem to attract vessels for no other purpose than to swallow them up. On the other hand we discover vast regions of an opposite nature, always smooth and calm, but equally dangerous to the mariner. To conclude, directing our eyes towards the southern or northen extremities of the globe, we discover huge masses of ice, which, detaching themselves from the polar regions, advance, like floating mountains, to the temperate climates, where they dissolve and vanish from our view. The bottom of the ocean and the shelving sides of rocks produce plentiful crops of plants of many different species: its soil is composed of sand, gravel, rocks, and shells; in some places it is a fine clay, in others a compact earth: and in general, the bottom of the sea has an exact resemblance to the dry land which we inhabit.

"Let us next take a view of the dry land. Upon an attentive observation of this, we will find, that the great chains of mountains lie nearer the equator than the poles; that in the old continent their direction is more from east to west than from south to north; and that, on the contrary, in the new continent they extend more from north to south than from east to west. But what is still more remarkable, the figure and direction of these mountains, which have a most irregular appearance, correspond so wonderfully, that the prominent angles of one mountain are constantly opposite to the concave angles of the neighbouring mountain, and of equal dimensions, whether they be separated by an extensive plain or a small valley. I have further

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further remarked, that opposite hills are always nearly of the same height; and that mountains generally occupy the middle of continents, islands, and promontories, dividing them by their greatest lengths. I have likewise traced the courses of the principal rivers, and find that their direction is nearly perpendicular to the sea-coasts into which they empty themselves; and that during the greatest part of their courses they follow the direction of the mountains from which they derive their origin. The sea-coasts are generally bordered with rocks of marble and other hard stones; or rather with earth and sand accumulated by the waters of the sea, or brought down and deposited by rivers. In opposite coasts, separated only by small arms of the sea, the different strata or beds of earth are of the same materials. I find that volcanoes never exist but in very high mountains; that a great number of them are entirely extinguished; that some are connected to others by subterranean passages, and their eruptions not unfrequently happen at the same time. There are similar communications between certain lakes and seas. Some rivers suddenly disappear, and seem to precipitate themselves into the bowels of the earth. We likewise find certain mediterranean or inland seas, that constantly receive from many and great rivers prodigious quantities of water, without any augmentation of their bounds; probably discharging by subterraneous passages all those extraneous supplies. It is likewise easy to distinguish lands which have been long inhabited, from those new countries where the earth appears in a rude state, where the rivers are full of cataracts, where the land is nearly overflowed with water or burnt up with drought, and where every place capable of producing trees is totally covered with wood.

"Proceeding in our examination, we discover that the upper stratum of the earth is universally the same substance: that this substance, from which all animals and vegetables derive their growth and nourishment, is nothing but a composition of the decayed parts of animal and vegetable bodies, reduced into such small particles that their former organic state is not distinguishable. Penetrating a little deeper, we find the real earth, beds of sand, limestone, clay, shells, marble, gravel, chalk, &c. These beds are always parallel to each other, and of the same thickness throughout their whole extent. In neighbouring hills, beds or strata of the same materials are uniformly found at the same levels though the hills be separated by large and deep valleys. Strata of every kind, even of the most solid rocks, are uniformly divided by perpendicular fissures. Shells, skeletons of fishes, marine plants, &c. are often found in the bowels of the earth, and on the tops of mountains, even at the greatest distances from the sea. These shells, fishes, and plants, are exactly similar to those which exist in the ocean. Putrified shells are to be met with almost every where in prodigious quantities; they are not only inclosed in rocks of marble and limestone, as well as in earths and clays, but are actually incorporated and filled with the very substances in which they are inclosed. In fine, I am convinced, from repeated observation, that marbles, limestones, chalks, marles, clays, sand, and almost all terrestrial substances, wherever situated, are full of shells and other spoils of the ocean."

From these positions, which he lays down as facts, Mr Buffon draws the following conclusion.

1. The changes which the earth has undergone within these last 2000 or 3000 years must be inconsiderable, when compared with the great revolutions that took place in those ages immediately succeeding the creation. The reason he gives for this assertion is, that terrestrial substances could not acquire solidity but by the continued action of gravity: hence the earth must have been originally much softer than it is now, and therefore more apt to be changed by causes which cannot now effect it.

2. It seems an incontrovertible fact, that the dry land which we now inhabit, and even the summits of the highest mountains, were formerly covered with the waters of the sea; for shells and other marine bodies are still found on the very tops of mountains.

3. The waters of the sea have remained for a long track of time upon the surface; because in many places, such immense banks of shells have been discovered, that it is impossible so great a multitude of animals could exist at the same time.

4. From this circumstance it likewise appears, that although the materials on the surface of the earth were then soft, easily disunited, moved, and transported by the waters, yet these transportations could not be suddenly effected: they must have been gradual and successive, as sea-bodies are sometimes found more than 1000 feet below the surface; and such a thickness of earth or stone could not be accumulated in a short time.

5. It is impossible these effects could be owing to the universal deluge. For though we should suppose that all the shells in the bottom of the ocean should be deposited upon the dry land; yet, besides the difficulty of establishing this supposition, it is plain, that as shells are found incorporated in marble, and in the rocks of the highest mountains, we must suppose these rocks and marbles to have been formed all at the very instant when the deluge took place: and that before this grand revolution, there were neither mountains, nor marbles, nor rocks, nor clays, nor matter of any kind similar to what we are now acquainted with; as they all, with few exceptions, contain shells and other productions of the ocean. Besides, at the time of the universal deluge, the earth must have acquired a considerable degree of solidity, by the action of gravity for more than 16 centuries. During the short time the deluge lasted, therefore, it is impossible that the waters should have overturned and dissolved the whole surface of the earth to the greatest depths.

6. It is certain (for what reason he does not mention), that the waters of the sea have, at some period or other, remained for a succession of ages upon what we now know to be dry land; and consequently that the vast continents of Asia, Europe, Africa, and America, were then the bottom of an immense ocean, replete with every thing which the present ocean produces.

7. It is likewise certain, that the different strata of the earth are horizontal and parallel with each other This parallel situation must therefore be owing to the operation of the waters, which have gradually accumulated the different materials, and given them the same position which the water itself invariably assumes.

8. It is certain that these strata must have been gradually

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9. No other cause than the motion and sediments of water could possibly produce the regular position of the various strata of which the superficial part of this earth consists. The highest mountains are composed of parallel strata, as well as the lowest valleys. Of course, the formation of mountains cannot be attributed to the shock of earthquakes, or to the eruptions of volcanoes. Such small eminences as have been raised by volcanoes or convulsions of the earth, instead of being composed of parallel strata, are mere masses of weighty materials, blended together in the utmost confusion.

Having now, as he thinks, *proved*, that the dry and habitable part of the earth has remained for a long time under the waters of the sea, and consequently must have undergone the same changes that now take place at the bottom of the sea, he proceeds to enquire what these changes are.

10. The ocean, since the creation of the world, has been constantly agitated by the tides, occasioned by the action of the sun and moon; and this agitation is greater in the equatorial than in the other parts of the globe, because the action of the sun and moon is there strongest.

11. The earth performs a rapid motion on its axis; and consequently its parts have a centrifugal force, which is also greatest at the equator.

12. From the combined action of the two last mentioned causes, the tides and the motion of the earth, it may be fairly concluded, that although this globe had been originally a perfect sphere, its diurnal motion, and the ebbing and flowing of the tides, must necessarily, in a succession of time, have elevated the equatorial parts, by gradually carrying mud, earth, sand, shells, &c. from other climates, and depositing them at the equator.

13. On this supposition, the greatest inequalities on the surface of the earth ought to be found, and in fact are found, in the neighbourhood of the equator.

14. As the alternate motion of the tides has been constant and regular since the existence of the world, it is natural to think, that, at each tide, the water carries from one place to another a small quantity of matter, which falls to the bottom as a sediment, and forms those horizontal and parallel strata that every where appear. Here it may indeed be objected, that as the flux is equal to, and regularly succeeded by, the reflux, the two contrary motions will balance each other; and whatever is brought in by the flux will be carried back by the reflux. The motion of the ocean, therefore, could never be the cause of the formation even of parallel strata; much less of mountains, and all the inequalities to be observed in this globe. To this Mr Buffon replies, that the alternate motion of the waters is by no means equal; for the sea has a continual motion from east to west: the agitations occasioned by the winds likewise produce great inequalities in the tides. It must also be acknowledged, that, by every motion of the sea, particles of earth and other matter must be carried from one place and deposited in another; and that these collections of matter must assume the form of parallel and horizontal strata. Lastly, this objection is obviated by a well known fact. On all coasts where the ebbing and flowing of the sea is discernible, numberless materials are brought in by the flux, which are not carried back by the reflux. The sea gradually increases on some places and recedes from others; narrowing its limits by depositing earth, sand, shells, &c. which naturally take a horizontal position. These materials when accumulated, and elevated to a certain degree, gradually shut out the water, and remain for ever in the form of dry land.

15. The possibility of a mountain's being formed at the bottom of the sea by the motion and sediments of the water, will appear from the following considerations. On a coast which the sea washes with violence during the flow of tide, some part of the earth must be carried off at every stroke of the waves. Even where the sea is bounded by a rock, it is a known fact, that the rock itself is greatly washed by the water; and consequently that small particles are carried off by the retreat of every wave. Those particles of earth or stone are necessarily transported to some distance. Whenever the agitation of the water ceases, the particles are precipitated in the form of a sediment, and lay the foundation of a first stratum, which is either horizontal or inclined, according to the situation of the surface on which they fall. This stratum is soon succeeded by another, produced by the same cause; and thus a considerable quantity of matter will be amassed, and deposited in parallel beds. In process of time this gradually accumulating mass will become a mountain in the bottom of the sea, exactly resembling, both in external and internal structure, those mountains which we see on the dry land. If there happened to be shells in that part of the bottom of the sea where we have supposed the sediments to be deposited, they will be covered, filled, and incorporated with the deposited matter, and form a part of the general mass. These shells will be lodged in different parts of the mountain, corresponding to the times in which they were deposited: these which lay at the bottom before the first stratum was formed, will occupy the lowest station; the others will be found in places more elevated.

16. It has been imagined that the agitation of the sea produced by the winds and tides is only superficial, and does not affect the bottom, especially where it lies very deep. But it ought to be remembered, that whatever be the depth, the whole mass is put in motion by the tides at the same time; and that, in a fluid globe, this motion would be communicated even to the centre. The attractive power which occasions the flux and reflux, is penetrating. It acts equally upon every particle of the mass; so that the quantity of its force at different depths may be determined by calculation. We cannot therefore hesitate in pronouncing that the tides, the winds, and all other causes of motion in the sea, must produce heights and inequalities in its bottom; and that these heights must uniformly be composed of regular strata either horizontal or inclined. The heights thus produced will gradually augment; like the waves which formed them, they will mutually respect each other; and if the extent of the

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base be great, in a course of years they will form a vast chain of mountains.

17. Whenever eminences are formed, they interrupt the uniform motion of the waters, and produce currents. Between two neighbouring heights in the bottom of the ocean there must be a current which will follow their common direction, and, like a river, cut a channel, the angles of which will be alternately opposite through the whole extent of its course. These heights must continually increase: for, during the flow, the water will deposit its ordinary sediment upon their ridges; and the waters which are impelled by the current will force along, from great distances, quantities of matter, which will subside between the hills, and, at the same time scoop out a valley with corresponding angles at their foundation. Now, by means of these different motions and sediments, the bottom of the ocean, though formerly smooth, must soon be furrowed and interspersed with hills and chains of mountains, as we actually find it at present. These soft materials of which the eminences were originally composed, would gradually harden by their own gravity. Such of them as consisted of sandy and crystalline particles would produce those enormous masses of rock and flint, in which we find crystals and other precious stones. Others, composed of stony particles mixed with shells, give rise to those beds of limestone and marble in which vast quantities of sea-shells are still found incorporated.

18. These causes, as before observed, act with greater force under the equator than in other climates; for there the tides are higher, and the winds more uniform. The mountains of Africa and Peru are the highest in the world; often extending through whole continents, and stretching to great distances under the waters of the ocean. The mountains of Europe and Asia, which extend from Spain to China, are not so high as those of Africa and South America. According to the relations of voyagers, the mountains of the north are but small hills, when compared with the mountains of the equatorial regions. These prodigious chains of mountains which run from east to west in the old continent, and from north to south in the new, must have been formed by the general motion of the tides. But the origin of the less considerable hills must be ascribed to particular motions occasioned by winds, currents, and other irregular agitations of the sea.

16 How the earth was deserted by the ocean, and left dry.

Having thus discussed some very important points respecting the theory of the earth, our author now proceeds to answer other questions which seem still more difficult of solution.

19. But how has it happened that this earth, which we and our ancestors have inhabited for ages, which, from time immemorial, has been an immense continent, dry, compact, and removed from the reach of water, should, if formerly the bottom of an ocean, be now exalted to such a height above the waters, and so completely separated from them? Since the waters remained so long upon the earth, why have they now deserted it? What accident, what cause, could introduce a change so great? A little reflection, says he, will furnish us with at least plausible solutions to these seemingly so difficult questions. We daily observe the sea gaining ground on certain coasts, and losing it on others. We know that the ocean has a general and uniform motion from east to west: that it makes violent efforts against the rocks and low grounds which encircle it; that there are whole provinces which human industry can hardly defend against the fury of the waves; and that there are instances of islands which have but lately emerged from the waters, and of regular inundations. History informs us of inundations and deluges of a more extensive nature. Ought not all this to convince us, that the surface of the earth has experienced very great revolutions, and that the sea may have actually given up possession of the greatest part of the ground which it formerly occupied? For example, let us suppose, that the old and new worlds were formerly but one continent; and that, by a violent earthquake, the ancient Atlantis of Plato was sunk. The consequence of this mighty revolution must necessarily be, that the sea would rush in from all quarters, and form what is now called the *Atlantic Ocean;* and vast continents, perhaps those we now inhabit, would of course be left dry. This great revolution might be effected by the sudden failure of some immense cavern in the interior parts of the globe, and an universal deluge would infallibly succeed.

20. But, however, conjectures of this kind may stand, it is certain that such a revolution hath happened: and we may even believe that it hath happened naturally; for if a judgment of the future is to be formed from the past, we have only to attend carefully to what passes before our eyes. It is a fact established by the repeated observation of voyagers, that the ocean has a constant motion from east to west. This motion, like the trade-winds, is not only perceived between the tropics, but through the whole temperate climates, and as near the poles as navigators have approached. As a necessary consequence of this motion, the Pacific Ocean must make continual efforts against the coasts of Tartary, China, and India; the Indian Ocean must act against the east coast of Africa; and the Atlantic must in a similar manner act against all the eastern coasts of America. Hence the sea must have gained, and will always continue to gain, on the east, and to lose on the west. This of itself would be sufficient to prove the possibility of the change of the sea into land, and land into sea. If such is the natural effect of the sea's motion from east to west, may it not reasonably be supposed, that Asia, and all the eastern continent, is the most ancient country in the world? and that Europe, and part of Africa, especially the west parts of these continents, as Britain, France, Spain, &c. are countries of a more recent date?

21. The cause of the perpendicular fissures with which the earth abounds, is easily investigated. As various materials constituting the different strata were transported by the waters, and deposited in the form of sediments, they would at first be in a very diluted state, and would gradually harden and part with the superfluous quantity of moisture they contained. In process of time, drying, they would naturally contract and split at irregular distances. These fissures necessarily assumed a perpendicular direction: because in this direction the action of gravity of one particle upon another is equal to nothing: but it acts directly opposite to this description, in a horizontal situation: the di-

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minution in bulk could have no sensible effect but in a vertical line. The contraction of the parts in drying, therefore, and not the contained water forcing an issue, as has been alleged by some, is the cause of perpendicular fissures; for it may be often remarked, that the sides of those fissures, through their whole extent, correspond as exactly as the two sides of a split piece of wood.

22. Perpendicular fissures vary greatly as to the extent of their openings. Some are about half an inch or an inch; others a foot or two feet; some extend several fathoms, and give rise to those vast precipices which so frequently occur between opposite parts of the same rocks, in the Alps and other high mountains. It is plain, that the fissures, the openings of which are small, have been occasioned solely by drying. But those which extend several feet are partly owing to another case; namely, the sinking of the foundation upon one side, while that of the other remains firm. If the base sinks but a line or two, when the height is considerable, an opening of several feet, or even fathoms, will be the consequence. When rocks are founded on clay or sand, they sometimes slip a little to one side; and the fissures are of course augmented by this motion.

23. The large openings, however, and prodigious cuts, which are to be met with in rocks and mountains, are to be ascribed to another cause. They could be produced no other way than by the sinking of immense subterraneous caverns, that were unable any longer to sustain their incumbent load. But these cuts or intervals in mountains are not of the same nature with the perpendicular fissures: they appear to have been ports opened by the hand of nature for the communication of nations. This seems to be the intention of all large openings in chains of mountains, and of those straits by which different parts of the ocean are connected; as the straits of Thermopyle, of Gibraltar, &c. the gaps or ports in mount Caucasus, the Cordeleras, &c.

24. But the greatest changes upon the surface of the earth are occasioned by rains, rivers, and torrents from the mountains. These derive their origin from vapours raised by the sun from the surface of the ocean, and which are transported by the winds through every climate. The progress of these vapours, which are supported by the air, and transported at the pleasure of the winds, is interrupted by the tops of the mountains, where they accumulate into clouds, and fall down in the form of rain, dew, or snow. At first, these waters descended into the plains without any fixed course; but they gradually hollowed out proper channels for themselves. By the power of gravity they ran to the bottom of the mountains; and penetrating or dissolving the lower grounds, they carried along with them sand and gravel, cut deep furrows in the plains, and thus opened passages to the sea, which always receives as much water by rivers as it loses by evaporation. The windings in the channels of rivers have uniformly corresponding angles on their opposite banks; and as mountains and hills, which may be regarded as the banks of the valleys by which they are separated, have likewise sinuosities with corresponding angles, this circumstance seems to demonstrate, that the valleys have been gradually formed by currents of the ocean, in the same manner as the channels of rivers have been produced. Rivers produce considerable changes on the surface of the earth; they carry off the soil, wear away the most solid rocks, and remove every thing that opposes their passage. The waters of the clouds also, which descend upon the mountains, by continually washing away some part of the earth, tend to level them with the plains; and would undoubtedly do so, if time enough were allowed for that purpose.

25. From what has been advanced, we may conclude, that the flux and reflux of the ocean have produced all the mountains, valleys, and other inequalities on the surface of the earth: that currents of the sea have scooped out the valleys, elevated the hills, and bestowed on them the corresponding directions; that the same waters of the ocean, by transporting and depositing earths, &c. have given rise to the parallel strata: that the waters from the heavens gradually destroy the effects of the sea, by continually diminishing the height of the mountains, filling up the valleys, and choaking up the mouths of rivers; and by reducing every thing to its proper level, they will in time restore the earth to the sea, which by its natural operations will again create new continents interspersed with mountains and valleys, and every way similar to those which we now inhabit.

17
Buffon's account of the formation of the planets.

Thus far our author preserves some degree of plausibility in his reasoning; but in his account of the original formation of the earth, he certainly goes to the utmost verge of *probability*, or rather of *possibility*, in his suppositions. According to him, all the planets in our system were originally parts of the sun himself. They were detached from his body all at once by a mighty stroke of a comet. The possibility of driving off such a quantity of matter from the sun by a single stroke, he labours hard to prove; but this is far from being the greatest difficulty in this system.—"To this theory (says he) it may be objected, that if the planets had been driven off from the sun by a comet, in place of describing circles round him, they must, according to the law of projectiles, have returned to the same place from whence they had been forced; and therefore, that the projectile force of the planets cannot be attributed to the impulse of a comet.

"I reply, that the planets issued not from the sun in the form of globes, but in the form of torrents; the motion of whose anterior particles behoved to be accelerated by those behind, and the attraction of the anterior particles would also accelerate the motion of the posterior; and that this acceleration, produced by one or both of these causes, might be such as would necessarily change the original motion arising from the impulse of the comet; and that, from the cause, might result a motion similar to what takes place in the planets; especially when it is considered, that the shock of the comets removes the sun out of its former station. This reasoning may be illustrated by an example. Suppose a musket-ball discharged from the top of a mountain, and that the force of the powder was sufficient to send it beyond a semidiameter of the earth: it is certain that this ball would revolve round the earth, and return at every revolution to the place from whence it had been discharged. But, instead of a musket-ball, if a rocket were employed, the continued action of the fire would greatly accelerate the original

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original impulsive motion. This rocket would by no means return to the same point like the ball; but, *cæteris paribus*, would describe an orbit, the perigee of which would be more or less distant from the earth in proportion to the greatness of the change produced in its direction by the accelerating force of the fire. In the same manner, if the original projectile force impressed by the comet on the torrent of solar matter was accelerated, it is probable that the planets formed by this torrent acquired their circular or elliptical movements around the sun."

In like manner he accounts for the formation and circulation of the secondary planets. The revolutions of the primaries on their axes, he accounts for from the obliquity of the original stroke impressed by the comet. The oblate spheroidal figure of the earth is easily deduced from its diurnal motion, and the fluidity of the whole at its first formation. The flattening at the poles he estimates at about one 230th part of the whole. As this computation differs considerably from the account given by the mathematicians who were sent to different parts of the world on purpose to determine the figure of the earth, and who made the flatness at the poles equal to one 175th part of the whole, he supposes this difference to have arisen from changes that have since taken place on the surface of the earth, occasioned by the causes already mentioned. He then proceeds to account for the formation of all things, in the following manner.—"It is therefore evident, that the earth assumed its figure when in a melted state; and, to pursue our theory, it is natural to think, that the earth when it issued from the sun, had no other form but that of a torrent of melted and inflamed matter: that this torrent, by the mutual attraction of its parts, took on a globular figure, which its diurnal motion changed into a spheroid; that when the earth cooled, the vapours which were expanded like the tail of a comet, gradually condensed, and fell down in the form of water upon the surface, depositing at the same time a slimy substance mixed with sulphur and salts; part of which was carried by the motion of the waters into the perpendicular fissures of the strata, and produced metals; and the rest remained on the surface, and gave rise to the vegetable mould which abounds in different places, with more or less of animal or vegetable particles, the organization of which is not obvious to the senses.

"Thus the interior parts of the globe were originally composed of vitrified matter; and, I believe they are so at present. Above this vitrified matter were placed those bodies which the fire had reduced to the smallest particles, as sands, which are only portions of glass; and above these pumice-stones and the scoriæ of melted matter, which produced the different clays. The whole was covered with water to the depth of 500 or 600 feet, which originated from the condensation of the vapours when the earth began to cool. This water deposited a stratum of mud, mixed with all those matters which are capable of being sublimed or exhaled by fire: and the air was formed of the most subtile vapours, which, from their levity, rose above the water.

"Such was the condition of the earth when the tides, the winds, and the heat of the sun, began to introduce changes on its surface. The diurnal motion of the earth, and that of the tides, elevated the waters in the equatorial regions, and necessarily transported thither great quantities of slime, clay, and sand; and by thus elevating those parts of the earth, they perhaps sunk those under the poles about two leagues, or a 230th part of the whole, as was formerly remarked: for the waters would easily reduce into powder pumice-stones, and other spongy parts of the vitrified matter upon the surface; and by this means excavate some places and elevate others, which, in time, would produce islands and continents, and all those inequalities on the surface, which are more considerable towards the equator than towards the poles. The highest mountains lie between the tropics and the middle of the temperate zones, and the lowest from the polar circles towards the poles. Indeed, both the land and sea have most inequalities between the tropics, as is evident from the incredible number of islands peculiar to those regions."

18 Dr Hutton's theory.

V. In the first volume of the Edinburgh Philosophical Transactions a new theory of the earth has been laid down at considerable length by Dr Hutton; of which the following is an abstract.

The general view of the terrestrial system conveys to our minds an idea of a "fabric, erected in wisdom, to obtain a purpose worthy of the power that is apparent in the production of it."

19 Eearth formed to be inhabited.

The end for which it was formed, as far as we can comprehend our author's meaning, is, that it might be an habitation for living creatures; and we are enabled to understand the constitution of this earth as a thing formed by design, "not only by seeing those general operations which depend on its construction as a machine, but also by perceiving how far the particulars in the construction of that machine depend on the operations of the globe."

20 Composed of three principal parts.

In taking a comprehensive view of the mechanism of the globe, we observe three principal parts of which it is composed; and which, by being properly adapted to one another, form it into an habitable world. These are the solid body of the earth, the waters of the ocean, and the atmosphere surrounding the whole. On these our author observes,

1. The parts of the terrestrial globe more immediately exposed to our view are supported by a central body commonly supposed, but without any good reason, to be solid and inert.

2. The aqueous part reduced to a spherical form by gravitation, has become oblate by the earth's centrifugal force. Its use is to receive the rivers, be a fountain of vapours, and to afford life to innumerable animals as well as to be the source of growth and circulation to the organized bodies on earth.

3. The irregular body of land, raised above the level of the sea (though the smallest of these large divisions), is by far the most interesting, as immediately necessary to the support of animal life.

4. The atmosphere surrounding the whole is evidently necessary for innumerable purposes of life and vegetation, neither of which could subsist a moment without it.

21 Powers by which it is upheld.

Having thus considered the mechanism of the globe, Dr Hutton proceeds to investigate the powers by which it is upheld.—These are the gravitating and projectile forces by which the planets are guided, the influence

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influence of light and heat, cold and condensation; to which may be added electricity and magnetism.

22 Why the land must necessarily decay, and at last be destroyed.

In the further pursuit of our general or preparatory ideas, the Doctor observes, that "a solid body of land could not have answered the purpose of a habitable world, for a soil is necessary for the growth of plants; but a soil is only the materials collected from the destruction of the solid land. Therefore the surface of this land, inhabited by man, is made by nature to decay, in dissolving from the hard and compact state in which it is found below the soil; and this soil is necessarily washed away by the continual circulation of the water running from the summits of the mountains." Thus he supposes that the land must at last be entirely destroyed; a misfortune unavoidable from the very constitution of the globe as a habitable world. It remains, therefore, to be considered, whether there be, "in the constitution of this world, a productive operation by which a ruined constitution may be again repaired, and a duration and stability procured to the machine considered as capable of sustaining plants and animals?" The solution of this question, he says, is perhaps within the reach of human sagacity, and, as he justly observes, might add some lustre to science and the human intellect.

23 Marine animals of much higher antiquity than the human race.

With regard to the beginning of the world, though our author does not pretend to lay aside the Mosaic accounts concerning the origin of man, yet, says he, "though there has not been found in natural history any document by which a high antiquity might be attributed to the human race, this is not the case with regard to the inferior animals, particularly those which inhabit the ocean and its shores. We find in natural history monuments which prove that these animals had long existed; and we thus procure a measure for the computation of a period of time extremely remote, though far from being exactly ascertained.—Thus, in finding the relics of sea animals of every kind in the solid body of the earth, a natural history of those animals is formed, which includes a certain portion of time; and for the ascertaining this portion of time, we must again have recourse to the operations of this world.

From a view of the present construction and operations of nature, therefore, our author supposes, that we may understand what has formerly passed in the original formation of the globe; and then proceeds to reason in the following manner.

24 General view of the solid parts of the globe.

The solid parts of the globe are, in general, composed of sand, gravel, argillaceous and calcareous strata, or of these mixed with some other substances. Sand is separated and sized by streams and currents; gravel is formed by the mutual attrition of stones agitated in water; and marly or argillaceous strata have been collected by subsiding in water in which those earthy substances had floated. Thus, so far as the earth is formed of these materials, it would appear to have been the production of water, winds, and tides.

25 Earth in a great measure composed of the exuviæ of marine animals.

The next inquiry of our author is into the origin of our land, which he seems willing to derive entirely from the exuviæ of marine animals. The only argument he makes use of for determining this most important point is drawn from the quantity of them to be met with in the different parts of it. "We find (says he) the marks of marine animals in the most solid parts of the earth; consequently those solid parts have been formed after the ocean was inhabited by those animals which are proper to that fluid medium."

26 Marble and limestone totally to be derived from these.

That all the masses of marble or limestone are composed of the calcareous matter of marine bodies, he concludes, 1. From there being few in which some of those objects may not be found which indicate the marine origin of the mass; and a single cockle-shell or piece of coral found in a marble or limestone quarry, will certainly prove it to have been originally at the bottom of the sea as much as if it had been all composed of such bodies. 2. In the calcareous strata, which are evidently of marine origin, there are many parts of a sparry structure; which shows that in these places the original texture of those beds has been dissolved and a new structure assumed. This change is produced by crystallization, in consequence of a previous state of fluidity; which has so disposed the concreting parts, as to allow them to assume a regular shape and structure proper to that substance. 3. There are, in all the regions of the earth, huge masses of calcareous matter in that crystalline or sparry state, in which perhaps no vestige can be found of any organized body, nor any indication that such calcareous matter had belonged to animals; but as, in other masses, this sparry or crystalline state is evidently assumed by the calcareous matter of the marine productions, we have no reason to derive these from any other source: and hence, says our author, we are led to conclude, that all the strata of the earth, not only those consisting of such calcareous masses, but others superincumbent upon these, have had their origin at the bottom of the sea, by the collection of sand and gravel, of shells, of coralline and crustaceous bodies, and of earths and clays variously mixed, or separated and accumulated.

27 Almost the whole body of earth formed at the bottom of the sea.

"The general amount of our reasoning (says he) is this; that nine-tenths perhaps, or 99 hundredths, of this earth, so far as we see, have been formed by natural operations of the globe, in collecting lose materials and depositing them at the bottom of the sea, consolidating those collections in various degrees, and either elevating those consolidated masses above the level on which they were formed, or lowering the level of that sea."

28 Could not be raised from thence by any motion of the water.

With regard to the raising of the land, thus formed at the bottom of the sea, to some height above its surface, our author differs from Buffon, and contends, that "no motion of the sea occasioned by the earth revolving in this solar system could bring about that end; for let us suppose the axis of the earth to be changed from the present poles and placed in the equinoctial line, the consequence of this might indeed be the formation of a continent of land about each new pole, from whence the sea would run towards the new equator; but all the rest of the globe would remain an ocean. Some new points might be discovered, and others which appeared before above the surface of the sea would be sunk by the rising of the water; but, on the whole, land could only be gained substantially at the poles. Nor could the continents, even supposing they had been originally produced in this manner, have continued stationary for many thousand years, and presented to us, every where below their surface, masses of consolidated marble and other mineral substances, in a state as different as possible from what they were originally. Besides an operation, therefore, by which the

the earth at the bottom of the sea should be converted into an elevated land, or placed high above the level of the ocean, there is required a consolidating power, by which the loose materials that had subsided from water should be formed into masses of the most perfect solidity, having neither water nor vacuity betwixt their constituent parts, nor in the pores of these constituent parts themselves.

29
Consolidating power of the strata to be discovered by an inspection of the materials themselves.

This consolidating power, he is of opinion, must lie out of the reach of common observation, because the consolidated masses on the surface of the earth are now in a state of decay; and therefore we must look into these masses themselves, in order to discover the cause by which they assumed their present form.

In entering upon the investigation of this consolidating power, our author observes, that there are only two ways in which the requisite changes can happen, viz. simple congelation from a fluid state, or a continual accretion of solid particles. Fire and water, therefore, may be considered as the general agents in this operation; and we are to consider whether they have acted in the way of aqueous solution and crystallization, or in that of fusion. If the former of these ways is supposed to be that in which the strata in general have been consolidated, we may look for a considerable degree of uniformity in its effects. "The action of water (he says) upon all different substances is what we are well acquainted with; and there is no reason to conclude any thing mysterious in its operation, unless we suppose an immense compressing power to have some effect in altering it. Compression, however (he says), only alters the relation of evaporation to heat, or changes the degree of heat which water can contain. We are therefore to look for no occult quality in water acting at the bottom of the sea more than on the surface of the earth. Time, indeed, may do a great deal where the course of the operation is slow; but where it is contrary to the nature of the things to produce the change in question, it is plain that no length of time can have any effect."

30
Consequences of supposing the strata to be consolidated by aqueous solution.

31
Difficulties attending this supposition.

Again, if the masses have been consolidated by crystallization, the bodies must first have been dissolved in water as a menstruum; and therefore another power is to be sought for by which the water might again be extricated from those endless labyrinths in which the solid matter of the strata is deposited, without leaving a fluid particle in its composition. There is likewise another difficulty in finding a source from whence the vast quantity of matter deposited in these strata should be derived. Besides, the water contained in the cavities and interstices of these bodies composing strata must be in a stagnating state; and consequently it can only act on the surface of those cavities which are to be filled up. "But with what are they to be filled? Not with water; they are full of this already: Not with the substance of those bodies which contain the water; this would be only to make one cavity in order to fill up another. If, therefore, the cavities of the strata are to be filled with solid matter by means of water, there must be made to pass through these porous masses water impregnated with some other substances in a dissolved state, and the aqueous menstruum must be separated from the dissolved substance, and to deposit the same in cavities through which the solution moves." This supposition is, however, according to our author, inadmissible; for, in the case of materials accumulated in the bottom of the ocean, there is no proper means for separating the dissolved matter from the water included in these enormous masses; nor are there any means by which a circulation in those masses may be formed.

In the further prosecution of this subject, our author informs us, that "if water had been the menstruum by which the consolidating matter was introduced into the cavities of the strata, masses of those bodies that are soluble in water could only be found consolidated; and these only in such a state as the simple separation of the dissolving water might produce. But this is far from being the case. We have strata consolidated by calcareous spar; a thing perfectly distinguishable from the stalactical concretion of the calcareous earth in consequence of aqueous solution. We have strata made solid by the formation of fluor; a substance, so far as we know, not soluble in water. We have strata consolidated with sulphureous and bituminous substances, which do not correspond to the solution in water. We have strata consolidated with siliceous matter in a state totally different from that in which it is deposited by water: we have them also consolidated by almost all the various metallic substances, with their almost endless mixtures and sulphureous compositions; that is to say, we find perhaps every different substance introduced into the interstices of strata which had been formed by subsidence at the bottom of the sea."

32
Strata consolidated by substances insoluble in water.

33
These probably consolidated by heat and fusion.

For these reasons, our author thinks it more probable that the strata have been consolidated by heat and fusion; and this hypothesis, he imagines, will solve every difficulty. And as the question is of the greatest importance to natural history, he proposes to investigate it at great length; at the same time that the subject is generalized as much as possible.

He considers, that among the various strata which compose the earth, we find some strata formed of *siliceous* and some of sulphureous materials; and with one or other, or both of these substances, the strata are so intimately mixed, that what has changed the siliceous or sulphureous materials from a fluid to a solid state, must likewise have materially affected the strata which contain them. The former he looks upon to be absolutely insoluble in water; and there are many other bodies whose solubility is so small, that it could not be discovered but by means of the siliceous matter. Of this an instance is adduced in the feldt-spar, a compound of siliceous, argillaceous, and calcareous earth, intimately united together; which being for ages exposed to the weather, the calcareous part is dissolved, and the siliceous left in the form of a white soft earth; though it is uncertain whether this dissolution be performed by means of pure water, or whether an acid be also concerned. Siliceous matter is undoubtedly contained in the water of the boiling fountain of Geyser in Ireland; but he thinks that here it must be dissolved by an alkali, one of the natural solvents of this earth. "It may therefore be asserted (says he), that no siliceous body having the hardness of flint, nor any crystallization of that substance, has ever been formed except by fusion. If by any art this substance shall be dissolved in simple water, or *made to crystallize from any solution*, in that case the assertion which has been here made may be denied."

34
Siliceous bodies supposed absolutely insoluble by water.

35
Probably dissolved by an alkali in the fountain of Geyser.

But

36 Bodies penetrated by flinty matter in fuſion.

But beſides this proof he adduces another, ſuppoſed to be more direct; and that is, the penetration of many bodies with a flinty ſubſtance, which, according to every collateral circumſtance, muſt have been performed by the flinty matter in a ſtate of ſimple fuſion, and not in a ſtate of ſuſpenſion by any ſolvent. Flinty bodies are found perfectly inſulated in ſtrata of chalk and ſand: and here our author determines that it is *not poſſible* that flint matter could be conveyed into the middle of theſe ſtrata by a menſtruum in which it was diſſolved, and thus depoſited in that place, without the ſmalleſt trace of depoſition in the neighbouring parts. The form of theſe bodies alſo demonſtrates, in his opinion, "1. That they have been introduced among thoſe ſtrata in a fluid ſtate, by injection from ſome other place; 2. That they have been diſperſed in a variety of ways among thoſe ſtrata then deeply immerſed at the bottom of the ſea; and, 3. That they have been there congealed from the ſtate of fuſion, and have remained in that ſituation, while thoſe ſtrata have been removed from the bottom of the ocean to the ſurface of the preſent land."

37 Exemplified in chalk;

38 In petrified wood.

There are alſo ſpecimens brought from many different places, which contain in themſelves *the moſt evident marks of this injection of the flinty ſubſtance in a fluid ſtate*; and theſe are pieces of *foſſile wood* brought from England, Germany, and Loch Neagh in Ireland. Sometimes theſe ſpecimens appear to have been previouſly penetrated by an irony or calcareous matter, and ſometimes not: "the injected flint, however (ſays he), appears to have penetrated the body of this wood immerſed at the bottom of the ſea, under an immenſe compreſſion of water. This appears from the wood being penetrated partially, ſome parts not being penetrated at all. Now, in the limits betwixt theſe two parts, we have the moſt convincing proofs that it had been flint in a ſimple fluid ſtate which had penetrated the wood, and not in a ſtate of ſolution.

39 Why the wood has not been penetrated by flint in a ſtate of ſolution.

"*Firſt*, Becauſe, however little of the wood is left unpenetrated, the diviſion is always diſtinct between the injected part and that which is not penetrated by the fluid flint. In this caſe the flinty matter has proceeded a certain length, which is marked, and no farther; and beyond this boundary there is no partial impregnation, nor a graduation of the flintifying operation, as there muſt have been if ſiliceous matter had been depoſited from a ſolution. *2dly*, The termination of the flinty impregnation has aſſumed ſuch a form preciſely as would have happened naturally from a fluid flint penetrating that body.

"In other ſpecimens of this mineralizing operation, foſſile wood, penetrated more or leſs with ferruginous or calcareous ſubſtance, has been afterwards penetrated with a flinty ſubſtance. In this caſe, with whatever different ſubſtances the woody body ſhall be ſuppoſed to have been penetrated in a ſtate of ſolution by water, the regular ſtructure of the plant would ſtill have remained, with its vacuities variouſly filled with the petrifying ſubſtances, ſeparated from the aqueous menſtruum, and depoſited in the vaſcular ſtructure of the wood.

"There cannot be a doubt with regard to the truth of this propoſition; for, as it is, we frequently find parts of the conſolidated wood with the vaſcular ſtructure remaining perfectly in its natural ſhape and ſituation; but if it had been by aqueous ſolution that the wood had been penetrated and conſolidated, all the parts of that body would be found in the ſame natural ſhape and ſituation.

"This, however, is far from being the caſe; for while in ſome parts the vaſcular ſtructure is preſerved entire, it is alſo evident, that in general the woody ſtructure is variouſly broken and diſſolved by the fuſion and cryſtallization of the flint.

40 Of the ſulphureous ſubſtances.

With regard to the ſecond kind of ſubſtances to be conſidered, and which are called by our author *ſulphureous*, he tells us, "that they are not ſoluble in water ſo far as we know, but fuſible by heat, and inflammable by means of heat and vital air. They are either more ſimple or more compound. The former conſiſt of phlogiſton united either with acid or metallic ſubſtances, the one forming ſulphur, properly ſo called, the other metals. The more compound kind are compoſed of oily matter produced by vegetables, and forming bituminous ſubſtances.

41 Metals cannot be mineralized by aqueous ſolution.

"Sulphur is found naturally combined with metals, which are ſaid to be mineralized by it; and it is well known that this mineralization is performed by means of heat and fuſion; nor will any perſon ſkilled in chemiſtry pretend to ſay that this is done in the way of aqueous ſolution. The combination of iron and ſulphur, for inſtance, may be eaſily performed by fuſion; but this compound is reſolved into a vitriolic ſalt by aqueous ſolution."

42 Exemplified in different ſubſtances.

Our author further remarks, that unleſs all the ſubſtances of this kind were ſoluble in water, we ought not to ſay that any one of them is formed by aqueous ſolution; for there is ſuch a continued chain of connection between them, that all muſt have been formed either by aqueous ſolution or by means of heat and fuſion. In one maſs, for inſtance, we find, 1. Pyrites, containing ſulphur, iron, and copper: 2. Blend, conſiſting of iron, ſulphur, and calamine: 3. Galena, conſiſting of lead and ſulphur: 4. Marmor metallicum, conſiſting of terra ponderoſa ſaturated with the vitriolic acid, a ſubſtance inſoluble in water: 5. A ſaturation of calcareous earth with the acid of fluor, forming a ſubſtance likewiſe inſoluble in water: 6. Calcareous ſpar of different kinds, being calcareous earth ſaturated with fixed air, and ſomething alſo which makes a variety: And, laſtly, Siliceous ſubſtance, or quartz cryſtals. Unleſs, therefore, every one of theſe different ſubſtances were ſoluble in water, and cryſtallizable from it, we will look in vain for any explanation of theſe appearances by means of aqueous ſolution; while heat being capable of rendering all theſe ſubſtances fluid, they may be with the greateſt ſimplicity tranſported from one place to another; and they may be made to concrete altogether at the ſame time, and diſtinctly ſeparate in any place.

43 Suppoſed proof from an Hungarian mineral.

But what puts the matter beyond all doubt with our author, is a ſpecimen of ore taken from an Hungarian mine, and which contains petro-ſilex, pyrites, and cinnabar, ſo mixed together and cryſtallized upon one another, that it is impoſſible to conceive any one of theſe bodies to have had its fluidity and concretion from a cauſe which had not effected the other two.

"Now (ſays our author), let thoſe who would deny the fuſion of this ſiliceous body explain how water could diſſolve theſe three different bodies, and depoſit them in their preſent ſhape. If, on the contrary, they

have

Earth.

have not the leaſt ſhadow of reaſon for ſuch a gratuitous ſuppoſition, the preſent argument muſt be admitted in its full force."

44 From the exiſtence of native metals in the earth.

The next argument in favour of our author's doctrine is drawn from the exiſtence of metallic bodies in their malleable ſtate in the bowels of the earth. In this ſituation they are alſo commonly attended with ſuch evident marks of fuſion, that it is impoſſible to deny their having been really melted; and for the truth of this he appeals, among a thouſand inſtances, to the great native maſs of iron found by Dr Pallas in Siberia.

45 Of bituminous bodies.

Oily or bituminous bodies are found variouſly intermixed with mineral ſubſtances, as well as forming diſtinct ſtrata of themſelves. Vegetables afford oily and reſinous matters; which being collected at the bottom of the ocean are there formed into ſtrata, afterwards changed by various degrees of heat, and the evaporation of their more fluid parts. "In order to underſtand this (ſays our author), it muſt be conſidered, that, while immerſed in water, and under inſuperable compreſſion, the vegetable, oily, and reſinous ſubſtances would appear to be unalterable by heat, and it is only in proportion as certain chemical ſeparations take place, that thoſe inflammable bodies are changed in their ſubſtance by the application of heat. Now, the moſt general change of this kind is by evaporation, or the diſtillation of their more volatile parts; by which oily ſubſtances become bituminous, and bituminous ſubſtances become coaly. There is here a gradation, which is beſt underſtood by comparing the two extremes. On the one hand, we know by experiment, that oily and bituminous ſubſtances can be melted, and partly changed into vapour by heat; and that they become harder and denſer in proportion as the more volatile parts have evaporated from them. On the other hand, coaly ſubſtances are deſtitute of fuſibility and volatility, in proportion as they have been expoſed to greater degrees of heat, and to other circumſtances favourable to the diſſipation of their more volatile and fluid parts. If, therefore, in mineral bodies we find the two extreme ſtates of this combuſtible ſubſtance, and alſo the intermediate ſtates, we muſt either conclude that this particular operation of heat has been thus actually employed in nature, or we muſt explain thoſe appearances by ſome other means in as ſatisfactory a manner, and ſo as ſhall be conſiſtent with other appearances. In this caſe it will avail nothing to have recourſe to the falſe analogy of water diſſolving and cryſtallizing ſalts, which has been ſo much employed for the explanation of other mineral appearances. The operation here in queſtion is of a different nature, and neceſſarily requires both the powers of heat and proper conditions for evaporation. Therefore, in order to decide the point with regard to what is the power in nature, by which mineral bodies have become ſolid, we have only to find a bituminous ſubſtance in the moſt complete ſtate of coal, intimately connected with ſome other ſubſtance which is more generally found conſolidating the ſtrata, and aſſiſting in the concretion of mineral ſubſtances. A moſt undoubted proof of this kind our author has in his poſſeſſion, viz. a maſs in which are blended together coal of the moſt fixed kind, quartz, and marmor metallicum. The ſpecimen alſo is contained in a rock, which every naturaliſt, he ſays, will allow to have been produced by fire and fuſion.

46 Why theſe bodies are not altered by heat while under water.

47 Proof that bituminous ſubſtances have been conſolidated by heat

Earth.

48 Formation of the different kinds of coal.

The ſtrata of foſſil coal are found in almoſt every intermediate ſtate, as well as in thoſe of bitumen and charcoal. Of the former kind is that foſſil coal which melts and becomes fluid by heat; of the latter, is that ſpecies found both in Wales and Scotland, which is perfectly infuſible in the fire, and burns like coaks without flame or ſmoke. The former abounds in oily matter; the latter has been diſtilled by heat until it has become a *caput mortuum*, or perfect coal. The more volatile parts of theſe bodies are ſometimes found in their ſeparate ſtate. Thus at Raith in Fifeſhire, there is a ſtratum of limeſtone, which, though but ſlightly tinged with a black colour, contains bituminous matter like pitch, in many cavities which are lined with calcareous ſpar cryſtallized. Now, it is to be obſerved, that had the cavity in the ſolid limeſtone or marble, which is lined with calcareous cryſtals containing pyrites, been thus incruſted by means of filtration with water, this water muſt have diſſolved calcareous ſpar, pyrites, and bitumen. But theſe natural appearances would not even be ſolved by this hypotheſis of diſſolution and filtration of theſe ſubſtances. There is alſo required, firſt, a cauſe for the ſeparation of theſe different ſubſtances from the aqueous menſtruum. 2. An explanation of the way in which a bitumen ſhould be formed into hard round bodies (our author has a ſpecimen of this kind) of the moſt ſolid ſtructure; and, laſtly, ſome probable means for this complicated operation being performed below the bottom of the ocean, in the cloſe cavity of a marble ſtratum.

49 Stratum containing liquid bituminous matter in Fifeſhire.

Having thus run through his courſe of argument for the probability of the ſtrata of earth being formed by heat and fuſion rather than by aqueous ſolution, our author proceeds to the examination of a phenomenon in the mineral kingdom, which may be thought inconſiſtent with what he has advanced; viz. the exiſtence of great maſſes of ſalt in the bowels of the earth. On this ſubject he obſerves, that the formation of maſſes of ſalt at the bottom of the ſea, without the aſſiſtance of ſubterraneous fire, is not a thing unſuppoſeable as at firſt ſight might appear. "Let us but ſuppoſe a rock placed acroſs the gut of Gibraltar (a caſe no wiſe unnatural), and the bottom of the Mediterranean would be certainly filled with ſalt; becauſe the evaporation from the ſurface of that ſea exceeds the meaſure of its ſupply. But ſtrata of ſalt formed in this manner at the bottom of the ſea are as far from being conſolidated by means of aqueous ſolution as a bed of ſand in the ſame ſituation; and we cannot ſuppoſe the conſolidation of ſuch a ſtratum of ſalt by means of water, without ſuppoſing ſubterranean heat employed to evaporate the brine which would ſucceſſively occupy the interſtices of the ſaline cryſtals. But this, it may be obſerved, is equally departing from the natural operation of water as the means for conſolidating the ſediment of the ocean, as if we were to ſuppoſe the ſame thing done by heat and fuſion. For the queſtion is not, if ſubterranean heat be of ſufficient intenſity for the purpoſe of conſolidating ſtrata by the fuſion of their ſubſtances? but, whether it be by means of this agent, ſubterraneous heat, or by water alone, without the operation of a melting

50 On the production of foſſile ſalt by fuſion.

melting heat, that those materials have been variously consolidated?

51 From the appearance of the salt-rock in Cheshire.

The Doctor now attempts to prove, from the appearance of the saline strata, that they have been formed by subterraneous heat and fusion as well as the others. "The salt-rock in Cheshire lies in strata of red marl. It is horizontal in its direction, and is dug 30 or 40 feet deep. The body of this rock is perfectly solid, and the salt in many places pure, colourless, and transparent, breaking with a sparry, cubical texture: but the greatest part is tinged by the admixture of the marl, and that in various degrees, from the slightest tinge of red to the most perfect opacity. Thus the rock appears as if it had been a mass of fluid salt, in which had been floating a quantity of marly substance not uniformly mixed, but every where separating and subsiding from the saline substance. There is also to be observed a certain regularity in the separation of the tinging from the colourless substance; which, at a proper distance, gives to the perpendicular section of the rock a distinguishable figure in its structure. When looking at this appearance near the bottom of the rock, it first presented the figure of regular stratification; but upon examining the whole mass of rock, this stratification was found only to take place near the bottom. At the top of the rock, the most beautiful figure, though the most distant from stratification, was observed. It was all composed of concentric circles, and these appeared to be the section of a mass made up entirely of concentric spheres, like those beautiful systems of configuration which agates so frequently present us with in miniature. In about eight or ten feet from the top, the circles growing large, were blended together, and gradually lost their regular appearance, until at a greater depth they again assumed that of a regular stratification. This regular arrangement of the floating marly substance in the body of the salt, which is that of the structure of a coated pebble, or that of concentric spheres, is altogether inexplicable upon any other supposition than the perfect fluidity or fusion of the salt, and the attractions and repulsions of the contained substances. It is in vain to look in the operations of solution and evaporation for that which nothing but perfect fluidity and fusion can explain.

52 From the mineral alkali on Teneriff.

"This example of a mineral salt congealed from a melted state, may be confirmed by another argument suggested by Dr Black, *viz.* an alkaline salt found in a mineral state, and described in the Philosoph. Transac. for 1771. The fossile alkali crystallizes from a dissolved state, in combining itself with a large quantity of water, in the manner of alum: and in this case the water is essential to the constitution of that solid crystalline body; for, upon the evaporation of the water, the transparent salt loses its solidity, and becomes a white powder. If, instead of being gently dried, the crystalline salt is suddenly exposed to a sufficient degree of heat (that is, somewhat more than the heat of boiling water), it enters into the state of aqueous fusion, and boils, emitting the water by means of which it had been crystallized in the cold, and rendered fluid in that heated state. It cannot be crystallized from a dissolved state without the combination of that quantity of water; nor can that water be separated without destroying its crystalline state. But in this mineral specimen we have a solid crystalline salt, with a structure which, upon examination, appears to be sparry and radiated like the zeolite. It contains no water in its crystallization, but melts in a sufficient heat without any aqueous fusion. Therefore this salt must have been in a fluid state of fusion immediately before its congelation and crystallization.

53 From iron-stone.

"Another example may be drawn from the iron-stone, which is commonly found among the argillaceous strata attendant upon fossile coal, both in Scotland and England. This stone is generally found among the bituminous schistus or black argillaceous strata, either in separate masses of various shapes and sizes, or forming of itself strata which are more or less continuous in their direction among the schistus or argillaceous beds. This mineral contains in general from 40 to 50 *per cent.* of iron, and it loses near one-third of its weight in calcination. Before calcination it is of a grey colour, is not penetrable by water, and takes a polish. In this state therefore it is perfectly solid; but being calcined, it becomes porous, red, and tender. The fact to be proved with regard to these iron stones is, that they have acquired their solid state from fusion, and not in concreting from any aqueous solution. A species of this kind of stone is found at Aberlady in East Lothian, resembling an oblate or much compressed sphere, and the size from two or three inches diameter to more than a foot. In the circular or horizontal section they present the most elegant septarium: and from this examination of this particular structure, the following conclusions may be drawn.

54 Supposed to have received its form by fusion.

"1. That the septa have been formed by the uniform contraction of the internal parts of the stone, the volume of the central parts diminishing more than that of the circumference; by which means the separations of the stone diminish in a progression from the centre towards the circumference.

"2. There are only two ways in which the septa must have received the spar with which they are filled more or less; either, first, by insinuation into the cavity of these septa after they were formed; or, secondly, by separation from the substance of the stone at the same time that the septa were forming.

55 The septa of this stone could not have been filled by aqueous solution.

"Were the former of these suppositions true, appearances would be observable, showing that the sparry substance had been admitted either through the porous structure of the stone, or through proper apertures communicating from without. Now, if either of these had been the case, and the stone had been consolidated from no other cause than concretion from a dissolved state, that particular structure of the stone by means of which the spar had been admitted must appear at present upon an accurate examination. This, however, is not the case; and we might rest the argument here: The septa reach not the circumference; the surface of the stone is solid and uniform in every part; and there is not any appearance of the spar in the argillaceous earth around the stone. It therefore necessarily follows, that the contraction of the iron-stone, in order to form the septa, and the filling the cavities with spar, had proceeded *pari passu*; and that this operation must have been brought about by means of fusion or by congelation from a state of simple fluidity and expansion.

"There is one fact more, which is well worth our attention; *viz.* the crystallizations which are found in close

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56 Of cryſtallizations in cavities of ſolid bodies.

close cavities of the moſt ſolid bodies. Theſe concretions are well known to naturaliſts, and form part of the beautiful ſpecimens which are to be found in the cabinets of collectors, and which the German mineraliſts have named *druſen*." Our author, however, conſiders only one of theſe ſpecies, which is of the agate kind. It belongs to the kind of ſtones frequent in this country, which are commonly called *pebbles*. Many of them are filled with a ſiliceous cryſtallization, which evidently proceeds from the circumference towards the centre. Many of them again are hollow. They are uniformly lined with cryſtallized ſubſtances; and it is proper to attend to this circumſtance, that the cavity is perfectly incloſed with many ſolid coats impervious to air or water; but particularly with the external cortical part, which is extremely hard, takes the higheſt poliſh, and is of the moſt perfect ſolidity, admitting nothing but the paſſage of light and heat.

57 Particular kind of druſen deſcribed.

58 Other mineral cryſtallizations deſcribed.

"Within theſe cavities we find, firſt, the coats of cryſtals with which this cavity is always lined: and this is general to all ſubſtances concreting in ſimilar circumſtances from a ſtate of fuſion; for when thus at liberty they naturally cryſtallize. 2. We have frequently a ſubſequent cryſtallization ſet upon the firſt, and more or leſs immerſed in it. 3. There is alſo ſometimes a third cryſtallization ſuperincumbent on the ſecond, in like manner as the ſecond was upon the firſt. Our author has one ſpecimen in which the primary cryſtals are ſiliceous; the ſecond thin foliaceous cryſtals of deep red but tranſparent ore, forming elegant figures that have the form of roſes; the tertiary cryſtallization is a froſting of ſmall ſiliceous cryſtals upon the edges of the foliaceous cryſtals. In other ſpecimens there is firſt a lining of colourleſs ſiliceous cryſtals, then another lining of amethyſtine cryſtals, and ſometimes within that fuliginous cryſtals. Upon theſe fuliginous and amethyſtine cryſtals are many ſphericles or hemiſpheres of red compact iron-ore like hæmatites. In others again, the primary cryſtals are ſiliceous, and the ſecondary calcareous. Of this kind there is one in the Doctor's poſſeſſion, which has upon the calcareous cryſtals beautiful tranſparent ſiliceous cryſtals, and iron ſphericles upon theſe. He has alſo an agate formed of various red and white coats, and beautifully figured. The cavity within the coated part of the pebble is filled up without vacuity; firſt with colourleſs ſiliceous cryſtals; ſecondly, with fuliginous cryſtals: and, thirdly, with white or colourleſs calcareous ſpar. But between the ſpar and cryſtals there are many ſphericles, ſeemingly of iron, half ſunk into each of theſe two different ſubſtances."

59 Concluſions concerning the fuſed ſtate of the minerals.

From the foregoing facts our author now draws the following concluſions.

"1. That concretion had proceeded from the ſurface of the agate inwards. This neceſſarily follows from the nature of thoſe figured bodies, the figures of the external coats always determining the ſhape of thoſe within, and never contrariwiſe, thoſe within affecting thoſe without.

"2. That when the agate was formed, the cavity then contained every thing which is now found in it, and nothing more.

"3. That the contained ſubſtances muſt have been in a fluid ſtate, in order to their cryſtallizing.

"4. That as this fluid ſtate had not been the effect of ſolution in a menſtruum, it muſt have been fluidity from heat and fuſion."

This is the ſubſtance of all the evidence brought by Dr Hutton in ſupport of his doctrine, that moſt of the mineral ſubſtances with which the ſtrata are conjoined muſt have been produced by ſubterraneous heat, and not from any aqueous ſolution. Thus far he thinks it is perfectly concluſive, though not altogether ſo with regard to the formation of the ſtrata themſelves: but, in order to make it apply alſo to theſe, he next propoſes to give examples of ſtrata conſolidated without the introduction of foreign matter, merely by the ſoftening or fuſion of their own materials.

60 The doctrine of fuſion applied to the formation of the ſtrata.

61 Univerſal prevalence of the calcareous and ſiliceous ſtrata.

For this purpoſe he conſiders the calcareous and ſiliceous ſtrata, which are the two ſo much prevalent on the ſurface of the globe, that all others, according to him, may be conſidered as nothing: "for (ſays he) unleſs it be the bituminous or coal ſtrata, there is hardly any other which does not contain more or leſs of one or other of theſe two ſubſtances. If therefore it can be ſhown, that both of theſe two general ſtrata have been conſolidated by the ſimple fuſion of their ſubſtance, no deſideratum or doubt will remain with regard to the nature of that operation which has been tranſacted at great depths of the earth, places to which all acceſs is denied to mortal eyes.

"We are now to prove, 1. That thoſe ſtrata have been conſolidated by ſimple fuſion; and, 2. That this operation is univerſal in relation to the ſtrata of the earth, as having produced the various degrees of hardneſs or ſolidity in theſe bodies.

62 Conſolidation of a ſtratum from a fortuitous collection of hard bodies.

"I ſhall firſt remark, that a fortuitous collection of hard bodies, ſuch as gravel and ſand, can only touch in points, and cannot while in that hard ſtate be made to correſpond ſo preciſely to each other's ſhape as to conſolidate the maſs. But if theſe hard bodies ſhould be ſoftened in their ſubſtance, or brought into a certain degree of fuſion, they might be adapted mutually to each other; and thus conſolidate the open ſtructure of the maſs. Therefore to prove the preſent point, we have but to exhibit ſpecimens of ſiliceous and calcareous ſtrata which have been evidently conſolidated in this manner. Of the firſt kind great varieties occur in this country. They are the conſolidated ſtrata of gravel and ſand, often containing abundance of feldtſpar, and thus graduating into granite; a body, in this reſpect, perfectly ſimilar to the more regular ſtrata which we now examine. The ſecond kind again are leſs common, unleſs we conſider the ſhells and coralline bodies of our limeſtones as exhibiting the ſame example, which indeed they do. But I have a ſpecimen of marble from Spain which will afford the moſt ſatisfactory evidence of the fact in queſtion. This Spaniſh marble may be conſidered as a ſpecies of puddingſtone; a ſpecies of marble which, from Mr Bowles's Natural Hiſtory, appears to be very common in Spain. The gravel of which this marble is compoſed conſiſts of fragments of other marbles of different kinds. Among theſe are different ſpecies of zeolites, marble, ſome ſhell marbles, and ſome compoſed of a chalky ſubſtance, or of undiſtinguiſhable parts. But it appears that all theſe different marbles had been conſolidated or made hard, then broken into fragments, rolled and worn by attrition; and thus collected together, along with ſome ſand or ſmall ſiliceous bodies,

63 Spaniſh marble deſcribed.

into

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into one mass. Lastly, this compound body is consolidated in such a manner as to give the most distinct evidence that this had been executed by the heat of simple fusion.

64 Proof of this having been in a state of fusion.

" The proof is, that, besides the general conformation of those hard bodies, so as to be perfectly adapted to each other's shape, there is in some places a mutual indentation, which resembles perfectly the junction of the different bones of the cranium; and which must necessarily have required a mixture of those bodies while in a soft or fluid state.

" This appearance of indentation is by no means singular or limited to one particular specimen. I have several specimens of different marbles, in which fine examples of this species of mixture may be perceived. But in this particular case of the Spanish pudding-stone, where the mutual indentation is made, between two pieces of hard stone worn round by attrition, the softening or fusion of these two bodies is not simply rendered probable, but demonstrated.

" Having thus proved, that those strata had been consolidated by simple fusion, as proposed, we now proceed to show, that this mineral operation had been not only general but universal, in consolidating our earth in all the various degrees, from loose and incoherent shells and sand to the most solid bodies of the siliceous and calcareous substances.

65 The same doctrine exemplified in chalk.

" To exemplify this in the various collections and mixtures of sands, gravels, shells, and corals, were endless and superfluous. We shall only take for an example one simple homogeneous body, in order to exhibit it in the various degrees of consolidation, from the state of simple incoherent earth to that of the most solid marble. The substance meant is chalk, naturally a soft calcareous earth, but which may be found consolidated in every different degree.

66 Account of a ridge of indurated chalk running thro' the isle of Wight.

" Through the middle of the isle of Wight there runs a ridge of hills of indurated chalk. This ridge runs from the isle of Wight directly west into Dorsetshire, and goes by Corfcastle towards Dorchester, perhaps beyond that place. The sea has broke through this ridge at the west end of the isle of Wight, where columns of the indurated chalk remain, called the *Needles*; the same being found on the opposite shore in Dorsetshire. In this field of chalk we find every gradation of this soft earthy substance to the most consolidated body of this indurated ridge, which is not solid marble, but which has lost its chalky property, and acquired a kind of stony hardness.

67 Another in Ireland.

" We have this cretaceous substance in its most indurated and consolidated state in the kingdom of Ireland, not far from the Giant's Causeway; and it affords the most perfect evidence of this body having been once a mass of chalk, which is now a body of solid marble. Thus, if it is by means of fusion that the strata of the earth have in many places been consolidated, we must conclude that all the degrees of consolidation, which are indefinite, have been brought about by the same means.

68 Granite also consolidated by fusion.

" It may, however, still be alleged, that there is a great part of the solid mass of this earth not properly comprehended among those bodies which have been thus proved to be consolidated by means of fusion. This is granite; a mass which is not generally stratified, and which being a body perfectly solid, and forming some parts in the structure of this earth, deserves to be considered. The nature of the granite is too intricate a subject to be here considered: we shall therefore only now take notice of one species; and if this appears to have been once in a state of fusion, we must conclude that all the rest have been so too.

69 Description of a species from Portsoy.

The species in question comes from Portsoy, on the road to Huntley; and is partly a porphyry and partly a granite. The singularity of it, however, consists not in the nature or proportions of its constituent parts, but in the uniformity of the sparry ground, and the regular shape of the quartz mixture. This siliceous substance, viewed in one direction, or longitudinally, may be considered as columnar, prismatical, or continued in lines running nearly parallel. These columnar bodies of quartz are beautifully impressed with a figure on the sides, where they are in contact with the spar. This figure is that of furrows or channels, which are perfectly parallel, and run across the longitudinal direction of the quartz. This striated figure is only seen when, by fracture, the quartz is separated from the contiguous spar. But what is more particularly to be noticed is, that the transverse section of those longitudinal bodies not only have separately the forms of certain typographical characters, but collectively give the regular linear appearance of types set in writing.

" It is evident from the inspection of this fossil, that the sparry and siliceous substances had been mixed together in a fluid state; and that the crystallization of the sparry substance, which had been rhombic, had determined the regular structure of the quartz, at least in some directions. Thus the siliceous substance is to be considered as included in the spar, and as figured according to the laws of crystallization proper to the sparry ground; but the spar is also to be found included in the quartz. Now it is not possible to conceive any other way in which these two substances, quartz and feldt-spar, could be thus concreted, except by congelation from a fluid state, in which they had been mixed."

70 Veins of the strata numerous in proportion to their consolidation.

Our author having at length finished his arguments on the formation of the strata, draws the following general conclusion. " If it be by means of heat and fusion that strata have been consolidated, then, in proportion to the degree of consolidation they have undergone from their original state, they should, *cæteris paribus*, abound with more separations in their mass. But this conclusion is not found consistent with appearances. A stratum of sand-stone does not abound so much with cutters or veins as a similar stratum of marble, or even a similar stratum of sand-stone that is more consolidated. In proportion therefore as strata have been consolidated they are in general intersected with veins and cutters; and in proportion as strata are deep in their perpendicular section, the veins are wide, and placed at greater distances. In like manner, when strata are thin, the veins are many, but proportionally narrow.

71 Strata composed of the fragments of others.

" It is thus upon chemical principles to be demonstrated, that all the solid strata of the globe have been condensed by means of heat and hardened from a state of fusion. But this proposition is equally to be maintained from propositions that are mechanical. The strata of the globe, besides being formed of earths, are composed of gravel, sand, and fragments of hard bodies;

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dies; all of which may be considered as in their nature simple: but these strata are also found composed of bodies which are not simple, but are fragments of former strata which had been consolidated, and afterwards were broken and worn by attrition so as to make gravel. Strata composed in this manner have been again consolidated; and now the question is, By what means?

72 Could not be consolidated by aqueous dissolution.

"If strata composed of such various bodies had been consolidated, by any manner of concretion, from the fluidity of a dissolution, the hard and solid bodies must be found in their entire state, while the interstices between those constituent parts of the stratum are filled up. No partial fracture can be conceived as introduced into the middle of a solid mass of hard matter without having been communicated from the surrounding parts. But such partial separations are found in the middle of those hard and solid masses; therefore this compound body must have been consolidated by other means than that of concretion from a state of solution.

73 Must have undergone a fusion by fire.

"The Spanish marble already described, as well as many consolidated strata of siliceous gravel, afford the clearest evidence of this fact. These hard bodies are perfectly united together in forming the most solid mass; the contiguous parts of some of the rounded fragments are interlaced together, as has already been observed; and there are partial shrinkings of the mass forming veins traversing several fragments, but perfectly filled with the sparry substance of the mass, and sometimes with parts of the stone distinctly floating on the transparent body of the spar. Now there is not in nature any known power, besides heat and fusion, by which these effects might be produced. But such effects are general to all consolidated masses, although not always so well illustrated in a cabinet specimen."

74 How the strata have been elevated from the bottom of the ocean.

Thus the formation of the strata is supposed to be fully discussed: after which our author goes on to consider the means by which they have been elevated from the bottom of the ocean; for he looks upon it as an undoubted fact, that the highest points of our land have been for ages at the bottom of the ocean. "It is a truth unquestionable (says he), that what had been originally at the bottom of the sea, is at present the highest of our land. In explaining this appearance therefore no other alternative is left, but either to suppose strata elevated by the power of heat above the level of the present sea, or the surface of the ocean reduced many miles below the height at which it had subsisted during the collection and induration of the land which we inhabit. Now if, on the one hand, we are to suppose no general power of subterraneous fire or heat, we leave to our theory no means for the retreat of the sea or the lowering of its surface. If, on the other, we are to allow the general power of subterraneous heat, we cannot have much difficulty in supposing either the surface of the sea to have subsided, or the bottom of the ocean in certain parts to have been raised by a subterranean power above the level of its surface, according as appearances shall be found to require the one or the other of these conclusions

"The strata formed at the bottom of the ocean are necessarily horizontal in their position, or nearly so; and continuous in their horizontal direction and extent. They may change, and gradually assume the nature of each other so far as concerns the materials of which they are formed; but there cannot be any sudden change, fracture, or displacement naturally in the body of the stratum. But if these strata are cemented by the heat of fusion, and erected with an expansive force acting below, we may expect to find every species of fracture, dislocation, and contortion in those bodies, and every degree of departure from a horizontal towards a vertical position. The strata of the globe are actually found in every possible position: for from horizontal, they are frequently found vertical; from continuous, they are broken and separated in every possible direction; and from a plane, they are bent and doubled. It is impossible they could have been formed by the known laws of nature in their present state and position. And here the apparent irregularity and disorder of the mineral regions are as instructive, with regard to what had been transacted in a former period of time, as the order and regularity of these same regions are conclusive in relation to the place in which a former state of things had produced that which in its changed state, we now perceive.

75 Strata found broken and disjoined in every possible position.

76 Have been raised by the force of fire.

"We are now to conclude, that the land on which we dwell had been elevated from a lower situation by the same agent which had been employed in consolidating the strata, in giving them stability, and preparing them for the purpose of the living world. This agent is matter actuated by extreme heat, and expanded with amazing force. If this has been the case, it will be reasonable to expect that some of the expanded matter might be found condensed in the bodies which have been heated by that igneous vapour, and that matter foreign to the strata may have been thus introduced into the fractures and separations of those indurated masses. We have but to open our eyes to be convinced of this truth. Look into the sources of our mineral treasures; ask the miner from whence has come the metal into his vein? Not from the earth or air above; not from the strata which the vein traverses. There is but one place from whence these minerals may have come; and that is, the bowels of the earth; the place of power and expansion: the place from whence must have proceeded that intense heat by which loose materials have been consolidated into rocks, as well as that enormous force by which the regular strata have been broken and displaced."

77 Proved from the inspection of mines.

78 A great mechanical power requisite to fill the veins with the matter they contain.

Our author is of opinion, that this action of heat is likewise evident from an inspection of the materials with which the veins are filled, as well as their various fractures and irregularities; and informs us, that some great mechanical power must have been employed in filling these veins, as well as that necessarily employed in making the first fracture and divulsion. The successive irruptions of fluid substances into the veins, he says, is *demonstrable* from the mere inspection of the veins and their contents, it being very common to see three successive series of these operations; "all which may be perceived in a small fragment of stone, which a man of science may examine in his closet, often better then by descending to the mine where all the examples are found on a large scale."

79 Successive irruptions of fluid matter into them.

These fiery operations, he contends, are not to be accounted any way accidental, but as entirely natural to the globe, and remain at this day with undiminished force: and of this he brings a proof from the erup-

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tions of mount Ætna, informing us, that he has in his possession a table of Sicilian jasper, which evidently shows that this calcareous stone had flowed and been in such a state of fusion as lava is.

80 Sicilian jasper once in a state of fusion.

This subterraneous heat manifested in the burning mountains is the renovating power which the earth possesses within itself, and which prevents it from coming to an end by reason of the perpetual waste taken notice of n° 22. "Volcanoes (says he) are natural to the globe as general operations; but we are not to consider nature as having a burning mountain for an end in her intention, or as a principal purpose in the general system of this world. The end of nature in placing an internal fire or power of heat, and a force of irresistable expansion in the body of this earth, is to consolidate the sediment collected at the bottom of the sea, and to form thereof a mass of permanent land above the level of the ocean, for the purpose of maintaining plants and animals. The power appointed for this purpose is, as on all other occasions where the operation is important, and where there is any danger of a shortcoming, wisely provided in abundance; and there are contrived means for disposing of the redundancy. These, in the present case, are our volcanoes.

81 Heat of volcanoes the renovating power of the earth.

82 Volcanoes to be considered as spiracles to the subterraneous heat.

"A volcano is not made on purpose to frighten superstitious people into fits of piety and devotion, nor to overwhelm devoted cities with distructiou: A volcano should be considered as a spiracle to the subterraneous furnace, in order to prevent the unnecessary elevation of land and fatal effects of earthquakes; and we may rest assured, that they in general wisely answer the end of their intention, without being in themselves an end for which nature had exerted such amazing power and contrivance."

83 Are only proper for elevating land from the bottom of the sea.

The Doctor then goes on to show, that volcancoes are not proper for elevating land, unless, placed at the bottom of the sea, where the contact of the water tends to close the orifice, and to accumulate matter upon the weakest part. An instance of this was given in the year 1707, when the burning island arose in the Mediterranean; and he confirms his theory by the great number of melted matters which are every where to be found in the strata, even of countries where no volcanoes exist at present. Examples are brought from the dykes of whin-stone, as they are called in this country, and which he supposes to have been once in a state of fusion.

84 Whinstone supposed to have been in a state of fusion.

In order to avoid an objection which might here arise from the difference betwixt the appearance of our whinstone and the lavas of volcanoes, our author makes a distinction between such as have been erupted at the moment of explosion, and those which had been melted under a vast compression of weighty materials, and at last exposed to the air after the lapse of a number of ages. "In the erupted lavas, those substances which are subject to calcine and vitrify in our fires, suffer similar changes when delivered from a compression which had rendered them fixed, though in an extremely heated state. Thus a lava in which there is much calcareous spar, when it comes to be exposed to the atmosphere, or delivered from the compressing force of its confinement, effervesces by the explosion of its fixed air; the calcareous earth at the same time vitrifying with the other substances. Hence such violent ebullition in volcanoes, and hence the emission of so much pumice stone and ashes which are of the same nature. In the body of our whinstone, on the contrary, there is no mark of calcination or vitrification. We frequently find in it much calcareous spar, or the *terra calcarea aerata*, which had been in a melted state by heat, and had been crystallized by congelation into a sparry form. This is the cause of the differences between the erupted lavas and our whinstone, toadstone and the Swedish trap; which may be called *subterranean lavas*."

85 Difference between erupted and unerupted lavas.

86 Ebullition in volcanoes owing to the extrication of fixed air.

87 Composition of whin-stone described.

All this time our author seems to have excluded from his system every idea of accounting for the origin of metals, though this would seem to be no less necessary than to account for that of whinstone. At last, however, we are informed that there are peculiar productions in the mineral kingdom which are rare, as being found only in few places; and of these he enumerates the diamond of the east, the platina of the west, and the tin of Cornwall, Germany, and Sumatra. "But all these substances (gold itself not excepted)," says he, "are to be considered as the vapours of the mineral regions condensed occasionally in the crevices of the land."

88 Strange account of the origin of metals.

The last part of our author's dissertation contains the system of decay and renovation observed in the earth. In this having again observed what had been already repeated over and over, that the land we see at present had been formed at the bottom of the sea, he proceeds to inform us, that, "at a gross computation, there may perhaps be a fourth part of our solid land which is composed from the matter that had belonged to these animals. Now what a multitude of living creatures, what a quantity of animal economy, must have been required, for producing a body of calcoreous matter which is interspersed throughout all the land of the globe, and which certainly forms a very considerable part of the mass! Therefore, in knowing how these animals had lived, or with what they had been fed, we shall have learned a most interesting part of the history of the earth; a part which it is necessary to have ascertained, in order to see the former operations of the globe, while preparing the materials of the present land."

89 System of decay and renovation in the earth.

90 A fourth part of the land supposed to proceed from marine animals.

Before entering upon this subject, however, he still thinks it necessary to consider some other of the component parts of the strata of our present earth. These are gravel, sand, and clay. Gravel, he tells us, is no other than stones worn round by their attrition in water; and finding them in the composition of our land, we must conclude, that in the former earth there had been operations of wind and water similar to those which we behold at present; and by which new gravel is continually prepared, as well as old gravel consumed or diminished by attrition upon our shores. Sand is no other than small particles of hard and solid bodies worn round by attrition. Clay is a mixture of different earths or hard substances in an impalpable state; and these substances are chiefly the siliceous and aluminous earths. Others are occasionally mixed in clays; or perhaps always to be found in some small portion. But the great quantity of siliceous, argillaceous, and other compound substances, in form of earth or other impalpable sediment, corresponds perfectly with that quantity of these same substances which must have been prepared in the formation of so much gravel

91 Gravel, sand, and clay considered.

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gravel and ſand, by the attrition of theſe bodies in the moving waters.

92 Conjectures concerning the former earth.

From theſe conſiderations our author tells us, that we have reaſon to conclude there had been in the former earth ſuch operation as we ſee at preſent; and likewiſe that it had been compoſed of ſimilar materials. The animals which had formerly exiſted, alſo appear by their remains to have been ſimilar to what they are now; and it is alſo probable that their food had been derived from the ſame origin, viz. vegetables. There muſt therefore have exiſted in the former earth a world of vegetables, as well as a world of animals and an ocean. The exiſtence of theſe he determines from the many ſpecimens of foſſil wood and petrified plants to be met with; and its profuſion he thinks is evidenced from the quantities of mineral coal: of which he ſays, that "nothing can be more certain than that all the coaly or bituminous ſtrata have had their origin from the ſubſtance of vegetable bodies that grew upon the land."

93 Coal ſuppoſed to have been derived from wood.

Laſtly, when he comes to ſpeak of the actual diminution of the earth we at preſent inhabit, he proceeds in the following manner: "Our land has two extremities: the tops of the mountains on one hand, and the ſea-ſhore on the other. It is the intermediate ſpace between theſe two that form the habitation of plants and animals. While there is a ſea, ſhore, and a high ground, there is that which is required in the ſyſtem of the world; take theſe away, and there would remain an aqueous globe, in which the world would periſh. But, in the natural operations of the world, the land is periſhing continually; and this is what we now want to underſtand.

94 Of the diminution of our preſent land.

"Upon the one extremity of our land there is no increaſe, nor any occaſion of mineral ſubſtance. That place is the mountain top, on which nothing is obſerved but continual decay. The fragments of the mountain are removed in a gradual ſucceſſion from the higheſt ſtation to the loweſt. Being arrived at the ſhore, and having entered the dominion of the waves in which they find perpetual agitation, theſe hard fragments, which had eluded the reſolving powers natural to the ſurface of the earth, are incapable of reſiſting the powers here employed for the deſtruction of the land. By the attrition of one hard body upon another, the moving ſtones and rocky ſhores are mutually impaired; and that ſolid maſs, which of itſelf had potential ſtability againſt the violence of the waves, affords the inſtruments of its own deſtruction, and thus gives occaſion to its actual inſtability."

95 No perceptible progreſs made in the diſſolution of this earth.

Having thus deſcribed very particularly the means by which the deſtruction of the preſent earth is going on, it is natural to inquire what progreſs has been made in the work. But in this neither ancient nor modern hiſtory give any aſſiſtance. The ſtrait between Italy and Sicily he confeſſes to be no wider; the iſthmus of Corinth to be no narrower; nor the rock on which the famous tower of Pharos was erected, either larger or ſmaller than before. The Palus Mæotis in the time of Polybius appeared to be very near filling up, as that hiſtorian informs us; and ſo it continues to appear at this day, without any apparent progreſs having been made in it. In ſhort, the whole of our author's reſearches can produce nothing more than the loſs of a ſmall iſland in the mouth of the harbour of New Carthage, which, Polybius ſays, exiſted in his time; and for which there is now only a rock under water. Our author therefore is obliged at laſt to own, that the quantity of decay in the rocks he ſpeaks of, has either been too ſmall for human obſervation, or, which is more probable, that no accurate meaſurement of the ſubject by which this quantity of decreaſe might be aſcertained had been taken and recorded. "To ſum up the argument, therefore (ſays he), we are certain, that all the coaſts of the preſent continents are waſted by the ſea, and conſtantly wearing away upon the whole; but this operation is ſo extremely ſlow, that we cannot find a meaſure of the quantity in order to form an eſtimate. Therefore the preſent continents of the earth, which we conſider as in a ſtate of perfection, would, in the natural operations of the globe, require a ſpace indefinite for their deſtruction. But in order to produce the preſent continents, the deſtruction of a former vegetable world was neceſſary; conſequently the production of our preſent continents muſt have required a time which is indefinite. In like manner if the former continents were of the ſame nature with the preſent, it muſt have required another ſpace of time, which is alſo indefinite, before they had come to their perfection as a vegetable world.

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96 Immenſe ſpace of time required for the deſtruction and reproduction of the dry land.

"It is neceſſary, however, that the preſent land would be worn away and waſted exactly in proportion as new land ſhall appear; or converſely, that an equal proportion of new land ſhould always be produced as the old is made to diſappear. It is only required, that at all times there ſhould be a juſt proportion of land and water upon the ſurface of the globe, for the purpoſe of a habitable world. Neither is it required, in the actual ſyſtem of this earth, that every part of the land ſhould be diſſolved in its ſtructure, and worn away by attrition, ſo as to be floated in the ſea. Parts of the land may often ſink in a body below the level of the ſea, and parts again may be reſtored, without waiting for the general circulation of land and water; which proceeds with all the certainty of nature, but which advances with an imperceptible progreſſion. Many ſuch apparent irregularities may appear without the leaſt infringement on the general ſyſtem. That ſyſtem is comprehended in the preparation of future land at the bottom of the ocean, from thoſe materials which the diſſolution and attrition of the preſent land may have provided, and from thoſe which the natural operations of the ſea afford.

97 Of the manner of their diſſolution and production.

"We have been now ſuppoſing, that the beginning of our preſent earth had been laid in the bottom of the ocean at the completion of the former land: but this was only for the ſake of diſtinctneſs. The juſt view is this, that when the former land of this globe had been complete, ſo as to begin to waſte and be impaired by the encroachment of the ſea, the preſent land began to appear above the ſurface of the ocean. In this manner we ſuppoſe a due proportion of land and water to be always preſerved upon the ſurface of the globe for the purpoſe of a habitable world, ſuch as we poſſeſs. We thus alſo allow time and opportunity for the tranſlation of animals and plants to occupy the earth. But if the earth on which we live began to appear on the ocean at the time when the laſt began to be reſolved, it could not be from the materials

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terials of the continent immediately preceding this which we examine, that the present earth had been constructed: for the bottom of the ocean must have been filled with materials before land could be made to appear above its surface.—Let us suppose, that the continent which is to succeed our land is at present beginning to appear above the water in the middle of the Pacific Ocean; it must be evident, that the materials of this great body, which is formed, and ready to be brought forth, must have been collected from the destruction of an earth which does not now appear. Consequently in this true statement of the case, there is necessarily required the destruction of an animal and vegetable earth prior to the former land; and the materials of that earth which is first in our account, must have been collected at the bottom of the ocean, and begun to be concocted for the production of the present earth, when the land immediately preceding the present had arrived at its full perfection. This, however, alters nothing with regard to the nature of those operations of the globe; the system is still the same. It only protracts the indefinite space of time in its existence, while it gives us a view of another distinct period of the living world; that is to say, the world which we inhabit is composed of the materials, not of that which was the immediate predecessor of the present, but of the earth which, in ascending from the present, we consider as the third, and which had preceded the land that was above the surface of the sea while our present land was yet beneath the water of the ocean. Here are three distinct successive periods of existence; and each of them is, in our measurement of time, a thing of indefinite duration. We have now got to the end of our reasoning; we have no data further to conclude immediately from that which actually is; but we have got enough. If the succession of worlds is established in the system of nature, it is in vain to look for any thing higher in the origin of the earth. The result therefore of our present inquiry is, that we find no vestige of a beginning, no prospect of an end."

98 Present earth constructed from the materials of the third before it.

99 Eternity of the world the final result of this theory.

100 Whitehurst's theory.

VI. Though the theory of which we have now given such a large abstract is the most laboured and complete that hath yet appeared, it is still necessary to take notice of some other attempts, though perhaps less calculated to draw the attention of the public than that of Dr Hutton. One of these is by Mr Whitehurst; of which the following is the most material part of an abstract given by himself at the end of his work.

101 The globe originally in a fluid state.

"1. The globe we now inhabit was originally in a state of fluidity; and that not owing to any dissolvent principle or subsequent solution, but to the first assemblage of its component parts. Whence it is presumed, that the earth had a beginning, and has not existed from eternity, as some have imagined; though the precise number of ages it has existed have not yet been actually determined."

102 Proved from its spheroidal figure.

The proof given by our author of this original fluidity of the earth rests entirely upon its oblate spheroidal form; which a fluid globe may easily be supposed to assume, though we cannot conceive how a solid one should do so.

103 Its parts blended together into a soft pulp.

2. "The fluidity of the earth, and the infinite divisibility of matter, evidently show, that the component parts of air, earth, water, &c. were uniformly blended together, none being heavier or lighter than another; whereby they composed an uniform mass or pulp, of equal consistence in every part, from its surface to its centre: consequently the new formed globe was unfit for animal or vegetable life; and therefore it would seem extremely absurd to suppose that either the one or the other were created during the chaotic state of the earth, or prior to its being formed into an habitable world: therefore the presumption is great, that mankind were not created till the earth was become suitable to the nature of their existence."

104 Proved from the solution of metals in acids, &c.

The proof of this position is laid down in the following manner. "It is a truth universally known, that the component parts of the most dense bodies become suspended in whatever menstrua they are dissolved: as for instance, the particles of gold in aqua regia, silver in aquafortis, salts in water, and water in air. Nay, we may likewise add, that the component parts of mercury, in the act of distillation, become suspended in air, notwithstanding the specific gravity of the former is to that of the latter as 11,000 to 1 nearly. Such, therefore are the consequences arising from the infinite divisibility of matter, none being heavier or lighter than another when thus reduced to their original elementary principles."

105 Parts of the chaos endowed with various attractions.

3. "The component parts of the chaos were heterogeneous, or endowed with peculiar laws of *elective attraction*; whereby similar bodies are disposed to unite and form select bodies of various denominations, as air, water, earth, &c.: by means of these principles the chaos was progressively formed into an habitable world.

106 How the separation of its component parts took place.

"But the first operation which presents itself to our consideration is the oblate spheroidal figure of the earth, acquired from its diurnal rotation, and the laws of gravity, fluidity, and centrifugal force: which was no sooner completed, than the component parts began to act more freely, according to their affinities: hence the particles of air united to those of air, those of water to water, and those of earth to earth; and with their union commenced their specific gravities, and destroyed that uniform suspension which had hitherto prevailed throughout the chaotic mass. Thus commenced the separation of the component parts; for those of the greatest density began their approach toward the centre of gravity; and those of the greatest levity ascended towards the surface: therefore, as air is nearly 800 times lighter than water, the presumption is great, that the former was sooner freed from the general mass than the latter, and formed a kind of muddy impure atmosphere, surrounding the newly formed globe.—Water, being next in levity, succeeded the air, and universally encompassed the earth in one vast ocean. In process of time these elements became perfectly pure and fit for animal life.

107 Islands formed by the attraction of the sun and moon.

4. "The component parts of the chaos being thus progressively separated and formed into select bodies, the following consequences necessarily ensued; namely, as the sun and moon were coeval with the chaos, the solids could not uniformly subside from every part of the surface, and become equally covered by water; for as the separation of the solids and fluids increased, so in like manner, the tides increased, and removed the former from place to place without any order or regularity. Hence the sea became unequally deep; and these inequalities daily increasing, in process of time dry land appeared, and divided the waters which had,

hitherto prevailed universally over the earth. The primitive islands being thus formed, in process of time became firm and dry, and fit for the reception of the animal and vegetable kingdoms.

108 **Several days must have elapsed before the sun became visible.**

5. "Such appears to have been the natural order and progression of these things; consequently, as the sun was coeval with the earth, several days and nights must have preceded the sun's first appearance in the heaven's, or its becoming visible on the fourth day, according to the scripture account.

109 **Order in which terrestrial bodies were created.**

6. "The atmosphere, sea, and land, being thus formed for the reception of the animal and vegetable kingdoms in successive periods of time, we have now to consider the order in which they were severally created. First, since it appears that the ocean became perfectly pure and fit for animal life before the primitive islands were formed, therefore we have endeavoured to prove from a

110 **Marine animals first formed.**

series of undeniable facts (A), that marine animals were first formed; and being extremely prolific, they increased and multiplied so exceedingly as to replenish the sea from pole to pole. The ocean being thus stocked with inhabitants prior to the formation of the primitive islands, many of them became enveloped and buried in the mud by the continual action of the tides; particularly all the species of shell-fish, which are least able to defend themselves from such interments. Therefore, since the remains of marine animals are imbedded at various depths in the earth, from one to that of several thousand feet, and this in all parts of the world

111 **Have been buried in the earth at successive periods of time.**

hitherto explored, they bear sufficient testimony, that these marine bodies were thus entombed at successive periods of time; and likewise that they were created prior to the primitive islands, and consequently prior to any terrestrial animals. It may be needless further to observe, that these beds of marine shells plainly evince, that they were generated, lived, and died in the very beds wherein they are found, and were not brought from distant regions by a flood or floods of water, as some people have supposed; consequently such beds were originally the bottom of the ocean.

112 **Mountains and continents formed by subterraneous fire.**

7. With regard to the mountains, and indeed the continents also, Mr Whitehurst is of opinion, that they are the effects of subterraneous fire. His sentiments on this subject, however, are something singular; for he tells us, that "mountains and continents were not primary productions of nature, but of a very distant period of time from the creation of the world, when the strata had acquired their greatest degree of firmness and cohesion, and the testaceous matter had assumed a stony hardness."

113 **Theories of Burnet, &c. insufficient.**

Thus we have given a very particular account of all the theories of any note concerning the formation of the earth which have yet made their appearance. The deficiency of those of Burnet, Woodward, Whiston, and Buffon, must be exceedingly obvious even to the

114 **Powers of attraction and repulsion insufficient.**

most superficial reader. They all assume only the powers of attraction and repulsion as agents; without considering that these two powers, or indeed any other two with which we are acquainted, could only have composed matters nearly similar to each other. If the original particles of matter are homogeneous, and endowed with similar powers, all the matter we see ought to be homogeneous also. But this is far from being the case. Some parts of it we see are exceedingly hard, others proportionably soft. The parts of some bodies attract each other violently; those of others have hardly any attraction for each other, but are separable by the smallest force. And though it should be granted that the powers of attraction and repulsion were originally different in different parts of matter, we have still to explain by what means the similar parts of matter found out each other in such a chaos as the earth originally was. This seems an insuperable difficulty in the systems of Drs Burnet and Woodward; and is equally, though less conspicuously so, in those of Whiston and Buffon.

115 **Deficiency of Mr Whiston's theory;**

Mr Whiston's system has another and very remarkable defect. He supposes the earth to have been originally a comet, and at a certain time to have become a planet: but he forgets to tell us by what means this comet was originally formed, or what kind of bodies the comets are. Yet certainly this theory of the comet was as necessary to his system as the theory of the earth itself: for all the substances now existing on the earth must originally have existed in the comet; and if the natural powers were known which made a distinction between one substance and another in the comet, we would also know those which distinguished terrestrial substances from one another. But though even this great deficiency should be overlooked, the supposition of a chaos or original confusion of any kind involves us in the greatest difficulties. If the whole surface of the earth consisted of a chaos or melted matter, we cannot reasonably think it would have appeared otherwise when cool, than the lavas of burning mountains do just now; and this is a consequence of his system which Mr Whiston seems to have entirely overlooked.

116 **Of Mr Buffon's.**

Mr Buffon's theory is liable to the same difficulties with the rest. He placed his chaos in the sun; and therefore ought to have given a theory of the sun before he gave one of the earth. It ought also to have been shown for what purpose the sun was created when he had nothing to shine upon, or what probability there is that comets existed when there were no planets. His account of the formation of the planets by the stroke of a comet, is just within the verge of *possibility*; but his account of the formation of mountains by the motion of the winds and tides, is certainly inconsistent with the common principles of mechanics. Though it should be granted, that water can dissolve every terrestrial substance when vitrified by a heat 10,000 times greater than our hottest furnaces, as the sun must necessarily be; and though the water should let fall this matter as a sediment in what quantities and forms we think proper to imagine; it is impossible any of it could be thrown two or three miles above the surface of the water, in order to form those high mountains which are to be met with in different parts of the world. It is indeed very plain, that though by the motion of the waters their sediment might be collected in great heaps, it could never reach higher than their surface. The mountain,

(A) These proofs are afterwards considered, as here our author seems to be of the same opinion with Dr Hutton.

mountain, once formed, must then be for ever covered with water; for the sediment would take up precisely the same bulk when a mountain that it did when in a state of dissolution, and the water could never retire from it as he supposes. If the waters retired into vast subterraneous caverns, according to another of Mr Buffon's suppositions, they must have remained for ever in these caverns, from whence they could not have returned to effect those wonderful changes he ascribes to them. But what in the strongest manner shows the fallacy of Mr Buffon's hypothesis, is the analogy he draws between mountains on dry land and islands in the sea. The islands, he says, are only the tops of great mountains in the ocean. If, therefore, the ocean had for a series of many ages covered the present habitable part of the world, as our author supposes, we should undoubtedly find many mountains upon the dry land, the tops of which had formerly been islands. But no such thing is to be found. There is not on earth a mountain with a top broad and flat like the island of Great Britain or Ireland, or even like islands of much less consideration.

117 A number of natural powers besides attraction and repulsion proved to exist.

These, and many other objections that will naturally occur to an attentive reader, show the extreme difficulties under which the hypothesis of Mr Buffon labours, as well as others. These difficulties arise, in the first place, from their assuming too few natural powers. Though it is certain that the powers of attraction and repulsion exist in nature, it is no less certain that there are many others. One very remarkable power entirely different from those of attraction and repulsion, may be called the power of *assimilation* or *transmutation*. By this, each animal, and each plant, changes the nutritious particles thrown into its stomach, or which it meets with in the earth, into a substance of its own peculiar kind. Thus, a stalk of wheat, by means of its roots, always assimilates the nutritious particles of the ground into that particular grain we call wheat, and no other. This power naturalists have not been able to explain on the principles of attraction and repulsion, or any others with which we are acquainted; and therefore it may justly be called one of the primary laws of this earth at least, whether we understand the manner in which it operates or not.—Another power which seems to be diffused throughout this terraqueous globe, and common to all substances, water alone excepted, is that of multiplying themselves, or producing others of the same species. With regard to plants and animals, that is exceedingly evident; but may be disputed in the case of minerals. It is certain, however, that mines which have been exhausted, will in time be again replenished with ore; that spars and crystals, if broken or cut while their connection with the earth remains, will protrude a substance similar to the rest, as certainly as the wounded body of an animal will protrude flesh of a kind similar to what was taken away. The earth itself is capable of this multiplication. We see how it hath a tendency to ascend, and cover stones, &c. which lie a long time on its surface; and thus does this element, seemingly the most sluggish of all others, swallow up every thing that lies for some time undisturbed upon it. Hence we now meet with many monuments of antiquity below ground, which formerly were undoubtedly above it. Yet we have no right from thence to conclude, that the height of the dry land above the water was greater at that time than what it is now. This multiplication of earth is chiefly owing to vegetation; which continually produces a new crust on the top, and thus tends to bury all such matters as rest upon the surface. This crust, however, does not produce a continual increase in the height of the dry land; for whatever quantity the vegetables add to the surface, they take from the under parts by the suction of their roots. Thus the ground becomes more porous, and the weight of ancient buildings, stones, &c. gradually forcing them downwards, they are at last buried under ground to a considerable depth. 118

Appearance of shells at great depths accounted for.

—Hence it is easy to account for the sinking of the marine bodies that are to be found at different depths in the earth, even supposing them to have been left on its surface by the deluge. M. Buffon's objection, drawn from the great quantities of them, seems but very weak: for it is certain, that marine animals, both of the crustaceous and other kinds, are found in the sea at this day in amazing quantities; and there is no bed of shells so large, that we can reasonably think it *impossible* for all the animals to have existed in it at once.

119 Changes may naturally happen in the strata of the earth.

With regard to the strata, it seems undeniable that they may be produced from natural causes. Clay will sometimes be consolidated into stone; flint, marble, and limestone, are all found to grow naturally in the earth; so that we cannot draw any conclusion from the order in which we now find them. Though we find a bed of shells, then, in the heart of a solid rock, this makes no difficulty in the theory of the earth; since we know that the rock hath by some natural cause been consolidated around them. In fact, this is not so wonderful, as what is related by Mr Price in his Treatise of Minerals, Mines, &c. viz. That at the town of Redruth in Cornwall, "some labourers being put to clear and level the street for a pavement, they found a piece of hard stone in the ground, with abundance of common small pins of brass interspersed in and throughout the stone, in such manner and form, that all those who saw it afterwards were convinced it was not done artificially, but that the stone was formed and produced by petrifaction, subsequent to the time the pins were dropped into the ground. Doctor Plot, in his Natural History of Staffordshire, says, that near Newcastle under Lyne, there was found a stone with a man's skull, teeth and all, inclosed in it."—From these and others facts in some measure similar, this author concludes, that every earth or clay, in some places, may be converted into stone in process of time, at such a depth where it is undisturbed by being never lacerated nor molested, and also where it abounds with an uncommon quantity of juices of a lapidescent quality: but this property being extenuated or destroyed, the earthy stones may not improbably again return to their primitive clay. Thus we see some sorts of stone, when dug out of the ground and exposed to the air for a considerable time, do moulder again into earth, at least in appearance; while others, of an earth-like quality, are indurated, and become more compact and durable by lying above ground."

120 Dr Hutton's theory considered.

The theory laid down by Dr Hutton is of a different nature from the rest; and as it has been supposed directly to militate against revelation, merits a very particular consideration. The expression, however, with

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which he concludes his diſſertation, that "we can find no veſtage of a beginning—no proſpect of an end," might be ſuppoſed to relate only to the deficiency of our underſtandings or mode of inquiry, had he throughout the whole courſe of his work given a ſingle hint of any *materials* from which the world was originally formed. In this he differs moſt eſſentially from the other theoriſts whom we have mentioned; for all of them ſuppoſe a chaos to have been originally created, from whence all the variety of ſubſtances we ſee at preſent have been formed. But as the Doctor makes no mention of any thing prior to a world nearly ſimilar to what we ſee juſt now, we muſt neceſſarily conclude that its eternity is a part of his creed.

121 Arguments againſt the eternity of ths world.

122 From the ſucceſſion of worlds ſuppoſed by Dr Hutton.

Now, that the world has not been eternal, may be proved from what he himſelf allows. Wherever we perceive a ſucceſſion, we know that there muſt of neceſſity have been a beginning: but, according to our author, there has been a ſucceſſion of worlds, by a kind of uncouth generation, ſimilar to what would happen to the human race, if a man was to deſcend immediately from his grandmother. Proceeding in this way, therefore, we muſt at laſt arrive at one great-grandmother of earths, from whence all the reſt were deſcended; and of this one a theory was no leſs neceſſary than of any of her ſucceſſors. This theory would have been the more difficult, as his great element *cockle-ſhells* and *oyſters* would then have been abſent, and the materials from whence they were afterwards to be produced muſt have been ſought for.

123 A ſupernatural power neceſſary in the formation of the world.

124 Shown from the production of animals and vegetables.

Another argument, which evidently ſhows not only that the world is not eternal, but that ſome other power beſides its own interfered with it originally, may be taken from the exiſtence of animals and vegetables; both of which our author allows to have had a place throughout all his worlds. We ſee at preſent, that animals proceed from animals, and vegetables from vegetables; but the time muſt have been, when an animal was produced without a parent, and a vegetable without a ſeed. At this time the world muſt have been influenced by a power different from any it poſſeſſes at preſent; for no ſuch power is now to be found in any part of the globe.

125 Quantity of ſhells found on earth too ſmall on the Doctor's principles.

Laſtly, the quantity of ſhells, great as it is, can by no means be reconciled with an eternal ſucceſſion of worlds, or even with three; for, according to him, we muſt have *three* in order to have *two* habitable ones; *viz.* one lying at the bottom of the ſea, another wearing away, and another beginning to emerge. Now he informs us, that only a fourth part of our land is compoſed of calcareous matter derived from marine animals*.

*See n° 90.

126 Amazing increaſe of ſhell-fiſh.

But if one of the worlds has continued for a time *indefinite*, and conſequently another lain at the bottom of the ſea for an equal length of time, it muſt, inſtead of having a fourth part of its ſoil compoſed of calcareous matter at the time of its emergence, have been entirely compoſed of it, at leaſt if we can credit what is ſaid concerning the prolific nature of theſe animals. Mr Whitehurſt informs us, that "it is not uncommon to take away a bed of ſhell-fiſh ſeveral fathoms in thickneſs; and though the places where they are fiſhed for appear to be entirely exhauſted, yet in the enſuing year there ſhall be as many found in all theſe places as before." Such an amazing increaſe muſt, in a time *indefinite*, eſpecially if repeated for an indefinite number of times, have reduced the whole terraqueous globe to an heap of cockle-ſhells or other ſubſtances of that kind.

127 A ſupernatural power muſt have taken place in the original formation of vegetable ſoil.

Our author is equally unfortunate in the very firſt ſtep of his argument, where he ſays that the ſoil is only "the materials collected from the deſtruction of the ſolid land." He owns that all his earths produced vegetables; but theſe muſt have had a ſoil whereon to grow before the firſt world had time to be deſtroyed. We are therefore here in the ſame dilemma with regard to the ſoil that we were before with regard to the vegetables; and as we are obliged to own the interference of a Superior Power to produce the firſt vegetable, ſo muſt we alſo have recourſe to the ſame power for the production of the ſoil on which it grew. All theſe conſiderations ought to have led the Doctor to a concluſion very different from that which he has drawn, and to have ſhowed him that the *beginning* of the world was occaſioned by a power which cannot poſſibly be inveſtigated, becauſe it lies without the bounds of Nature itſelf, and far beyond the reach of our faculties.

128 Origin of the earth cannot be accounted for from natural cauſes.

This objection indeed militates invincibly againſt all theories of the earth which ſeek to derive its original from natural cauſes. The powers of attraction and repulſion we have already ſhown to be inſufficient; and though we ſhould add to them thoſe of fire and water with all the train of ſolvents and precipitants which chemiſtry can afford, the deficiency will ſtill be as great. It is true, that by means of chemiſtry we can imitate many of the natural operations, provided we have the proper materials: But this is the capital defect in all our theories of the earth. Whence came vaſt quantities of argillaceous earth into one place, of ſiliceous earth into another, of the materials for iron, ſilver, gold, &c. into the places where they are now found?

129 Too much attributed to calcareous earth and flint by Dr Hutton.

With Dr Hutton indeed the whole ſeems to be compoſed of two materials, *viz.* calcareous earth and flint. But before he could juſtify this aſſertion, he ought to have produced from theſe two materials, at leaſt a great number of the different ſubſtances with which the earth is repleniſhed. But inſtead of this, he has recourſe to natural productions, formed, as he ſays, by means which, in the hands of the beſt chemiſts, will prove inſufficient to produce any thing like them.

130 Calcareous matter proved to exiſt independent of marine animals.

In his account of the origin of calcareous matter, he tells us, it is to be derived entirely from the ſhells of marine animals; but he forgets to inform us whence theſe animals got their ſhells. There muſt have been ſome ſource of calcareous matter from which the *firſt* oyſter (for we have already ſeen that they could not have exiſted from eternity) derived its ſhell, and that independent of any other marine animal; Now we ſee at this day an abundant ſource from whence the ſhells of all marine animals may be derived, *viz.* the waters of the ocean, which contain a great quantity of calcareous matter. If we inquire whence theſe waters have it, we may ſay they take it up from the earth, part with it again in the form of ſhells, corals, &c. rediſſolve it, and ſo on. But if we will ſtill inquire farther whence the earth itſelf had it, we muſt once more have recourſe to that unſearchable and ſupernatural power to which we aſcribed the origin of animals, vegetables, and the ſoil whereon they grow.

It is the foundation of Dr Hutton's theory, and indeed

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deed seems now to be a favourite doctrine of most theorists, that the earth we inhabit has once been at the bottom of the sea; and it is thought to be a sufficient proof of this, that such vast quantities of marine shells are to be met with on dry land. Mr Whitehurst, after giving a long account of these shells, infers, among other things, that the "beds of fossil shells, which consist of one species only, and are not natives of the climate where found, but of very distant regions of the earth, evidently show that they were generated, and have lived and died in the very beds where found; and could not have been removed from their native climates by a flood or floods of water, with so much order as to form beds consisting only of one select species; and therefore all such beds must have been originally the bottom of the ocean."

131 Earth proved not to have remained long at the bottom of the sea.

132 False mode of reasoning adopted by many theorists.

On this mode of reasoning, however, we must observe, that no hypothesis can have a worse foundation than when it is built confessedly on our own ignorance. We know not, for instance, how a bed of fossile shells came into a certain place; therefore the whole world has been at the bottom of the sea for many thousand years, the climates have changed, or it has been eternal! Thus to unhinge the settled laws of nature for such trivial purposes, is certainly the greatest contradiction to true reasoning that can be imagined. But it is not only from a negative argument of this kind that we may refute this hypothesis; there is a much stronger one drawn from the marine productions themselves. It is certain, that there are substances very different from shells of any kind, which grow up from the bottom of the ocean, and in time *indefinite* ascend all the way to the surface, and there form islands. These are the coral rocks so common and so dangerous in the South Sea, and of which many of the islands there are formed. Now, how comes it to pass, that among all the marine monuments to be found on land we find no coral rocks growing there? The answer to this is obvious. The coral rocks require a vast length of time for their production, and are strongly fixed to the place where they grow; they cannot therefore be removed over land by any sudden flood or inundation, not even by a general deluge. Though it appears therefore, from the shells and other marine moveables, that what is now dry land has once been at the bottom of the sea, yet it is equally evident from the deficiency of these rocks, that it has not remained so for any length of time; and therefore, though we should by no means be able to explain all the appearances of fossile shells, we are not to admit a supposition which, from the circumstance just mentioned, cannot possibly be true.

133 The want of coral rocks on land shows that it has not been long at the bottom of the sea.

134 Why every appearance of fossil shells cannot be explained.

With regard to these shells, however, we must remark, that it is in vain to attempt the explanation of every appearance; nor can any such thing be reasonably desired, even though we should acknowledge the deluge to be the universal cause. We know not, nor can we have any conception of, what might be accomplished by the mere mechanical motion of the waters in this case. Every one who has had an opportunity of seeing the effects of a violent land-flood, will be ready to own that it has performed things which *à priori* he would not have thought it could have done. But how infinitely must these effects be exceeded by one vast deluge, in which not only the dry land was softened by an incessant rain of six weeks, but the sea rose on all sides, and poured in upon it with all the moveable contents which the waters carried along with them?

135 Of the effects which the deluge certainly produced.

136 Vast numbers of shells must have been brought along with it.

That great numbers of shells already formed would be brought along with the waters of the ocean, is an assertion which can scarce be denied; and we shall be inclined to look upon this number as exceedingly great, if we consider the way in which it is most probable that the deluge came on. This was by the issuing out of waters* from every pore of the earth and bottom of the ocean, as well as by their descent from the clouds. In consequence of the former action, all the light bodies at the bottom of the sea must have been turned topsy turvy, and carried up no one can tell how far; at the same time that by the progressive motion of the waters they were carried to an unknown length over the land, and there deposited when the motion ceased.

* See *Deluge*.

137 The fish would leave their former abodes to dwell over land.

This circumstance of itself will account for the appearance of vast numbers of shells and other marine productions on land; but there is another which must be taken along with it, and will undoubtedly add greatly to its force. The unfathomable depths of the ocean are not the proper habitations of fish; and they are only found on shoals, or near the sea-coasts. At the time of the deluge, therefore, great numbers of the marine animals must have exchanged their ancient habitations for those where the water was more shallow; and of consequence would have abounded on the tops of mountains and other elevated places. Whether those animals whose exuviæ are most plentifully met with on land have any locomotive power when full-grown, is uncertain; but whether they have or not, they are certainly of such minute sizes when young, that they may be floated to any distance by water. Thus therefore any kind of shell-fish may have reached any place in the globe; and Mr Whitehurst himself owns, that they can arrive to their full maturity in less than a year, as the beds which have been exhausted one year are found to be replenished the next. Now the flood, according to the Scripture account, continued long enough to allow time for their increase from spawn to their full size. It arrived at its full height in 40 days; and continued stationary for five months. It then began to decrease; but so gradually, that it was not till the first day of the tenth month that the tops of the mountains began to appear above the surface of the water; and it was not till towards the end of the eleventh that the tops of trees began to emerge. Here then we have time for beds of shell-fish to grow, live, and afterwards be left by the water; which in their mature state they could not follow, and thus to die in the place where they were generated.

138 The continuance of the flood allowed time for shell-fish to breed on land.

Thus far we may safely argue with regard to the existence of large beds of shells on the surface of the earth: and it has already been shown how the earth would naturally cover and swallow them up to a considerable depth. But to account for the great depths at which we find them sometimes buried, several other things must be taken into consideration. One is, that the earth, by the continual rains at the time of the deluge, as well as by the issuing of the waters every where through its substance, must have been exceedingly soft and easily penetrated. The helpless animals, there-

139 Numbers of shells would be sunk deep into the earth by the pressure of the waters.

therefore, brought along with the ocean at its first irruption over land, would have been deep buried in the mud: and when we take into our account the pressure of a column of water four miles deep, it is impossible to say what effects this cause might have produced. They might, besides, have been accumulated in clefts of rocks, in hollows, valleys, and caves; and have been there consolidated by petrifaction and the growth of calcareous matter over them. And that something similar to this actually happens, we are very certain: for Mr Whitehurst informs us, that "the springs of Matlock bath in Derbyshire, though extremely pellucid and friendly to the human constitution, are nevertheless plentifully saturated with calcareous matter, which readily adheres to vegetables and other substances immersed in their streams; and thus, by a constant accretion, large masses of stone are gradually formed. The banks on which the bath-houses stand, and likewise the buildings themselves, are mostly composed of such materials."—Now, had these waters directed their course over a bed of shells, through a burying-place, or over a field of battle, it is evident that they would have inclosed a great number of shells, human and horse bones, heads of lances, swords, or even the more modern weapons of guns and pistols; which, to a curious naturalist, might have furnished an argument for the antiquity of these latter weapons. If therefore we see that bodies at this day may be so easily imbedded in stone, why should we pretend to set bounds to the petrifactions which may have happened in the course of more than 4000 years? a period far beyond the reach of our most ancient histories.

It is not meant, by what we have just now said, to explain all the appearances of fossil shells or bones from the deluge as a general cause. This cannot be done unless we knew all the circumstances. The following facts, however, may be looked upon as authenticated.

140 General recapitulation of facts.

1. That when the waters overwhelmed the land, great numbers of marine animals were carried along with it. 2. That during its continuance most of those which have any locomotive power would choose rather to dwell over land than in places which had formerly been their residence. 3. That while the waters remained on the earth, all kinds of marine animals would breed over land in their natural way; and such as could not follow the waters in their retreat, would be left to die on dry land, which must have been the case particularly with shell-fish. 4. These impotent animals, which have little or no power of locomotion, would by the pressure of a column of water four miles high be buried to depths unknown. 5. After the retreat of the waters, those which had been lodged in hollows or clefts, or perhaps diffused through the substance of many soft strata, might by some petrifying quality in the stratum be so consolidated along with it as afterwards to form one entire rock. This is evident, not only from the example of the Matlock springs, but more so from that of the pins found in the stone at Red-Ruth in Cornwal, from the petrified skull mentioned by Dr Plott, and many others; of which we shall mention the following from Mr Whitehurst.—

141 Examples of bodies inclosed by stone.

"The strata of limestone in Derbyshire, and in many other parts of England, abound with the exuviæ of marine animals, or the impressions of them in the solid substance of the stone; and we have likewise several instances related by authors of the bones of terrestrial animals, and also of wood, having been found inveloped in strata of stone. A complete human skeleton, with British beads, chains, iron-rings, brass bits of bridles, were dug up in a stone-quarry near the Earl of Widdrington's seat at Blanknay in Lincolnshire.—Human bones and armour, with Roman coin, fibulæ, &c. were found in a stone-pit in the park at Hustanton in Norfolk, supposed to have been buried after a battle.—In the mountains of Canne, half a league from Meastrick, were found the remains of a crocodile well preserved in a stratum of sand-stone.—The remains of a crocodile were also found in a stratum of stone at Blenheim.—The beds of argillaceous stone, &c. incumbent on coal, also contains a great variety of figured fossils representing different parts of the vegetable creation.

142 The deluge may be supposed the general cause of fossil animal substances.

From all these examples it is plain, that the lapidescent power which the earth possesses is capable of incrusting bodies with stone to an unknown thickness. In whatever situation therefore we find those fossil bodies, we have no reason to say that the deluge is not ultimately the cause of their being there; because its power in overspreading the earth with them, in burying them in it, or forcing them into clefts and caverns, is altogether unknown: and before it is denied that the deluge could be the cause of such appearances, it is necessary to show all that it really *could* do, which is evidently impossible; so that here our speculations must ultimately rest.

143 Of fossil human bones.

We shall only add one other fact which must certainly have taken place at the deluge. At that time the world is generally thought to have been very full of inhabitants. These, as well as all the inferior animals, would naturally fly from the approaching danger. This would assemble them in great numbers in such places as appeared to afford security; and here they would all perish together. This will account for the vast heaps of bones found in certain parts of the world, as in the rock of Gibraltar, Dalmatia, &c. and the natural petrifactive power of the earth may account for their consolidation. The slaughters which mankind have made of one another may indeed account for many of these appearances. When we read in history of 40,000, 50,000, or 100,000 men being killed in a battle, we never think of the space their bones would occupy when thrown into a heap; nevertheless, we are assured that the bulk of these remains must be very great. Tamerlane, with an army of 800,000 men, filled up the harbour of Smyrna by causing each of his soldiers throw one stone into it; and when Marius defeated the Cimbri, the bones of the slain were so numerous, that they were used for a long time as fences for vineyards. Had these been collected into one heap, and afterwards consolidated by petrifactive matter, they would undoubtedly have occupied a very considerable space. What then must have been the case, when every man, nay every other terrestrial creature, died at once? Taking all these things into consideration, it must surprise us that the collections of fossil bones are not more numerous than we find them.

Thus we see, there is on the one hand no reason for denying that the deluge has been the cause of all the fossil appearances we perceive; and on the other, that there

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there is the strongest reason for denying that the land we inhabit has been for a length of time at the bottom of the sea.

144 Dr Hutton's account of the formation of the strata considered.

Dismissing therefore this part of Dr Hutton and Mr Whitehurst's theories, we shall now proceed to consider that of the former, where he investigates the formation of the strata. These, he says, could not be formed by aqueous solution. That they could not be so originally, we readily grant; but that they have preserved themselves from decay, transformed themselves into one another, and repaired their waste by this means, is absolutely certain.

145 His theory overthrown by an experiment of Bergman's.

The Doctor indeed gives up his own argument; for he tells us, that "if flint can be produced by crystallization from water or any aqueous solution, then may his assertions concerning the consolidation of the strata be denied." But Mr Bergman assures us, that he actually did produce flint by allowing a quantity of fluor acid to stand for two years on some powdered quartz; and this is more than any chemist can pretend to do by the violent heat of fusion, to which Dr Hutton has recourse on all occasions. We do not pretend, however, to say, that the different strata of earth have been formed originally by aqueous solution. For this we must have recourse to the power already mentioned, and for want of which neither Dr Hutton's theory nor any other can support itself. But though the strata were originally formed by Divine power, they are certainly preserved, repaired, and changed by natural causes; of which aqueous solution is a principal, though not the only one.

146 Wood may be penetrated by flint in a state of solution.

The said experiment of Mr Bergman's entirely overthrows the Doctor's objection (n° 39.) relating to the penetration of wood by siliceous or flinty matter. It shows, that the matter in question may be dissolved, and in no very long time deposited in its proper form; so that had Mr Bergman inclosed a bit of wood in his bottle which produced the flint, there is no reason to doubt that it would have been so penetrated by the siliceous matters as to be completely *flintified* (to use Dr Hutton's word) by the end of the two years.

147 Flints may thus grow in the heart of chalk.

The *impossibility* which our author talks of, of flinty substances being found insulated in the midst of beds of chalk, is likewise thus removed.

148 Extreme absurdity of supposing wood to be penetrated by melted flint.

But if we view his own account of the petrifaction of wood by the action of melted flint, what mortal in his senses can give him credit? It exceeds the power of a glass-house furnace to melt flint by itself: how is it possible, then, that the combustible substance of wood should bear to be filled with this dreadful fluid without being burnt? The operation being performed under water, will not answer the purpose: for wood may be reduced to charcoal, by the heat of a burning-glass, under water; and a red hot iron, thrown into a wooden vessel full of water, will burn a hole in the bottom. Dr Black, who mentions this circumstance in his Lectures, very justly observes, that the steam which is produced keeps off the water until the iron has produced its effect. Must not the same effect take place at the bottom of the sea, even granting, what Dr Hutton never can prove, that flint, by any degree of heat whatever, can be reduced to such a state of tenuity as to be capable of penetrating wood like an anatomical injection? Here indeed he may tell us, as on another occasion, that the compression of the water is *insuperable* †. But if this be the case, how comes it to pass, that not only this insuperable compression, but an additional one (no less than the vast loads of earth which compose the continents of Europe, Asia, Africa, and America), has actually been overcome, and these immense tracts thrown up from the bottom of the ocean, by the force of fire which could not consume a piece of wood?

† See n° 46.

149 Contradiction in the Doctor's hypothesis.

150 His suppositions concerning fire entirely unreasonable.

To suppose that, by any compression whatever, the element of fire, when applied to a combustible body, should be prevented from destroying its texture, is certainly without the least foundation; and yet upon this and similar suppositions proceeds the whole of the Doctor's theory. He differs from those who maintain the volcanic theory, in supposing that fire may work under ground in such a manner as to perform none of its common effects, or indeed none but such as are agreeable to his own hypothesis. Thus fire, working at the bottom of the sea, or at an unknown depth under it, shall not burn wood; it shall not extricate the fixed air from calcareous matter, but melt it sometimes into one substance and sometimes into another; it shall not dissipate the most volatile substance, nor in short perform any effect which we ever saw performed by fire: and all this, it seems, is demonstrable by the mere inspection of fragments of stones in a closet, without paying the least attention to the operations of nature abroad.

151 His proofs from mineral crystallization considered.

Though it must be very evident that a theory built on such extravagant principles cannot support itself, we must still take notice of the proofs he adduces from the mineral crystallizations, &c. On this subject it may be observed, that there are various ways by which substances can be crystallized or assume regular figures.

152 Various ways in which substances may be crystallized

1. The most common is by solution in a large quantity of water, from which the bodies are deposited by cooling, and form distinct and regular crystals. 2. By solution in no greater quantity of boiling water than will keep them suspended; after which they are formed into large masses, as is the case with alum. 3. By slow evaporation, as is the case with vitriolated tartar and some other salts. 4. By efflorescence, when a saline fluid is mixed with a quantity of earthy matter, and kept moist for some time. Of this we often have an example in moist cellars, or other damp places, where we shall see part of the walls covered with a fine, downy, saline matter. In salt-butter also we shall frequently see the same appearance; where the salt shoots into small spiculæ, though in the common way it crystallizes in cubes. 5. By sublimation, as in the case of flowers of benzoin, of corrosive mercury, cinnabar, sal ammoniac, orpiment, &c. &c. 6. By the meeting of two substances in an aerial form, as alkaline and fixed air. By the attraction of fixed air from the atmosphere or otherwise, as is the case with alkaline salts when long exposed to the common air, or for a shorter time to a stream of pure fixed air. 7. By precipitation, as in the arbor Dianæ and other metallic vegetations. 8. By means of acids. Thus the residuum of Glauber's spirit of nitre, if the distillation has been performed with an excess of acid, will shoot into beautiful ramifications like branches of trees. 9. By fusion, as in regulus of antimony and other metals, sulphur, &c.

Now of all these different ways by which crystallization may be effected, Dr Hutton has chosen only the last; and this he obstinately carries through the whole system

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system of nature, whether reasonable or not. His argument against any other mode is chiefly built upon the insolubility of certain substances; but this argument has failed in one very remarkable instance, *viz.* that of flint, which has been produced by aqueous solution. Another instance he brings, n° 42, of "marmor metallicum, consisting of terra ponderosa saturated with vitriolic acid, a substance insoluble in water." Now though this substance, when once it is formed, may be termed absolutely insoluble; yet the fact is certain, that it may be formed by aqueous solution and crystallization; and we have done so by the following process: Let terra ponderosa be formed into an hepar sulphuris by any of the common methods; dissolve the mass in water; filter the solution, and expose it to the air in a vessel kept in a gentle warmth: the phlogiston of the sulphur will gradually fly off; the acid attach itself to the earth: and in a day or two a great quantity of fine crystalline spiculæ will be formed, which are a true marmor metallicum.

153 Dr Hutton's argument from the insolubility of certain substances insufficient.

154 Marmor metallicum formed by crystallization.

155 How bodies naturally insoluble may be formed by aqueous solution.

Thus we learn how many bodies, naturally insoluble, may yet be formed by aqueous solution by reason of the solubility of their component parts. Sulphur is soluble by calcareous earth and by terra ponderosa, and makes these substances soluble in much greater quantity than they naturally are. By the decomposition of the solution of terra ponderosa, marmor metallicum is produced; and by decomposing the other, selenite or alabaster. This last substance Dr Hutton has not thought proper to mention, though huge masses of rock are composed of it; and it is incapable of fusion without being destroyed. Its regular figures, however, afford us a fine example of that species of crystallization which proceeds from precipitation or accretion. The selenite is a substance very little soluble in water; yet by the perpetual deposition of small quantities, we see that beautiful and regular crystals are formed: and hence we learn another important fact, *viz.* that in order to form these crystals, it is not always necessary that the whole of the substance should be dissolved in water at once, though this is the case with our artificial crystallizations. The largest and most transparent crystals, and even the most insoluble in water, may have been formed by the continual accretion of crystalline matter from an aqueous solution: and thus they may appear in any cavity whatever; for as there is no mineral substance impermeable to water, it evidently follows that no cavities can be impermeable to it.

156 Of the formation of selenite.

157 Fine crystals formed by continued accretion.

158 Fluor spar may be formed by aqueous solution,

Among his other insoluble substances Dr Hutton mentions fluor and calcareous spar. But as we know that one of the component parts of fluor is calcareous earth, naturally soluble in water, it is only necessary to suppose a calcareous water like that of Matlock to meet with fluor acid; when as great quantities of fluor would be produced as there are at present of calcareous stone.

159 And likewise calcareous spar.

The same thing may be said of calcareous spar.—We know that fixed air will precipitate calcareous earth from water, or redissolve it after it has been precipitated, according to its quantity. The formation of spars, therefore, from calcareous matter dissolved in water and fixed air, may easily be understood; and we know that there is no water which does not contain some quantity of calcareous earth. Of fixed air there is always great plenty in the bowels of the earth; and according to the quantity uniting itself which the dissolved calcareous earth, either chalky concretions or crystalline bodies will be produce. If fire were applied to this calcareous matter in order to fuse it, an emission of the fixed air would be the certain consequence; and without this we have not the least evidence that calcareous earth ever did or could undergo any fusion by heat.

160 Of the formation of pyrites by aqueous solution.

With regard to the mineralization of metals by sulphur, as in the case of pyrites, we cannot pretend to explain them particularly; though it was certainly incumbent on the Doctor to have formed these bodies, or to have produced something like them, by fusion, before he determined that they were formed originally in this way. It is easy, however, to see how the calx of a metal may meet with sulphur in the earth. We know that sulphur is soluble by alkali, by terra ponderosa, or by calcareous earth. By exposing this solution to fixed air, part of the sulphur is separated, and may unite with the metallic earth, or any other thing with which it has an affinity. The crystallizations of sulphur artificially united with metals have not indeed been examined; but before we affirm that a metal is mineralized by fusion with sulphur, we ought to perform something like it artificially, which never has been done.

161 Formation of cinnabar in the moist way.

As to the invincible argument n° 43, where our author triumphantly challenges his adversaries to show how petro-silex, pyrites, and cinnabar, can be dissolved in water; it may be replied, that Mr Bergman has decided the matter against him with regard to the first, by his remarkable experiment of making flint: the second is as yet undecided, for no chemist has been able to make pyrites either by solution or fusion. The third is likewise decided against our theorist; for Dr Lewis has shown that cinnabar may be prepared by solution of sulphur as well as in the dry way by sublimation. We have only to suppose therefore that a calcareous solution of sulphur pervaded this mineral, while a number of particles of quicksilver were dispersed through it; in which case the latter, attracting the sulphureous particles, would form the cinnabar in question.

162 Of metals found native.

Our author's argument, (n° 44) from metals being found in their perfect state, is very inconclusive. The mass of native iron he speaks of, is by many thought to be factitious; and as to the small bits of other metals sometimes found native, they rather make against him than otherwise: for had they been melted, all the rest of the matters around them must have been melted also; in which case the superior weight of the metals would have carried them to the bottom of the melted mass, there to unite as in a common furnace.

163 Coals supposed to be formed from vegetables.

His arguments concerning bituminous bodies are equally unfortunate with the rest. That coal is derived from wood has been the opinion of very learned men, particularly Dr Black. The argument, however, is only this, that sometimes we see coals with woody fibres, plainly indicating their vegetable original. But this would hold equally with regard to stones; for we often see wood penetrated with stony matter, while its fibrous texture still remains. In this case therefore we might as well suppose that stones are derived from wood as that coals are so. A decisive proof that coals are not produced by fusion, is,

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164 Certainly not formed by fusion. that a living toad has been taken out of the heart of a solid piece of coal. This is similar to the entombment of the fishes called *pholades* in the heart of stones; and as, in the latter case, we believe that the stone has concreted round the fish, so we have the same reason to believe, in the former, that the coal had consolidated round the toad. All that we can say therefore is, that coal is formed by a natural, and not very tedious process, unknown to us; but that this process certainly is not fusion. His proof n° 47 is altogether inconclusive; for we have already seen that flinty substances and marmor metallicum may be produced by aqueous solution.

165 Dr Hutton's theory entirely erroneous. Thus we have seen, that, contrary to our author's hypothesis, the world has undoubtedly had a beginning; that our dry land has not, for ages, been the bottom of the sea; that we may reasonably suppose the deluge to have been the cause of all or most of the fossil appearances of shells, bones, &c. we meet with; that our author has erred in denying to aqueous solution the effects which experience has shown it capable of producing, and in ascribing to fusion effects which experience doth not warrant; and that his theory, far from having any foundation in chemistry, is directly contradicted by that science. It would be tedious and disagreeable to proceed farther in animadverting on a theory so truly unphilosophical, however elaborate and ostentatious in a display of facts: we shall therefore content ourselves with taking notice

166 His method of accounting for the water contained in siliceous bodies. of one other objection to his doctrine, of which he himself has been aware, with the answer he has given. The objection is, That there are sometimes found flinty and crystalline bodies containing water: It seems therefore a contradiction to say that such were produced by fusion. To this the Doctor replies, "It must not be here objected, that there are frequently found siliceous crystals and amethysts containing water; and that it is impossible to confine water even in melted glass. It is true, that here, at the surface of the earth, melted glass cannot, in ordinary circumstances, be made to receive and inclose condensed water; but let us only suppose a sufficient degree of compression in the body of melted glass, and we can easily imagine it to receive and confine water as well as any other substance. But if, even in our operations, water, by means of compression, may be made to endure the heat of red-hot iron without being converted into vapour, what may not the power of nature be able to perform?"

167 Final test of the truth of his hypothesis. On this reply we shall only observe, that the truth of this hypothesis, as well as of all other parts of it, may easily be put to the trial by those who have any of these crystals in their possession. Let one of them be broken, and the water it contains examined. If the crystal has been formed by fusion at the bottom of the sea, as Dr Hutton supposes, it will be salt; if otherwise, fresh. As to his doctrine concerning subterraneous heat and volcanoes, there will be occasion to consider it under the article VOLCANO.

168 No sufficient proof of extraordinary changes on the surface of the earth. We must now take into consideration those remarkable changes which are supposed to have taken place on the globe, in such a manner as entirely to have altered its appearance. These, however, do not appear to have any solid foundation. Changes, no doubt, have happened in particular parts; new islands have been thrown up from the bottom of the sea by the force of subterraneous fire, and others have been swallowed up. But these appear to be merely the effects of volcanoes, which are common in many parts of the world; and we are not warranted to conclude, because we see a small volcanic island arise, and another swallowed up, that this has been the case with the whole habitable world.—An imperfect theory hath indeed been suggested by Sir William Hamilton, Mr Brydone, and others, concerning the use of volcanoes and subterraneous fires; from whence it might seem probable, though they do not indeed say so in direct terms, that all the dry land was originally thrown up from the bottom of the sea by the force of these fires. Sir William Hamilton, in his letter to Dr Maty, broaches this theory in the following words. "I am myself convinced, that the whole circuit, so far as I have examined, within the boundaries marked in the map (extending at least 50 Italian miles in length, and 30 in breadth where broadest), is wholly and totally the production of subterraneous fires; and that most probably the sea formerly reached the mountains that lie behind Capua and Caserta, and are a continuation of the Apennines. If I may be allowed to compare small things with great, I imagine the subterraneous fires to have worked in this country under the bottom of the sea, as moles in a field, throwing up here and there a hillock; and that the matter thrown out of some of these hillocks formed into settled volcanoes, filling up the space between the one and the other, has composed this part of the continent, and many of the islands, adjoining. 169 Volcanic theory.

"From the observations I have made upon Mount Ætna, Vesuvius, and the neighbourhood, I dare say that, after a careful examination, most mountains that are, or have been, volcanoes, would be found to owe their existence to subterraneous fire; the direct reverse of what I find the commonly received opinion.—Nature, though varied, is certainly in general uniform in her operations; and I cannot conceive that two such considerable volcanoes as Ætna and Vesuvius, should have been formed otherwise than every other considerable volcano of the known world. I do not wonder that so little progress hath been made in the improvement of natural history, and particularly in that branch of it which regards the theory of the earth: Nature acts slowly; it is difficult to catch her in the fact.

"From repeated observations I have made in the neighbourhood of Vesuvius, I am sure that no virgin soil is to be found there; and that all is composed of different strata of erupted matter, even to a great depth below the level of the sea. In short, I have not any doubt in my own mind but that this volcano took its rise from the bottom of the sea; and as the whole plain between Vesuvius and the mountains behind Caserta, which is the best part of Campagna Felice, is (under its good soil) composed of burnt matter, I imagine the sea to have washed the feet of those mountains, until the subterraneous fires began to operate, at a period certainly of a most remote antiquity.

"The soil of the Campagna Felice is very fertile; I saw the earth opened in many places. The stratum of good soil was in general four or five feet thick; under which was a deep stratum of cinders, pumice, fragments of lava, and such burnt matter as abounds near Mount

Earth.

Mount Vesuvius and all volcanoes. The mountains at the back of Caserta are mostly of a sort of limestone, and very different from those formed by fire; though Signior Van Vitelli, the celebrated architect, has assured me, that in the cutting of the famous aqueduct of Caserta through these mountains, he met with some soils that had evidently been formed by subterraneous fires. The high grounds which extend from Castel-a-Mare to the point of Minerva towards the island of Caprea, and from the promontory that divides the bay of Naples from that of Salerno, are of limestone. The plain of Sorrento, that is bounded by these high grounds, beginning at the village of Vico, and ending at that of Massa, is wholly composed of the same sort of tufa as that about Naples, except that the cinders or pumice-stones intermixed in it are larger than in the Naples tufa. I conceive, then, that there has been an explosion in this spot from the bottom of the sea. This plain, as I have remarked to be the case with all soils produced by subterraneous fire, is extremely fertile; whilst the ground about it, being of another nature is not so. The island of Caprea does not show any signs of having been formed by subterraneous fire, but is of the same nature as the high grounds last mentioned; from whence it has probably been detached by earthquakes, or the violence of the waves. Roviglia-no, an island, or rather a rock, in the bay of Castel-a-Mare, is likewise of limestone, and seems to have belonged to the original mountains in its neighbourhood: in some of these mountains also, there are petrified fish and fossile shells, which I have never found in the mountains which I suppose to have been formed by explosion. Bracini, however, in his account of the eruption of 1613, says, that he found many sorts of sea-shells on Vesuvius after that eruption; and P. Ignatio in his account of the same eruption, says, that he and his companions picked up many shells likewise at that time upon the mountain: this circumstance would induce one to believe, that the water thrown out of Vesuvius during that formidable eruption came from the sea."

170 Insufficiency of the volcanic theory.

This may serve to show upon what grounds the volcanic theory stands: but though we should admit it in its utmost extent, the theory of the earth can receive but very little assistance from it. Sir W. Hamilton himself does not say that all the mountains have been volcanoes, or that all the soil throughout the different quarters of the world hath been thrown up from the bottom of the sea. If, therefore, there remains but one mountain in the whole world which never was a volcano, we shall be as much difficulted to account for the production of that one, as though there were ever so many; and at any rate our theory will be absolutely useless, because what will account for the origin of that mountain, will also account for the origin of others. If we go a step beyond our author, and say, that there are no mountains whatever that have not been originally volcanoes, but that all the dry land is the production of subterraneous fire, our difficulties are so far from being removed, that they are greatly increased. The lavas and volcanic ashes, though in time they become covered with an exceedingly fertile soil, remain absolutely barren for a great number of years; insomuch that, by the adopters of the volcanic hypothesis, the period at which Moses fixes the creation is reckoned by far too late to have given time for covering the many lavas of Italy and Sicily with the depth of earth they just now have upon them. The whole world therefore must have remained for many ages in a state of absolute sterility; and by what means or in what corner of the world vegetation first began, remains to be inquired into.

171 Centrifugal force not the cause of the earth's spheroidal figure.

Without entering further into the theories either of Sir W. Hamilton or any other person, it is easy to see, that all of them are insufficient to solve the difficulties mentioned n° 11. It is common to account for the spheroidal figure of the earth, from the greater centrifugal force of the equatorial parts than of the polar ones; but this explication can by no means be deemed sufficient. The globe we inhabit is composed of two very different kinds of matter, earth and water. The former has a very considerable power of cohesion, besides the gravitating power; the latter has very little cohesion, and its parts may be separated from each other by whatever will overcome its weight. It follows, therefore that the solid parts of the earth, resisting, by their cohesion, the centrifugal force more than the water, ought not to dilate so much. The waters of the ocean therefore ought, about the equator, to swell up and overflow the land; and this they ought to do at this present moment as much as at the first creation. That this ought to be the case, is evident from the phenomena of the tides. It is not to be doubted but that the attraction of the moon affects the solid earth as well as the sea; but because of the greater cohesion of the former, it cannot yield as the ocean does, and therefore the waters are raised to some height above it. Mr. Whitehurst and others indeed solve this difficulty by supposing the earth to have been originally fluid. But this is arguing in a circle: for if we desire them to prove this original fluidity, they will do it by the spheroidal figure of the earth; and if the cause of the spheroidal figure is required, they refer us to the original fluidity. See *Whitehurst's Inquiry*.—The height to which the waters would have covered the equatorial parts by the centrifugal force, must have been equal to the depression at the poles; which, according to M. Buffon, is about 17 miles; according to other mathematicians, 25 or 26 miles.

The other difficulties are so totally inexplicable, that Buffon, who seems to exert himself as much as possible in order to remove them, is obliged at last to own, that the earth is in a perishing state; that the hills will be levelled, and the ocean at last cover the whole face of the earth; a prophecy which wears no very favourable aspect to the inhabitants of this globe. —For these imaginations, however, there does not seem to be the smallest foundation in nature. The mountains have continued what they were, from the earliest accounts of time, without any signs of decay. Mount Ætna, besides the waste common to it with other mountains, hath been exhausting itself by throwing out incredible quantities of its own substance; yet it still seems to be what it was called by Pindar 2200 years ago, the *pillar of heaven*. It seems extremely probable, therefore, that there are powers in the system of nature which tend to preserve, and are capable of counteracting those which tend to destroy, the mountains; and perhaps 172

172 Natural powers for preserving the mountains.

haps

Earth.

haps the late discovery concerning the attraction on mountains may some time or other throw some light on the nature of these powers. See MOUNTAIN.

173 And isthmuses.

The like may be said of the isthmuses or narrow necks of land which in some parts of the world join different countries together; such as the isthmus of Darien, of Suez, and Morea, &c. Though the ocean seems to beat on these with great violence, they are never diminished in bulk, or washed away, as, according to Buffon's theory, they ought to be. It is plain, therefore, that there is in nature some power by which these narrow necks of land are preserved from the fury of the ocean; for history does not afford one instance of any neck of land of this kind being broken down by the sea.—It seems impossible to solve the difficulties with regard to the strata and shells by any other means than supposing, that there are in the terrestrial matter several distinct powers, by which the strata of any particular kind are occasionally transformed into others; and that the shells and other marine bodies were originally deposited on the surface by the deluge. The volcanic hypothesis, by which some attempt to account for the appearance of these bodies, will in no shape answer the purpose. By the explosions of a volcano, shells, mud, sand, &c. might be indiscriminately thrown up, and scattered irregularly about; but we could never find the large beds of shells which are frequently to be met with of a considerable extent in different parts of the earth.

174 Notion of a chaos ought not to be adopted.

With regard to any degree of certainty, it is scarcely to be hoped for on this subject. The common notion of the earth's being originally a chaos, seems neither to have a foundation in reason, nor in the Mosaic account of the creation. It is surely inconsistent with the wisdom ascribed to the Deity, to think that he would create this visible system in confusion, and then employ it to put itself in order. It seems more probable, that the earth was originally created with the inequalities of surface we see it have, and that the natural powers for preserving it were afterwards superadded. Thus, according to Moses, the first natural agent created, or produced, by directing matter to move in a certain manner, was *light*. This, we know, was absolutely necessary for the evaporation of the water which took place on the second day. Moses tells us, that the earth was originally covered with water: and we see a natural reason why it should be so; namely, that the evaporation by the atmosphere might more easily take place. When this was done, there being then no more occasion for the waters in that diffused state, they were commanded to retire into the place appointed for them, and thus formed the ocean. Whether this was done by the action of gravity then first taking place, or by any other means, we have it not in our power to know, nor will our speculations on this subject probably be attended with much benefit. We see, however, that the Mosaic account of the creation is perfectly consistent with itself, and free from those difficulties with which other systems are clogged. It is impossible to show, how, by any natural power, a confused mass of matter, such as the chaos of the ancient poets, of Drs Burnet and Woodward, the hollow globe of Mr Hutchinson, the comet of Mr Whiston, or the vitrified matter of M. Buffon, could put itself in the order in which we see it. The sacred historian simply tells us, that God created the heavens and the earth; that the heavens gave no light, and the earth was covered with water. He first commanded the light to shine, then the air to take up what quantity of water he thought proper for the purposes of vegetation. After this, the dry land was made to appear; and the different powers of vegetation already taken notice of were given to it. Next the sun and moon were created as subordinate agents, to *divide the light from the darkness*, &c. Then followed the formation of animals and of man.

175 Mosaic account of the creation perfectly consistent.

According to this account, it would appear, that what we call the *laws of nature*, were given to preserve the earth in that shape which the Deity thought proper to give it originally by his own power; and by no means to form it in any particular way, much less to put it out of the form which he had already given it: and thus the world, according to the best accounts we have, is very little altered in its appearance; and according to what we can judge, will continue unaltered for ever, unless the Creator thinks proper to interpose in such a manner as to supersede all the laws he hath given it, and change it into some other form.

176 Objections to the Mosaic chronology.

From some observations of Sir W. Hamilton and others, objections have been drawn, as hath been already mentioned, to the Mosaic chronology. These objections are in substance as follows. In pits, and other natural and artificial openings of the ground, in the neighbourhood of Vesuvius and Ætna, several beds of lava have been discovered at considerable depths below each other. These beds of lava in some places are covered with successive strata of vegetable mould. From this disposition of materials, Sir William concludes that the world must have been created at a much more remote period than is generally believed. The different strata of lava found below ground, he observes, must have proceeded from an equal number of eruptions from the mountain; and such of them as are covered with vegetable soil must have remained at least 1000 years on the surface before they could acquire a soil sufficient for the purposes of vegetation. Ten or twelve successive strata overlaid with soil have already been discovered in the bowels of the earth; and it has been strongly asserted, that, by digging deeper, many more might have been found. Now, allowing 1000 years for each stratum of lava, which the supporters of this theory affirm to be too little, the antiquity of the earth cannot be less than 12,000 years, which is more than double its age according to the Mosaic account.

The principal fact in this theory is, that 1000 years are necessary to the production of a soil sufficient for the nourishment and growth of vegetables upon volcanic lavas. This notion is confirmed by a conjecture of the Canonico Recupero, that streams of lava in Sicily have lain for centuries without acquiring a vegetable mould; and by some obscure accounts, that these lavas have proceeded from eruptions of Ætna, above 1000 years ago. The following considerations, however, will render this theory at least extremely dubious.

177 Answered.

Sir William informs us, that some lavas are very solid, and resist the operation of time much longer than another kind, which, he says, "is farinaceous, the particles separating as they force their way out, just like meal

meal coming from under the grindstones. A stream of lava of this sort (he justly observes), being less compact, and containing more earthy particles, would certainly be much sooner fit for vegetation than one composed of the more perfect vitrified matter." He has not, however, ventured to determine whether these lavas found below ground were of the former or latter quality; a circumstance which materially affects the justness of his calculation.

That soil gradually increases by decayed vegetables, and the sediment deposited by snow and rain, is an undeniable fact. The thickness or thinness of soil indicates a greater or less time of accumulation. But Sir William has not informed us of the dimensions of his subterraneous vegetable strata; a circumstance of great moment in instituting a calculation of their different eras.

Besides, eruptions of volcanoes are often accompanied with incredible quantities of ashes, which fall thick upon all the ground for many miles round; intended by nature, it would appear, quickly to repair the barrenness occasioned by the lava. The muddy water sometimes thrown out may co-operate powerfully with the ashes in producing the same happy effect.

But Sir William has furnished us with facts of a more important nature. The town of Herculaneum was destroyed by an eruption in the 97th year of the Christian era. There are evident marks, says he, that the matter of six eruptions has taken its course over Herculaneum; for each of the six strata of lava is covered with a vein of good soil. Here we have Sir William's own authority for six strata of *good soil*, accumulated in less than 1700 years; which, supposing them to be all of equal thickness, instead of 1000 years, leaves not 300 to the production of each.

From the same authority we learn, that the crater on the top of the Monte Nuovo, or New Mountain, which was thrown up by subterraneous fire no farther back than the year 1538, is now covered with shrubs.

There is not on record any eruption from the great crater of Vesuvius from the year 1139 to 1631, a period of only 292 years. But Bracini, who descended into it not long before the 1631, tells us, "that the crater was five miles in circumference, and about 1000 paces deep. Its sides were covered with bushwood, and at the bottom there was a plain on which cattle grazed. In the woody parts, boars frequently harboured," &c.

The correspondence of these facts, related by Sir William himself, with his favourite notion that 1000 years are necessary for the production of vegetable soil, we leave to the reader's consideration; and shall conclude with a few remarks of a different kind.

The appearance of a stratum of lava below ground, though not covered with vegetable soil, our author considers as demonstrative evidence, that such stratum formerly lay above the surface, and was thrown out by an eruption. This inference, however, seems not altogether just. Nothing with propriety, receives the denomination of an eruption, unless when lava or other matter is vomited from the crater, or from some new opening made in the mountain. But it deserves notice, that, in the environs of volcanoes, earthquakes are frequent. That these violent concussions are the genuine produce of subterraneous fire expanding itself in every direction, and making strong efforts against every substance which resists the natural tendency of its course, is a fact that cannot admit of doubt. It is no less certain, that these frequent concussions shake and dislocate the internal parts of the earth. They cannot fail to shatter and disarrange the natural direction of the original strata; and, of course, they must give rise to many subterraneous cavities and fissures. The nearer the great furnace, which confines the fury of the flames, the greater and more frequent will be the cavities. Every earthquake occasioned by a volcano is nothing else than an effort of the burning matter to enlarge the boundaries by which it is usually limited. If the quantity of matter and degree of inflammation require a space greatly superior to the internal cavities, an eruption above the surface is an infallible consequence: but when the quantity of matter, or the expansive force occasioned by the degree of inflammation, is insufficient to raise the lava to the top of the mountain, an earthquake may be produced; and the lava, without ever appearing above the surface, may run below ground in plentiful streams, and fill up all the subterraneous cavities and channels. These internal strata of lava may often lie so deep as to be below the level of the sea. In this manner we conceive it to be not only possible, but extremely probable, that beds of lava, having no covering of vegetable soil, may be found at great depths, although they never were above the surface.

It is much more reasonable to conclude, that lavas with a layer of soil were produced by eruptions, and once lay above the surface, till covered by the operation of time, or subsequent streams from the mouth of the vulcano. But even in this case, the argument is not altogether complete; for, as above remarked, earthquakes, with which countries adjacent to volcanoes are perpetually infested, often sink large tracts of land to great depths.

The other parts of the theory of the earth regard the situation of the different parts of its surface with respect to each other; its annual motion round the sun as a planet; its diurnal motion round its axis; and the different strata whereof it is composed, as far as it hath been hitherto found practicable to penetrate into it: for all which, see the articles GEOGRAPHY, ASTRONOMY, MINES, STRATA, &c.

Smell and Bath of the EARTH. See AGRICULTURE, n° 10.

Bread made of EARTH. See BREAD

EARTH-Flax. See AMIANTHUS.

EARTH-Nuts or *Ground-Nuts*, the roots of the ARACHIS hypogæa of Linnæus. They are composed of several small round bulbs or knobs; whence they were termed by Dodonæus, *terræ glandes* or *earth-nuts*. They are esteemed an excellent food by the Siberians. In Holland likewise, they are sold in the markets and used for food. The native country of this plant seems to be Africa; though, at present, all the American settlements abound with it; but many persons who have resided in this country affirm that they were originially brought by the slaves from Africa. The plant multiplies very fast in a warm country; but being very impatient of cold, it cannot be propagated in the open

Earth, Earthquake.

air in Britain. The seeds must therefore be planted in a hot-bed in the spring of the year; and when the weather proves warm, they may be exposed to the open air by degrees. The branches of the plant trail upon the ground; and the flowers, which are yellow, are produced single upon long footstalks; and as soon as the flower begins to decay, the germen is thrust under ground, where the pod is formed and ripened; so that unless the ground is opened, they never appear; the roots are annual, but the nuts or seeds sufficiently stock the ground in a warm country where they are not carefully taken up.

Earth-Nuts or *Pig-Nuts*. See Bunium.

Erath-Pucerons, in natural history, a name given by authors to a species of puceron very singular in its place of abode. In the month of March, if the turf be raised in several places in any dry pasture, there will be found, under some parts of it, clusters of ants; and, on a farther search, it will be usually found, that these animals are gathered about some pucerons of a peculiar species. These are large, and of a greyish colour, and are usually found in the midst of the clusters of ants.

The common abode of the several other species of pucerons is on the young branches or leaves of trees; as their only food is the sap or juice of vegetables, probably these *earth* kinds draw out those juices from the roots of the grasses, and other plants, in the same manner that the others do from the other parts. The ants that conduct us to these, are also our guides where to find the greater part of the others: the reason of which is, that as these creatures feed on the saccharine juices of plants they are evacuated from their bodies in a liquid form, very little altered from their original state; and the ants, who love such food, find it ready prepared for them in the excrements which these little animals are continually voiding*. It has been supposed by some, that these were the common pucerons of other kinds, which had crept into the earth to preserve themselves from the rigour of the winter. But this does not appear to be the case; for they are usually met with in places very distant from trees or plants, on which they should be supposed before to have fed; and it is very certain, that though many of these insects are killed by the cold, yet many escape, and are found very early in the spring, sucking the buds of the peach-tree. There is no doubt of these creatures being in a feeding condition when under ground; because otherwise the ants would have no temptation to follow them: and it is equally certain, that the several species of the pucerons, like those of the caterpillar kinds, have each their peculiar herbs on which they feed, as many of them will die of hunger rather than feed on any others; and it is not at all likely, that these earth pucerons had been used to feed on leaves of trees and plants, and had left that food for the roots of grass.

* See *Aphis*, and *Honey-dew*.

Earth-Worms. See Lumbricus.

EARTHQUAKE, in natural history, a sudden and violent concussion of the earth, generally attended with strange noises under ground or in the air; often destroying whole cities at once, throwing down rocks, altering the course of rivers, and producing the most terrible devastions.

Though there is hardly any country known in which shocks of an earthquake have not at some time or other been felt, yet there are some much more subject to them than others. It hath been observed, that northern countries in general are less subject to earthquakes than those situated near the equator, or in the southern latitudes; but this does not hold universally. The islands of Japan, which are situated pretty far north, are nevertheless exceedingly liable to these destructive phenomena. Islands in general, are also more subject to earthquakes than continents; but neither does this hold without exceptions. Some particular parts of continents and some particular islands, are more subject to them than others lying in the neighbourhood, and differing very little from them in external appearance. Thus, Portugal is more subject to earthquakes than Spain, and the latter much more than France; Mexico and Peru more than the other countries of America, and Jamacia more than the other Caribbee island. Earthquakes are frequent, though not often violent, in Italy; but in Sicily they are often terribly destructive. Asia Minor has been remarkably subject to them from the remotest antiquity; and the city of Antioch in particular hath suffered more from earthquakes than any other in that country. The same phenomena are said also to occur very frequently in the north-eastern extremities of Asia, even in very high latitudes.

1 What countries are most subject to earthquakes.

Though there is no phenomena in nature more calculated to impress the human mind with terror, and consequently to be well remembered and taken notice of, than earthquakes; yet the philosophy of them is but lately arrived at any degree of perfection; and even at this day, the history of earthquakes is very incomplete. The destruction occasioned by them engrosses the mind too much to admit of philosophical speculations at the time they happen: the same thing prevents the attentive consideration of the alterations that take place in the atmosphere after the earthquake is over, and which might probably throw some light on the causes which produced it: and the suddenness of its coming on prevents an exact attention to those slight appearances in the earth or air, which, if carefully observed, might serve as warnings to avoid the destruction.—From what observations have been made, however, the following phenomena may be deduced, and reckoned pretty certain.

2 History of their phenomena incomplete.

3 Account of the phenomena as far as yet ascertained.

1. Where there are any volcanoes or burning mountains earthquakes may reasonably be expected more frequently than in other countries.

2. If the volcano hath been for a long time quiet, a violent earthquake is to be feared, & *vice versa*. But to this there are many exceptions.

3. Earthquakes are generally preceded by long droughts; but they do not always come on as soon as the drought ceases.

4. They are also preceded by electrical appearances in the air; such as the aurora borealis, falling stars, &c.: but this does not hold universally.

5. A short time before the shock, the sea swells up and makes a great noise; fountains are troubled, and send forth muddy water; and the beasts seem frighted, as if sensible of an approaching calamity.

6. The air at the time of the shock is generally calm and serene; but afterwards commonly becomes obscure and cloudy.

7. The

Earthquake.

7. The shock comes on with a rumbling noise, sometimes like that of carriages; sometimes a rushing noise like wind, and sometimes explosions like the firing of canon are heard. Sometimes the ground heaves perpendicularly upwards, and sometimes rolls from side to side. Sometimes the shock begins with a perpendicular heave, after which the other kind of motion commences. A single shock is but of very short duration, the longest scarcely lasting a minute; but they frequently succeed each other at short intervals for a considerable length of time.

8. During the shock, chasms are made in the earth; from which sometimes flames, but oftener great quantities of water, are discharged. Flame and smoke are also emitted from places of the earth where no chasms can be perceived. Sometimes these chasms are but small; but, in violent earthquakes, they are frequently so large that whole cities sink down into them at once.

9. The water of the ocean is affected even more than the dry-land. The sea swells to a prodigious height; much more than we could suppose it raised by the mere elevation of its bottom by the shock. Sometimes it is divided to a considerable depth; and great quantities of air, flames, and smoke, are discharged from it. The like irregular agitations happen to the waters of ponds, lakes, and even rivers.

10. The shock is felt at sea as well as on land. Ships are affected by a sudden stroke, as if they had run aground or struck upon a rock.

11. The effects of earthquakes are not confined to one particular district or country, but often extend to very distant regions; though no earthquake hath yet been known extensive enough to affect the whole globe at one time. In those places also where the shock is not felt on dry land, the irregular agitation of the waters abovementioned is perceived very remarkably.

4
Account of the earthquake in Jamaica in 1692.

All these positions are verified by the accounts of those earthquakes which have been particularly described by witnesses of the best character. In 1692, an earthquake happened in Jamaica, attended with almost all the terrible circumstances abovementioned. In two minutes, it destroyed the town of Port Royal, at that time the capital of the island; and sunk the houses in a gulph 40 fathoms deep. It was attended with an hollow rumbling noise like that of thunder: the streets rose like the waves of the sea; first lifting up the houses, and then immediately throwing them down into deep pits. All the wells discharged their waters with the most violent agitation. The sea burst over its bounds, and deluged all that stood in its way. The fissures of the earth were in some places so great, that one of the streets appeared twice as broad as formerly. In many places it opened and closed again; and continued this agitation for some time. Of these openings, great numbers might be seen at once. In some of them, the people were swallowed up at once; in others, the earth caught them by the middle, and crushed them to death; while others, more fortunate, were swallowed up in one chasm, and thrown out alive by another. Other chasms were large enough to swallow up whole streets; and others, still more formidable, spouted up immense quantities of water, drowning such as the earthquake had spared. The whole was attended with stenches and offensive smells, the noise of falling mountains at a distance, &c.: and the sky, in a minute's time, was turned dull and reddish, like a glowing oven. Yet, as great a sufferer as Port Royal was, more houses were left standing therein than on the whole island besides. Scarce a planting-house, or sugar-house, was left standing in all Jamaica. A great part of them were swallowed up, houses, people, trees, and all, in one gap: in lieu of which, afterwards appeared great pools of water; which, when dried up, left nothing but sand, without any mark that ever tree or plant had grown thereon. The shock was so violent, that it threw people down on their knees or their faces as they were running about for shelter. Several houses were shuffled some yards out of their places, and yet continued standing. One Hopkins had his plantation removed half a mile from the place where it stood, without any considerable alteration. All the wells in the island, as well as those of Port-Royal, from one fathom to six or seven deep, threw their water out at the top with great violence. Above 12 miles from the sea, the earth gaped and spouted out, with a prodigious force, vast quantities of water into the air: yet the greatest violences were among the mountains and rocks; and it is a general opinion, that the nearer the mountains, the greater the shock; and that the cause thereof lay among them. Most of the rivers were stopped up for 24 hours by the falling of the mountains; till swelling up, they made themselves new tracks and channels; tearing up, in their passage, trees, &c. After the great shock, those people who escaped got on board ships in the harbour, where many continued above two months: the shocks all that time being so violent, and coming so thick, sometimes two or three in an hour, accompanied with frightful noises like a rushing wind, or a hollow rumbling thunder, with brimstone-blasts, that they durst not come ashore. The consequence of the earthquake was a general sickness, from the noisome vapours belched forth, which swept away above 3000 persons.

5
Of the earthquake in Calabria in 1638.

A still more terrible account, if possible, is that given by Kircher, of the earthquake which happened in Calabria in the year 1638. This instance is an exception to the second general position above laid down. In Italy, there had been an eruption of Mount Vesuvius five years before; and in Sicily there had been an eruption of Ætna only two years before this earthquake. The event, however, plainly showed, that the cause of the earthquake, whatever it was, had a connection not only with Mount Ætna, which lies in the neighbourhood, but also with the volcano of Stromboli, which is 60 miles distant. "On the 24th of March (says Kircher), we lanched (in a small boat) from the harbour of Messina in Sicily, and arrived the same day at the promontory of Pelorus. Our destination was for the city of Euphemia in Calabria; but on account of the weather, we were obliged to continue three days at Pelorus. At length, wearied with the delay, we resolved to prosecute our voyage; and although the sea seemed more than usually agitated, yet we ventured forward. The gulph of Charybdis, which we approached, seemed whirled round in such a manner as to form a vast hollow, verging to a point in the centre. Proceeding onward, and turning my eyes to Mount Ætna, I saw it cast forth large volumes of smoke, of moun-

mountainous ſize, which entirely covered the iſland, and blotted out even the ſhores from my view. This, together with the dreadful noiſe, and the ſulphureous ſtench, which was ſtrongly perceived, filled me with apprehenſions that ſome more dreadful calamity was impending. The ſea itſelf ſeemed to wear a very unuſual appearance; thoſe who have ſeen a lake in a violent ſhower of rain all covered over with bubbles, will have ſome idea of its agitations. My ſurpriſe was ſtill increaſed by the calmneſs and ſerenity of the weather; not a breeze, not a cloud, which might be ſuppoſed to put all nature thus into motion. I therefore warned my companions, that an earthquake was approaching; and, after ſome time, making for the ſhore with all poſſible diligence, we landed at Tropæa. But we had ſcarce arrived at the Jeſuits college in that city, when our ears were ſtunned with an horrid ſound, reſembling that of an infinite number of chariots driven fiercely forward, the wheels rattling and the thongs cracking. Soon after this, a moſt dreadful earthquake enſued; ſo that the whole track upon which we ſtood ſeemed to vibrate, as if we were in the ſcale of a balance that continued waving. This motion, however, ſoon grew more violent; and being no longer able to keep my legs, I was thrown proſtrate upon the ground. After ſome time, finding that I remained unhurt amidſt the general concuſſion, I reſolved to venture for ſafety; and running as faſt as I could, reached the ſhore. I did not ſearch long here, till I found the boat in which I had landed, and my companions alſo. Leaving this ſeat of deſolation, we proſecuted our voyage along the coaſt; and the next day came to Rochetta, where we landed, although the earth ſtill continued in violent agitations. But we were ſcarce arrived at our inn, when we were once more obliged to return to our boat; and in about half an hour we ſaw the greateſt part of the town, and the inn at which we had ſet up, daſhed to the ground, and burying all its inhabitants beneath its ruins. Proceeding onward in our little veſſel, we at length landed at Lopizium, a caſtle mid-way between Tropæa and Euphemia the city to which we were bound. Here, wherever I turned my eyes, nothing but ſcenes of ruin and horror appeared; towns and caſtles levelled to the ground; Stromboli, though at 60 miles diſtance, belching forth flames in an unuſual manner, and with a noiſe which I could diſtinctly hear. But my attention was quickly turned from more remote to contiguous danger. The rumbling ſound of an approaching earthquake, which by this time we were grown acquainted with, alarmed us for the conſequences. It every moment ſeemed to grow louder, and to approach more near. The place on which we ſtood now began to ſhake moſt dreadfully; ſo that, being unable to ſtand, my companions and I caught hold of whatever ſhrub grew next us, and ſupported ourſelves in that manner. After ſome time, the violent paroxyſm ceaſing, we again ſtood up, in order to proſecute our voyage to Euphemia, which lay within ſight. In the mean time, while we were preparing for this purpoſe, I turned my eyes towards the city; but could ſee only a frightful dark cloud, that ſeemed to reſt upon the place. This the more ſurpriſed us, as the weather was ſo very ſerene. We waited, therefore, till the cloud was paſſed away: then turning to look for the city, it was totally ſunk; and nothing but a diſmal and putrid lake was to be ſeen where it ſtood."

6 Of the earthquake in Sicily in 1693.

In 1693 an earthquake happened in Sicily, which may juſtly be accounted one of the moſt terrible of which we have any account. It ſhook the whole iſland: and not only that, but Naples and Malta ſhared in the ſhock. It was impoſſible for any body in this country to keep on their legs on the dancing earth; nay, thoſe that lay on the ground were toſſed from ſide to ſide as on a rolling billow: high walls leaped from their foundations ſeveral paces, &c. The miſchief it did is amazing; almoſt all the buildings in the countries were thrown down. Fifty-four cities and towns, beſide an incredible number of villages were either deſtroyed or greatly damaged. We ſhall only inſtance the fate of Catania, one of the moſt famous, ancient, and flouriſhing cities in the kingdom; the reſidence of ſeveral monarchs and an univerſity. This once famous city had the greateſt ſhare in the tragedy. Father Anthon. Serrovita, being on his way thither, and at the diſtance of a few miles, obſerved a black cloud like night hovering over the city; and there aroſe from the mouth of Montgibello great ſpires of flame, which ſpread all around. The ſea all of a ſudden began to roar and riſe in billows; and there was a blow, as if all the artillery in the world had been at once diſcharged. The birds flew about aſtoniſhed; the cattle in the fields ran crying, &c. His and his companions horſes ſtopped ſhort, trembling; ſo that they were forced to alight. They were no ſooner off, but they were lifted from the ground above two palms; when caſting his eyes towards Catania, he with amazement ſaw nothing but a thick cloud of duſt in the air. This was the ſcene of their calamity; for of the magnificent Catania, there was not the leaſt footſtep to be ſeen. S. Bonajutus aſſures us, that of 18900 inhabitants, 18000 periſhed therein.

7 Phenomena of the great earthquake, Novem. 1. 1755.

The great earthquake, however, which happened on the 1ſt of November 1755, affords the cleareſt example of all the phenomena abovementioned: having been felt violently in many places both on land and at ſea, and extended its effects to the waters in many other places where the ſhocks were not perceived. At Liſbon in Portugal its effects were moſt ſevere. In 1750, there had been a ſenſible trembling of the earth felt in this city: for four years afterwards, there had been an exceſſive drought; inſomuch that ſome ſprings, formerly very plentiful of water, were dried and totally loſt. The predominant winds were north and north-eaſt, accompanied with various, though very ſmall, tremors of the earth. The year 1755 proved very wet and rainy; the ſummer cooler than uſual; and for 40 days before the earthquake, the weather was clear, but not remarkably ſo. The laſt day of October, the ſun was obſcured, with a remarkable gloomineſs in the atmoſphere. The firſt of November, early in the morning, a thick fog aroſe, which was ſoon diſſipated by the heat of the ſun; no wind was ſtirring; the ſea was calm; and the weather as warm as in June or July in this country. At 35 minutes after nine, without the leaſt warning, except a rumbling noiſe not unlike the artificial thunder in our theatres, a moſt dreadful earthquake ſhook, by ſhort but quick vibrations, the foundations of all the city, ſo that many buildings inſtantly fell. Then, with a ſcarce perceptible pauſe, the nature of the motion

8 At Liſbon.

was

Earthquake.

was changed, and the houses were tossed from side to side, with a motion like that of a waggon violently driven over rough stones. This second shock laid almost the whole city in ruins, with prodigious slaughter of the people. The earthquake lasted in all about six minutes. At the moment of its beginning, some persons on the river, near a mile from the city, heard their boat make a noise as if it had run aground, though they were then in deep water; and at the same time they saw the houses falling on both sides of the river. The bed of the river Tagus was in many places raised to its surface. Ships were driven from their anchors, and jostled together with great violence; nor did their masters know whether they were afloat or aground. A large new quay sunk to an unfathomable depth, with several hundreds of people who were upon it; nor was one of the dead bodies ever found. The bar was at first seen dry from shore to shore: but suddenly the sea came rolling in like a mountain; and about Belem Castle the water rose 50 feet almost in an instant. About noon there was another shock; when the walls of several houses that yet remained were seen to open from top to bottom more than a quarter of a yard, and afterwards closed again so exactly that scarce any mark of the injury was left.

9 At Colares.

At Colares, about 20 miles from Lisbon, and two miles from the sea, on the last day of October, the weather was clear, and uncommonly warm for the season. About four o'clock in the afternoon there arose a fog, which came from the sea, and covered the valleys; a thing very unusual at that season of the year. Soon after, the wind changing to the east, the fog returned to the sea, collecting itself, and becoming exceeding thick. As the fog retired, the sea rose with a prodigious roaring. The first of November, the day broke with a serene sky, the wind continuing at east; but about nine o'clock the sun began to grow dim; and about half an hour after was heard a rumbling noise like that of chariots, which increased to such a degree, that it became equal to the explosions of the largest cannon. Immediately a shock of an earthquake was felt, which was quickly succeeded by a second and third; and at the same time several light flames of fire issued from the mountains, resembling the kindling of charcoal. In these three shocks, the walls of the buildings moved from east to west. In another situation, from whence the sea-coast could be discovered, there issued from one of the hills called the *Fojo* a great quantity of smoke, very thick, but not very black. This still increased with the fourth shock, and afterwards continued to issue in a greater or less degree. Just as the subterraneous rumblings were heard, the smoke was observed to burst forth at the Fojo; and the quantity of smoke was always proportioned to the noise. On visiting the place from whence the smoke was seen to arise, no signs of fire could be perceived near it.

10 At Oporto.

At Oporto (near the mouth of the river Douro), the earthquake began about 40 minutes past nine. The sky was very serene; when a dreadful hollow noise like thunder, or the rattling of coaches at a distance, was heard, and almost at the same instant the earth began to shake. In the space of a minute or two, the river rose and fell five or six feet, and continued to do so for four hours. It ran up at first with so much violence, that it broke a ship's hawser. In some parts the river opened, and seemed to discharge vast quantities of air; and the agitation in the sea was so great about a league beyond the bar, that air was supposed to have been discharged there also.

11 At St Ube's.

St Ube's, a sea-port town about 20 miles south of Lisbon, was entirely swallowed up by the repeated shocks and the vast surf of the sea. Huge pieces of rock were detached at the same time from the promontory at the west end of the town, which consists of a chain of mountains containing fine jasper of different colours.

12 At Ayamonte in Spain.

The same earthquake was felt all over Spain, except in Catalonia, Arragon, and Valentia.—At Ayamonte (near where the Gaudiana falls into the Bay of Cadiz), a little before 10 o'clock on the first of November, the earthquake was felt; having been immediately preceded by a hollow rushing noise. Here the shocks continued for 14 or 15 minutes, damaged almost all the buildings, throwing down some, and leaving others irreparably shattered. In little more than half an hour after, the sea and river, with all the canals, overflowed their banks with great violence, laying under water all the coasts of the islands adjacent to the city and its neighbourhood, and flowing into the very streets. The water came on in vast black mountains, white with foam at the top, and demolished more than one half of a tower at the bar named *De Canala*. In the adjacent strands every thing was irrecoverably lost; for all that was overflowed sunk, and the beach became a sea, without the least resemblance of what it was before. Many persons perished; for although they got aboard some vessels, yet part of these foundered; and others being forced out to sea, the unhappy passengers were so terrified, that they threw themselves overboard. The day was serene, and not a breath of wind stirring.

13 At Cadiz.

At Cadiz, some minutes after nine in the morning, the earthquake began, and lasted about five minutes. The water of the cisterns under ground washed backwards and forwards, so that a great froth arose. At ten minutes after eleven, a wave was seen coming from the sea, at eight miles distance, at least 60 feet higher than usual. It dashed against the west part of the town, which is very rocky. Though these rocks broke a good deal of its force, it at last came upon the city walls, beat in the breast-work, and carried pieces of the building of eight or ten ton weight to the distance of 40 or 50 yards.—When the wave was gone, some parts that are deep at low water, were left quite dry; for the water returned with the same violence with which it came. At half an hour after 11 came a second wave, and after that four other remarkable ones; the first at ten minutes before twelve; the second, half an hour before one; the third, ten minutes after one; and the fourth, ten minutes before two. Similar waves, but smaller, and gradually lessening, continued with uncertain intervals till the evening.

14 At Gibraltar.

At Gibraltar, the earthquake was not felt till after ten. It began with a tremulous motion of the earth, which lasted about half a minute. Then followed a violent shock; after that, a trembling of the earth for five or six seconds; then another shock not so violent as the first, which went off gradually as it began. The whole lasted about two minutes. Some of the guns on the battery were seen to rise, others to sink, the earth having an undulating motion. Most people were seized with giddiness and sickness, and some fell down; others

were stupified; and many that were walking or riding felt no motion in the earth, but were sick. The sea rose six feet every 15 minutes; and then fell so low, that boats and all the small craft near the shore were left aground, as were also numbers of small fish. The flux and reflux lasted till next morning, having de-
15 creased gradually from two in the afternoon.

At Madrid, Malaga, &c.

At Madrid the earthquake came on at the same time as at Gibraltar, and lasted about six minutes. At first every body thought they were seized with a swimming in their heads; and afterwards, that the houses were falling. It was not felt in coaches, nor by those who walked on foot, except very slightly; and no accident happened, except that two lads were killed by the fall of a stone-cross from the porch of a church.

Malaga (a sea-port on the Mediterranean) felt a violent shock; the bells rung in the steeples; the water of a well overflowed, and as suddenly retired.

Saint Lucar (at the mouth of the Gaudalquivir) was violently shocked, and the sea broke in and did a great deal of mischief.

At Seville, (16 leagues above the mouth of the Gaudalquivir) several houses were shaken down; the famous tower of the cathedral called *La Giralda* opened in the four sides; and the waters were so violently agita-
16 ted, that all the vessels in the river were driven ashore.

At Arzilla in Africa.

In Africa, the earthquake was felt almost as severely as it had been in Europe. Great part of the town of Algiers was destroyed. At Arzilla (a town in the kingdom of Fez), about ten in the morning, the sea suddenly rose with such impetuosity, that it lifted up a vessel in the bay, and dropped it with such force on the land, that it was broke to pieces; and a boat was found two musket-shot within land from the sea. At Fez and Mequinez, great numbers of houses fell down, and a
17 multitude of people were buried in the ruins.

At Morocco.

At Morocco, by the falling down of a great number of houses, many people lost their lives: and about eight leagues from the city the earth opened and swallowed up a village with all the inhabitants, who were known by the name of the *Sons of Besumba*, to the number of about 8000 or 10,000 persons, together with all their cattle, &c.; and, soon after, the earth
18 closed again in the same manner as before.

At other places on the African coast.

At Salle, a great deal of damage was done. Near a third part of the houses were overthrown; the waters rushed into the city with great rapidity, and left behind them great quantities of fish.

At Tangier, the earthquake began at ten in the morning, and lasted 10 or 12 minutes. The sea came up to the walls (a thing never heard of before); and went down immediately with the same rapidity with which it arose, leaving a great quantity of fish behind it. These commotions were repeated 18 times, and lasted till six in the evening.

At Tetuan, the earthquake began at the same time it did at Tangier, but lasted only seven or eight minutes. There were three shocks so extremely violent, that it was feared the whole city would be destroyed.

19

In the island of Madeira.

In the city of Funchal, in the island of Madeira, a shock of this earthquake was first perceived at 38 minutes past nine in the morning. It was preceded by a rumbling noise in the air, like that of empty carriages passing hastily over a stone pavement. The observer felt the floor immediately to move with a tremulous motion, vibrating very quickly. The shock continued more than a minute; during which space, the vibrations, though continual, were weakened and increased in force twice very sensibly. The increase after the first remission of the shock was the most intense. The noise in the air accompanied the shock during the whole of its continuance, and lasted some seconds after the motion of the earth had ceased; dying away like a peal of distant thunder rolling through the air. At three quarters past eleven, the sea, which was quite calm, it being a fine day, and no wind stirring, retired suddenly some paces; then rising with a great swell without the least noise, and as suddenly advancing, overflowed the shore, and entered the city. It rose 15 feet perpendicular above the high-water mark, although the tide, which flows there seven feet, was then at half ebb. The water immediately receded; and after having fluctuated four or five times between high and low water mark, it subsided, and the sea remained calm as before. In the northern part of the island the inundation was more violent, the sea there retiring above 100 paces at first, and suddenly returning, overflowed the shore, forcing open doors, breaking down the walls of several magazines and storehouses, leaving great quantities of fish ashore and in the streets of the village of Machico. All this was the effect of one rising of the sea, for it never afterwards flowed high enough to reach the high-water mark. It continued, however, to fluctuate here much longer before it subsided than at Funchal; and in some places farther to the westward, it was hardly, if at all, perceptible.

These were the phenomena with which this remarkable earthquake was attended in those places where it was violent. The effects of it, however, reached to an immense distance; and were perceived chiefly by the agitations of the waters, or some slight motion of the earth. The utmost boundaries of this earthquake to the south are unknown, the barbarity of the African nations rendering it impossible to procure any intelligence from them, except where the effects were dread-
ful. On the north, however, we are assured, that it 20

Effects of it in Norway and Sweden.

reached as far as Norway and Sweden. In the former, the waters of several rivers and lakes were violently agitated. In the latter, shocks were felt in several provinces, and all the rivers and lakes were strongly agitated, especially in Dalecarlia. The river Dala suddenly overflowed its banks, and as suddenly retired. At the same time a lake at the distance of a league from it, and which had no manner of communication with it, bubbled up with great violence. At Fahlun, a town in Dalecarlia, several strong shocks
were felt. 21

In Germany.

In many places of Germany the effects of the earthquake were very perceptible. Throughout the duchy of Holstein, the waters were violently agitated, particularly those of the Elbe and Trave. In Brandenburg, the water of a lake called *Libsee*, ebbed and flowed six times in half an hour, with a dreadful noise, the weather being then perfectly calm. The same agitation was observed in the waters of the lakes called *Muplgast* and *Netzo*, but at this last place they al-
so emitted an intolerable stench. 22

In Holland.

In Holland, the agitations were more remarkable. At

Earthquake.

At Alphen on the Rhine between Leyden and Woerden, the afternoon of the first of November, the waters were agitated to such a violent degree, that buoys were broken from their chains, large vessels snapped their cables, smaller ones were thrown out of the water upon the land, and others laying on land were set afloat. At Amsterdam, about eleven in the forenoon, the air being perfectly calm, the waters were suddenly agitated in their canals, so that several boats broke loose; chandeliers were observed to vibrate in the churches; but no motion of the earth, or concussion of any building, was observed. At Haerlem, in the forenoon, for near four minutes together, not only the water in the rivers, canals, &c. but also all kinds of fluids in smaller quantities, as in coolers, tubs, backs, &c. were surprisingly agitated, and dashed over the sides though no motion was perceptible in the vessels themselves. In these small quantities also the fluid apparently ascended prior to its turbulent motion; and in many places, even the rivers and canals rose 12 inches perpendicular. At Leyden, between half an hour after 10 and 11 in the forenoon, the waters rose suddenly in some of the canals, and made several very sensible undulations, so that the boats were strongly agitated. The same motion was perceived in the water of the backs of two brew houses.

Round the island of Corsica, the sea was violently agitated, and most of the rivers of the island overflowed their banks.—In the city of Milan in Italy, and throughout that district, shocks were felt. At Turin in Savoy, there was felt a very violent shock.

23 In Italy and Switzerland.

In Switzerland, many rivers turned suddenly muddy without rain. The lake of Neufchatel swelled to the height of near two feet above its natural level for the space of a few hours. An agitation was also perceived in the waters of the lake of Zurich.

24 At Antigua and Barbadoes.

At the island of Antigua, there was such a sea without the bar as had not been known in the memory of man; and after it, all the water at the wharfs, which used to be six feet deep, was not two inches.—At Barbadoes, about two in the afternoon, the sea ebbed and flowed in a surprising manner. It ran over the wharfs and streets into the houses, and continued thus ebbing and flowing till ten at night.

23 In England

The agitation of the water was perceived in greater numbers of places in Great Britain and Ireland.—Accounts of the most remarkable of them follow. At Barlborough in Derbyshire, between 11 and 12 in the forenoon, in a boat-house on the west side of a large body of water called *Pibley Dam*, supposed to cover at least 30 acres of land, was heard a surprising and terrible noise; a large swell of water came in a current from the south, and rose two feet on the sloped dam-head at the north end of the water. It then subsided; but returned again immediately, though with less violence. The water was thus agitated for three quarters of an hour; but the current grew every time weaker and weaker, till at last it entirely ceased.

At Busbridge in Surry, at half an hour after ten in the morning, the weather being remarkable still, without the least wind, in a canal near 700 feet long and 58 feet broad, with a small spring constantly running through it, a very unusual noise was heard at the east end, and the water there observed to be in great agitation. It raised itself in a heap or ridge in the middle; and this heap extended lengthwise about 30 yards, rising between two or three feet above the usual level. After this, the ridge heeled or vibrated towards the north side of the canal with great force, and flowed above eight feet over the grass walk on that side. On its return back into the canal, it again ridged in the middle, and then heeled with yet greater force to the south side, and flowed over its grass walk. During this latter motion, the bottom on the north side was left dry for several feet. This appearance lasted for above a quarter of an hour, after which the water became smooth and quiet as before. During the whole time, the sand at the bottom was thrown up and mixed with the water; and there was a continual noise like that of water turning a mill.

Earthquake.

At Cobham in Surrey, between 10 and 11 o'clock, a person was watering a horse at a pond fed by springs. Whilst the animal was drinking, the water suddenly ran away from him, and moved towards the south with such swiftness, that the bottom of the pond was left bare. It returned again with such impetuosity, that the man leaped backwards to secure himself from its sudden approach. The ducks were alarmed at the first agitation, and instantly flew all out of the pond.

At Dunstall in Suffolk, the water of a pond rose gradually for several minutes in the form of a pyramid, and fell down like a water-spout. Other ponds in the neighbourhood had a smooth flux and reflux from one end to the other.

Near the city of Durham, about half an hour after ten, a gardener was alarmed by a sudden rushing noise from a pond, as if the head of the pond had been broken down: when casting his eye on the water, he saw it gradually rise up, without any fluctuating motion, till it reached a grate which stood some inches higher than the common water level. After this it subsided, and then swelled again; thus continuing to rise and fall during the space of six or seven minutes, making four or five returns in the space of one minute. The pond was about 40 yards long and 10 broad.

At Earsy Court, Berks, about 11 o'clock, as a gardener was standing by a fish pond, he felt a violent trembling of the earth, which lasted about a minute. Immediately after, he observed a motion of the water from the south to the north end of the pond, leaving the bottom at the south end altogether dry for about six feet. It then returned, and flowed at the south end, rising three feet up the slope bank; and immediately after returned to the north bank, rising there also about three feet. In the time between the flux and reflux, the water swelled up in the middle of the pond, collected in a ridge about 20 inches higher than the level on each side, and boiled like a pot. This agitation from south to north lasted about four minutes.

At Eaton bridge, Kent, in a pond about an acre in size, a dead calm, and no wind stirring, some persons heard a noise, and imagining something had been tumbling in, ran to see what was the matter. On their arrival at the pond, to their surprise they saw the water open in the middle, so that they could see a post a good way down, almost to the bottom. The water in the mean time dashed up over a bank two feet high, and perpendicular to the pond. This was repeated several times with a great noise.

At

At Eyam-bridge, Derbyſhire (in the Peak), the overſeer of the lead-mines ſitting in his writing-room about 11 o'clock, felt a ſudden ſhock, which very ſenſibly raiſed him up in his chair, and cauſed ſeveral pieces of plaſter to drop from the ſides of the room. The roof was ſo violently ſhaken, that he imagined the engine ſhaft had been falling in. Upon this he immediately ran to ſee what was the matter, but found every thing in perfect ſafety.—At this time two miners were employed in carting, or drawing along the drifts of the mines, the ore and other materials to be raiſed up at the ſhafts. The drift in which they were working was about 120 yards deep, and the ſpace from one end to the other 50 yards or upwards. The miner at the end of the drift had juſt loaded his cart, and was drawing it along; but he was ſuddenly ſurpriſed by a ſhock, which ſo terrified him, that he immediately quitted his employment, and ran to the weſt end of the drift to his partner, who was no leſs terrified than himſelf. They durſt not attempt to climb the ſhaft, leſt that ſhould be running in upon them: but while they were conſulting what means they ſhould take for their ſafety, they were ſurpriſed by a ſecond ſhock more violent than the firſt; which frightened them ſo much, that they both ran precipitately to the other end of the drift. They then went down to another miner who worked about 12 yards below them. He told them that the violence of the ſecond ſhock had been ſo great, that it cauſed the rocks to grind upon one another. His account was interrupted by a third ſhock, which, after an interval of four or five minutes, was ſucceeded by a fourth; and, about the ſame ſpace of time after, by a fifth; none of which were ſo violent as the ſecond. They heard after every ſhock, a loud rumbling in the bowels of the earth, which continued about half a minute, gradually decreaſing, or ſeeming to remove to a greater diſtance.

At Shireburn caſtle, Oxfordſhire, at a little after ten in the morning, a very ſtrange motion was obſerved in the water of a moat which encompaſſes the houſe. There was a pretty thick fog, not a breath of air, and the ſurface of the water all over the moat as ſmooth as a looking-glaſs, except at one corner where it flowed into the ſhore, and retired again ſucceſſively, in a ſurpriſing manner. In what manner it began to move is uncertain, as nobody obſerved the beginning of its motion. The flux and reflux, when ſeen were quite regular. Every flood began gently; its velocity increaſed by degrees, when at laſt it ruſhed in with great impetuoſity till it had attained its full height. Having remained for a little time ſtationary, it then retired, ebbing gently at firſt, but afterwards ſinking away with great ſwiftneſs. At every flux, the whole body of water ſeemed to be violently thrown againſt the bank; but neither during the time of the flux nor that of the reflux, did there appear even the leaſt wrinkle of a wave on the other parts of the moat. Lord Viſcount Parker, who had obſerved this motion, being deſirous to know whether it was univerſal over the moat, ſent a perſon to the other corner of it, at the ſame time that he himſelf ſtood about 25 yards from him, to examine whether the water moved there or not. He could perceive no motion there, or hardly any: but another, who went to the north-eaſt corner of the moat, diagonally oppoſite to his lordſhip, found it as conſiderable there as where he was. His lordſhip imagining, that in all probability the water at the corner diagonally oppoſite to where he was would ſink as that by him roſe, he ordered the perſon to ſignify by calling out, when the water by him began to ſink and when to riſe. This he did; but, to his lordſhip's great ſurpriſe, immediately after the water began to riſe at his own end, he heard his voice calling that it began to riſe with him alſo; and in the ſame manner he heard that it was ſinking at his end, ſoon after he perceived it to ſink by himſelf. A pond juſt below was agitated in a ſimilar manner; but the riſings and ſinkings of it happened at diffeent times from thoſe at the pond where lord Parker ſtood.

At White Rock in Glamorganſhire, about two hours ebb of the tide, and near three quarters after ſix in the evening, a vaſt quantity of water ruſhed up with a prodigious noiſe; floated two large veſſels, the leaſt of them above 200 tons; broke their moorings, drove them acroſs the river, and had like to have overſet them. The whole riſe and fall of this extraordinary body of water did not laſt above ten minutes, nor was it felt in any other part of the river, ſo that it ſeemed to have guſhed out of the earth at that place. 26 In Scotland.

At Loch Lomond in Scotland, about half an hour after nine in the morning, all of a ſudden, without the leaſt guſt of wind, the water roſe againſt its banks with great rapidity, but immediately ſubſided, till it was as low in appearance as any body then preſent had ever ſeen it in the greateſt-ſummer drought. Inſtantly it returned towards the ſhore, and in five minutes time roſe again as high as before. The agitation continued at the ſame rate till 15 minutes after ten the ſame morning; taking five minutes to riſe, and as many to ſubſide. From 15 minutes after 10 till 11, the height of every riſe came ſomewhat ſhort of that immediately preceding, taking five minutes to flow, and as many to ebb, till the water was entirely ſettled. The greateſt perpendicular height of this ſwell was two feet four inches. A ſtill more remarkable phenomenon attending the earthquake in this lake was, that a large ſtone lying at ſome diſtance from ſhore, but in ſuch ſhallow water that it could eaſily be ſeen, was forced out of its place in the lake upon dry land, leaving a deep furrow in the ground all along the way in which it had moved.

In Loch Neſs, about half an hour after nine, a very great agitation was obſerved in the water. About ten the river Oich, which runs on the north ſide of Fort Auguſtus, into the head of the loch, was obſerved to ſwell very much, and run upwards from the loch, with a pretty high wave, about two or three feet higher than the ordinary ſurface. The motion of the wave was againſt the wind, and it proceeded rapidly for about 200 yards up the river. It then broke on a ſhallow, and flowed three or four feet on the banks, after which it returned gently to the loch. It continued ebbing and flowing in this manner for about an hour, without any ſuch remarkable waves as the firſt; but about 11 o'clock, a wave higher than any of the reſt came up, and broke with ſo much force on the low ground on the north ſide of the river, that it run upon the graſs upwards of 30 feet from the river's bank.

27 In Ireland.

At Kinſale, between two and three in the afternoon, the weather being very calm, and the tide near full, a large

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large body of water suddenly poured into the harbour with such rapidity, that it broke the cables of two sloops, each moored with two anchors, and of several boats lying between Sicily and the town. But just at the time that a great deal of mischief was apprehended by all the vessels running foul of each other, an eddy whirled them round several times, and then hurried them back again with the same rapidity as before. This was several times repeated; and while the current rushed up at one side of the harbour, it poured down with equal violence at the other. A vessel that lay all this time in the pool did not seem to be any ways affected by it; nor was the violence of the currents much perceived in the deeper parts of the harbour, but raged with most violence on the flats. The bottom of the harbour, which is muddy, was much altered; the mud being washed from some places, and deposited in others. The perpendicular rise of the water at one quay was measured, and found to be five feet and an half; and is said to have been much higher at another, where it overflowed, and poured into the market-place with such rapidity, that some people who were on the quay immediately ran off, and yet could not prevent themselves from being overtaken and immersed knee-deep in the water. The agitations extended several miles up the river; but, as in the harbour, were most perceived in the shallowest places. The successive risings and fallings of the water continued about ten minutes, and then the tide returned to its natural course. Between six and seven in the evening, the water rose again, though not with so great violence as before, and it continued to ebb and flow alternately till three in the morning. The waters did not rise gradually at first; but, with a hollow and horrid noise, rushed in like a deluge, rising six or seven feet in a minute, and as suddenly subsiding. They were as thick as puddle, very black, and stank intolerably.—From different accounts it appeared, that the water was affected in a similar manner all along the coast to the westward of Kinsale.

28 In France.

In France, shocks were perceived in several places; as at Bayonne, Bourdeaux, and Lyons. Commotions of the waters also were observed at Angoulesme, Bleville, Havre de Grace, &c. but not attended with the remarkable circumstances abovementioned.

29 Its effects on springs, and on the earth itself.

These are the most striking phenomena with which the earthquake of Nov. 1. 1755 was attended on the surface of the earth. Those which happened below ground cannot be known but by the changes observed in springs, &c. which were in many places very remarkable.—At Colares, on the afternoon of the 31st of October, the water of a fountain was greatly decreased: on the morning of the first of November it ran very muddy; and, after the earthquake, returned to its usual state both as to quantity and clearness. On the hills, numbers of rocks were split; and there were several rents in the ground, but none considerable. In some places where formerly there had been no water, springs burst forth, which continued to run.—Some of the largest mountains in Portugal were impetuously shaken as it were from their foundation; most of them opened at their summits, split and rent in a wonderful manner, and huge masses of them were thrown down into the subjacent valleys.—From the rock called *Pedra de Alvidar*, near the hill Fojo, a kind of parapet was broken off, which was thrown up from its foundation in the sea.—At Varge, on the river Macaas, at the time of the earthquake, many springs of water burst forth, some spouted to the height of 18 or 20 feet, throwing up sand of various colours, which remained on the ground. A mountainous point, seven or eight leagues from St Ube's, cleft asunder, and threw off several vast masses of rock.—In Barbary, a large hill was rent in two; the two halves fell different ways, and buried two large towns. In another place, a mountain burst open, and a stream issued from it as red as blood. At Tangier, all the fountains were dried up, so that there was no water to be had till night.—A very remarkable change was observed on the medicinal waters of Toplitz, a village in Bohemia famous for its baths. These waters were discovered in the year 762; from which time the principal spring of them had constantly thrown out hot water in the same quantity, and of the same quality. On the morning of the earthquake, between 11 and 12 in the forenoon, the principal spring cast forth such a quantity of water, that in the space of half an hour all the baths ran over. About half an hour before this great increase of the water, the spring flowed turbid and muddy; then having stopped entirely for a minute, it broke forth again with prodigious violence, driving before it a considerable quantity of reddish ochre. After this it became clear, and flowed as pure as before. It still continues to do so; but the water is in greater quantity, and hotter, than before the earthquake. At Angoulesme in France, a subterraneous noise like thunder was heard; and presently after the earth opened, and discharged a torrent of water mixed with red sand. Most of the springs in the neighbourhood sunk in such a manner, that for some time they were thought to be quite dry. In Britain, no considerable alteration was observed in the earth, except that, near the lead mine abovementioned in Derbyshire, a cleft was observed about a foot deep, six inches wide, and 150 yards in length.

30 Effects of the earthquake at sea.

At sea, the shocks of this earthquake were felt most violently. Off St Lucar, the captain of the Nancy frigate felt his ship so violently shaken, that he thought she had struck the ground; but, on heaving the lead, found he was in a great depth of water. Captain Clark from Denia, in N. Lat. 36.24. between nine and ten in the morning, had his ship shaken and strained as if she had struck upon a rock, so that the seams of the deck opened, and the compass was overturned in the binacle. The master of a vessel bound to the American islands, being in N. Lat. 25°, W. Long. 40°, and writing in his cabin, heard a violent noise, as he imagined, in the steerage; and while he was asking what the matter was, the ship was put into a strange agitation, and seemed as if she had been suddenly jerked up and suspended by a rope fastened to the mast-head. He immediately started up with great terror and astonishment; and looking out at the cabin-window, saw land, as he took it to be, at the distance of about a mile. But, coming upon the deck, the land was no more to be seen, but he perceived a violent current cross the ship's way to the leeward. In about a minute, this current returned with great impetuosity, and at a league's distance he saw three craggy-pointed rocks throwing up water of various colours resembling fire.

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fire. This phenomenon, in about two minutes, ended in a black cloud, which ascended very heavily. After it had risen above the horizon, no rocks were to be seen; though the cloud, still ascending, was long visible, the weather being extremely clear.—Between nine and ten in the morning, another ship, 40 leagues west of St Vincent, was so strongly agitated, that the anchors, which were lashed, bounced up, and the men were thrown a foot and an half perpendicularly up from the deck. Immediately after this, the ship sunk in the waters as low as the main chains. The lead showed a great depth of water, and the line was tinged of a yellow colour and smelt of sulphur. The shock lasted about ten minutes, but they felt smaller ones for the space of 24 hours.

31 Of the earthquakes in Calabria in 1783.

Such were the phenomena of this very remarkable and destructive earthquake, which extended over a tract of at least four millions of square miles. The earthquakes, however, which in the year 1783 ruined a great part of Italy and Sicily, tho' much more confined in their extent, seem to have been not at all inferior in violence.

32 Sir William Hamilton's account of their extent.

Sir William Hamilton, who wrote a particular account of their effects, informs us, that "if, on a map of Italy, and with your compass on the scale of Italian miles you were to measure off 22, and then, fixing the central point in the city of Oppido (which seemed to be the spot where the earthquake had exerted its greatest force) form a circle (the radii of which will be 22 miles), you will then include all the towns, villages, &c. that have been utterly ruined, and the spots where the greatest mortality happened, and where there have been the most visible alterations on the face of the earth: then extend your compass on the same scale to 72 miles, preserving the same centre, and form another circle, you will include the whole country that has any mark of having been affected by the earthquake. A gradation was plainly observed in the damage done to the buildings, as also in the degree of mortality, in proportion as the countries were more or less distant from this supposed centre of the evil." Another circumstance was particularly remarked, and in which this earthquake differed very considerably from others, viz. that if two towns were situated at an equal distance from this centre, one on the hill, the other on the plain or in a bottom, the latter always suffered more by the shocks of the earthquakes than the former.

33 General account of their effects.

From the most authentic reports and accounts received by his Sicilian majesty's secretary of state, it was learned that the part of Calabria which had been most affected by this heavy calamity, is that comprehended between the 38th and 39th degree of latitude: that the greatest force of the earthquake seemed to have exerted itself from the foot of those mountains of the Apennines called the Monte Dijo, Monte Sacro, and Monte Caulene, extending westward to the Tyrrhene sea: that the towns, villages, and farm-houses nearest these mountains, situated either on the hills or the plain, were totally ruined by the shock of the 5th of February about noon: that as the towns and villages were at a greater distance from this centre, the damage they received was less considerable; but that even these more distant towns had been greatly damaged by the subsequent shocks of the earthquakes, and effectually by those the 7th, 26th, and 28th of February, and that of the 1st of March; that from the first shock of the 5th of February, the earth had been in a continual tremor; and that the shocks were more sensibly felt at times in some parts of the afflicted provinces than at others; that the motion of the earth had been either whirling like a vortex, horizontal, or by pulsations, or by beatings from the bottom upwards. This variety of motions increased the apprehensions of the miserable inhabitants, who expected every moment that the earth would open under their feet, and swallow them up. It was said also that the rains had been continued and violent, frequently accompanied with irregular and furious gusts of wind; and that from all these causes, the face of that part of Calabria comprehended between the 38th and 39th degrees was entirely altered, particularly on the western side of the mountains abovementioned; that many openings and cracks had been made in those parts; some hills had been much lowered, and others entirely swallowed up; deep chasms had been made, by which many roads were rendered impassable; huge mountains were said to have been split asunder, and the parts of them driven to a considerable distance; deep valleys to have been filled up by the concourse of the mountains which formed them before; the course of rivers altered; many springs of water dried up, and new ones formed in their place, &c. A singular phenomenon was said to have been observed at Laureana in Calabria Ultra; viz. that two whole tenements, with large plantations of olive and mulberry trees, situated in a valley perfectly level, had been detached by the earthquake, and transplanted, with the trees still remaining in their places, to the distance of about a mile from their first situations; and that from the spot on which they formerly stood, hot water had sprung up to a considerable height, mixed with sand of a ferruginous nature: that near this place also some countrymen and shepherds had been swallowed up, with their teams of oxen, and their flocks of goats and sheep. The number of lives lost was estimated at 32,367; but Sir William Hamilton is of opinion, that, including strangers, it could not be less than 40,000.

34 Fate of the inhabitants of Scilla.

The fate of the inhabitants of Scilla was extremely affecting. On the first shock of the earthquake February 5th, they had fled along with their prince to the sea-shore, where they hoped for safety; but in the night time a furious wave (said to have been boiling hot, and by which many people were alleged to have been scalded) overflowed the land for three miles, sweeping off in its return 2473 of the inhabitants, among whom was the prince himself, who were at that time either on the strand or in boats near the shore.

35 A hill removes from its place.

But the most singular of all the phenomena enumerated in these accounts was, that a hill, about 500 palms in height, and 1300 in circumference at its basis, jumped to the distance of about four miles from the place where it formerly stood. At the same time the hill on which the town of Oppido stood, which extended about three miles, parted in two; and as its situation was between two rivers, both of these were of course stopped up; two great lakes were formed, and by their continual increase threatened to infect the air by their noxious exhalations.

36 Authenticity of these accounts examined by Sir William Hamilton.

Such were the accounts at first propagated and universally believed; but Sir William Hamilton, who made a tour through the ruined country that same year, found

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found that, though the effects in general were very dreadful, ſtill there had been ſome exaggeration in ſeveral particulars. He ſet ſail, for the purpoſe of making this tour, on the 2d of May, for Naples, and ſoon landed on the coaſt of Calabria Citra. The firſt appearances of the earthquake were obſerved at Cedraro; ſome of the principal inhabitants of that city having quitted their habitations, though Sir William could not perceive that any damage had been done. At St Lucido, the baron's palace and the church ſteeple had ſuffered, and moſt of the inhabitants were in barracks; but wiſhing to come as ſoon as poſſible to the centre of that ſcene of deſolation, he ſet ſail again, and landed on the 6th of May at the town of Pizzo in Calabria Ultra. This town is ſituated on a volcanic tufa, and had been greatly damaged by the earthquake of February 5th, but completely ruined by that of the 28th

37 Leſs ſmoke than uſual emitted by Stromboli during the earthquakes.

of March. Here he was aſſured, that the volcano of Stromboli, which is oppoſite, and in full view of the town, though diſtant about 50 miles, had ſmoked leſs and thrown up a ſmaller quantity of inflamed matter during the earthquakes than it had done for ſome years before; and that ſlight ſhocks ſtill continued to be felt. Sir William had ſoon a convincing proof that this laſt information was true; for, ſleeping that night in his boat, (called a *Malteſe Speronara*), he was awakened with a ſmart ſhock, which ſeemed to lift up the bottom of the boat, but was not attended with any ſubterraneous noiſe.

From Pizzo he paſſed through a moſt beautiful country to Monteleone. This town, anciently called *Vibo Valentia*, is finely ſituated on a hill, overlooking the ſea and the fine rich plains through which he had juſt paſſed; which are bounded by the Apennines, and crowned by Aſpramonte the higheſt of them all. They were formerly interſperſed with towns and villages; but at that time all of them lay in ruins. Monteleone ſuffered little on the 5th of February, but was greatly damaged on the 28th of March.

38 Manner in which the ſhocks came at Monteleone.

Here every one agreed, that the ſhocks of the earthquake ſeemed to come with a rumbling noiſe from the weſtward; beginning uſually with the horizontal motion, and ending with the vorticoſe, by which laſt the greateſt part of the buildings in this province were deſtroyed. It was a general obſervation alſo, that before a ſhock the clouds ſeemed to be ſtill and motionleſs, and that immediately after a heavy ſhower of rain a ſhock quickly followed. Here Sir William had an opportunity of ſeeing many people who had been thrown

39 Their exceſſive violence.

down by the violence of the ſhocks. Several peaſants told him, that the motion of the earth was ſo violent, that the heads of the largeſt trees almoſt touched the ground from ſide to ſide; that during a ſhock, the horſes and oxen extended their legs wide aſunder, that they might not be thrown down; and that they gave evident ſigns of being ſenſible of the approach of each ſhock. "I myſelf (ſays he) have obſerved, that in thoſe parts which have ſuffered moſt by earthquakes, the braying of an aſs, the neighing of a horſe, or the cackling of a gooſe, always drove people out of their barracks, and was the occaſion of many Pater-noſters and Ave-marias being repeated, in expectation of a ſhock."

From Monteleone our author deſcended into the plain, having paſſed through many towns and villages which had been more or leſs ruined according to their vicinity to the plain. The town of Mileto, ſtanding in a bottom, was totally ruined, not a houſe being left ſtanding. At ſome diſtance he ſaw Soriano, and the noble Dominican convent, a heap of ruins. In this day's journey, he obſerves, that all habitations ſituated upon high grounds, the ſoil of which is a gritty ſandſtone, ſomewhat like a granite, but without the conſiſtence, had ſuffered leſs than thoſe ſituated on the plain, the latter being univerſally levelled with the ground.

40 Leſs violent on the high grounds than on the plain.

The ſoil of the plain is a ſandy clay, white, red, and brown; but the white prevails moſt, and is full of marine ſhells, particularly ſcollops. It is interſected in many parts by rivers and torrents, which have produced wide and deep ravines all over the country. Paſſing through the ruined town of St Pietro, in his way to Roſarno, our author had a diſtant view of Sicily and the ſummit of Mount Etna, which then ſent forth a conſiderable ſmoke. Juſt before his arrival at Roſarno, he paſſed over a ſwampy plain, in many parts of which he was ſhown ſmall hollows in the earth, of the ſhape of an inverted cone.

41 Conical openings made in the earth, which ſpouted up water during the ſhock.

They were covered with ſand, as was the ſoil near them. He was informed, that during the earthquake of the 5th of February, a fountain of water, mixed with ſand, had been driven up from each of theſe ſpots to a conſiderable height. Here he ſpoke to a peaſant who had been an eye-witneſs, and was even covered with the water and the ſand; but he aſſured him, that it was not hot, as had been repreſented.

42 Rivers dried up for a ſhort time.

Before this appearance, he ſaid, the river was dry; but ſoon after returned and overflowed its banks. He afterwards found, that the ſame phenomenon had been conſtant with reſpect to all other rivers in the plain, during the dreadful ſhock of the 5th of February.

43 This phenomenon accounted for.

This phenomenon, our author thinks, may be eaſily explained by ſuppoſing the firſt impulſe of the earthquake to have come from the bottom upwards, which all the inhabitants of the plain atteſted to be fact; the ſurface of the plain ſuddenly riſing, the rivers, which are not deep, would naturally diſappear, and the plain returning with violence to its former level, the rivers muſt naturally have returned and overflowed, as the ſudden depreſſion of the boggy grounds would as naturally force out the water that lay hid under their ſurface. It was obſerved in the other parts where this phenomenon had been exhibited, that the ground was always low and ruſhy.

44 Appearance of a bridge on the Metauro.

Between this place and Roſarno they paſſed the river Meſſano or Metauro (which is near the town abovementioned) on a ſtrong timber-bridge, 700 palms long, lately built by the duke of Monteleone. From the cracks made in the banks and in the bed of the river by the earthquake, it was quite ſeparated in one part; and the level on which the piers were placed having been variouſly altered, the bridge had taken an undulated form, ſo that the rail on each ſide was curiouſly ſcolloped; but the ſeparated parts having been joined again, it was then paſſable. Our author was alſo informed, that at the time of the earthquake the river was perfectly dry for ſome ſeconds, and then returned with violence and overflowed: and that the bridge undulated in a moſt extraordinary manner. By the earthquake in the plain, our author underſtands the ſhock of the 5th of February, which did ſo much damage without giving any previous notice.

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The town of Roſarno, with the duke of Monteleone's palace there, was entirely ruined; but the walls remained about ſix feet high, and were at that time fitting up as barracks. The only building that remained unhurt at Roſarno was the town gaol, in which were three notorious villains, who would probably have loſt their lives if they had remained at liberty.

45 Explanation of the change of place of two tenements of land.

From Roſarno Sir William proceeded to Laureana, where he was conducted to the place where two tenements were ſaid to have exchanged ſituations. This fact, which at the firſt relation appeared ſo incredible, Sir William aſſures us was true, and very eaſily accounted for. Theſe tenements were ſituated in a valley ſurrounded by high grounds; and the ſurface of the earth, which was removed, had probably been undermined by little rivulets which come from the mountains, and were then plainly diſcernible on the bare ſpot which the tenements had quitted. Their courſe down the valley was ſufficiently rapid to prove that it had not been a perfect level as was repreſented. The earthquake, he ſuppoſes, had opened ſome depoſitories of rain-water in the clay-hills which ſurround the valley; which water, mixed with the looſe ſoil, taking its courſe ſuddenly through the undermined ſurface, lifting it up with the large olive and mulberry trees, and a thatched cottage, floated the whole piece of ground, with all its vegetation, about a mile down the valley, where it then ſtood with moſt of the trees

46 Cracks in the earth opened wide during the earthquake, and afterwards cloſed.

erect. Theſe two tenements were about a mile long and half a mile broad. In the neighbourhood were ſeveral cracks, none of them above a foot wide; but our author was aſſured, that during the earthquake they had opened wide, and ſwallowed up an ox with near 100 goats. In the abovementioned valley he ſaw the ſame ſort of hollows in the form of inverted cones, out of which he had been aſſured that hot water mixed with ſand iſſued during the earthquakes as

47 No hot water thrown up by the earth.

at Roſarno; but, on proper inquiry, no perſon was found who could poſitively declare that the water had really been hot. Some of the ſand which was thrown up had a ferruginous appearance, and ſeemed to have been acted upon by fire. It was ſaid alſo, that, when freſh, this ſand had the ſmell of ſulphur; but this our author could not perceive.

48 All the inhabitants of ſeveral towns buried in an inſtant in the ruins of their houſes.

Paſſing through the ſame beautiful country to the town of Poliſtene, he did not perceive a ſingle houſe ſtanding. "I travelled (ſays he) four days in the plain, in the midſt of ſuch miſery as cannot be deſcribed. The force of the earthquake there was ſo great, that all the inhabitants of the towns were buried, alive or dead, in the ruins of their houſes in an inſtant. The town of Poliſtene was large, but ill ſituated between two rivers that were ſubject to overflow. Two thouſand one hundred, out of 6000, loſt their lives here on the fatal 5th of February." At Caſal Nuova, the princeſs Gerace Grimaldi, with 4000 of

49 Houſes of Caſal Nuova lifted at once from their foundation.

her ſubjects, periſhed on the ſame day by the exploſion; for ſuch it appears to have been. Some who had been dug alive out of the ruins, told our author, that they had felt their houſes fairly lifted up, without having the leaſt previous notice. An inhabitant of Caſal Nuova was at that moment on a hill overlooking the plain; when, feeling the ſhock, and turning round, inſtead of the town he ſaw only a thick cloud of white duſt like ſmoke, the natural effect of the cruſhing of the buildings and the mortar flying off.

The town of Caſal Nuova was ſo effectually deſtroyed by this dreadful ſhock, that neither veſtige of houſe or ſtreet remained, but all lay in one confuſed heap of ruins. Caſtillace and Milicuſco, which our author next viſited, were both in the ſame ſituation. Terra Nuova, ſituated in the ſame plain, ſtood between two rivers, which, with the torrents from the mountains, had, in the courſe of ages, cut deep and wide chaſms in the ſoft ſandy clay ſoil of which it is compoſed. At Terra Nuova the ravine or chaſm is not leſs than 500 feet deep, and three quarters of a mile

50 Removal of part of the town of Terra Nuova explained.

broad. Here the accounts of the earthquake were confuſed, by not having the ſituation of the place and nature of the ſoil explained. It was ſaid, that a town had been thrown a mile from the place on which it ſtood, without mentioning a word of the ravine; that woods and corn-fields had been removed in the ſame manner, "when in truth (ſays our author) it was but upon a large ſcale, what we ſee every day upon a ſmaller; when pieces of the ſides of hollow ways, having been undermined by rain waters, are detached by their own weight. Here, from the great depth of the ravine, and the violent motion of the earth, two huge portions of the latter, on which a great part of the town ſtood, which conſiſted of ſome hundred houſes, had been detached into the ravine, and nearly acroſs it, at about the diſtance of half a mile from the place where they formerly ſtood; and what is very extra-

51 Extraordinary eſcape of ſome of the inhabitants.

ordinary, many of the inhabitants who had taken this ſingular leap in their houſes, were nevertheleſs dug out alive, and ſome unhurt." Our author's guide there, who was both a prieſt and phyſician, having been buried in the ruins of his houſe by the firſt ſhock, was blown out of it and delivered by the ſecond, which immediately followed the firſt; and there were many well atteſted inſtances of the ſame thing having happened in different parts of Calabria. At Terra Nuova, however, only 400 out of 1600 inhabitants were left alive.

52 Great tracts of land moved from their places.

In other parts of the plain, ſituated near the ravine, and near the town of Terra Nuova, our author ſaw many acres of land, with trees and corn-fields, that had been detached into the ravine, frequently without having been overturned; ſo that the crops were growing as well as if they had been planted there. Other ſuch pieces were lying in the bottom in an inclined ſituation; and others again that had been quite overturned. In one place, two of theſe immenſe pieces of land having been detached, oppoſite to one another, had filled the valley, and ſtopped the courſe of the river, the waters of which were forming a great lake; "and this (ſays our author) is the true ſtate of what the accounts mention of mountains that had walked, and joined together, ſtopped the courſe of a river, and formed a lake."

At the moment of the earthquake the river diſappeared as at Roſarno; and returning ſoon after, overflowed the bottom of the ravine about three feet in depth; ſo that the poor people who had been thrown with their houſes into the ravine from the top of it, and had eſcaped with broken bones, were now in danger of being drowned. Our author was aſſured, that the water was ſalt like that of the ſea; but this circumſtance

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cumſtance ſeemed to want confirmation. The ſame cauſe, however, given for the ſudden diſappearing of the river Metauro at Roſarno will account for the like phenomenon here, and in every part of the country where the rivers were dried up at the moment of the earthquake.

The whole town of Mollochi di Sotto was likewiſe detached into the ravine, and a vineyard of many acres lay near it in the bottom in perfect order, but in an inclined ſituation. There was a foot-path through this

53 Watermills raiſed up to an elevated ſituation.

vineyard which had a ſingular effect in its then impracticable ſituation. Some water-mills which were on the river, being jammed between two ſuch detached pieces as above deſcribed, were lifted up by them, and were then to be ſeen on an elevated ſituation many feet above the level of the river.

54 Riſing of the ground in ſome places, and ſinking in others, explained.

In ſeveral parts of the plain, the ſoil, with timber-trees and crops of corn, conſiſting of many acres, had ſunk eight and ten feet below the level of the plain, and riſen as many in other places. To explain this, it is neceſſary to remember, that the ſoil of the plain is a clay mixed with ſand, which is eaſily moulded into any ſhape. In the plain, near the ſpots where the abovementioned pieces had been detached into the ravine, there were ſeveral parallel cracks; ſo that, had

55 Cracks in the earth, why generally formed near ravines.

the violence of the earthquake continued, theſe pieces would alſo probably have followed. It was conſtantly remarked by our author, that near every ravine or hollow way, the parts of the plain adjoining were full of large parallel cracks. The earth rocking from ſide to ſide, and being ſupported only on one ſide, accounts very well for this circumſtance.

From Terra Nuova our author continued his journey to Oppido. This city ſtands on a mountain of a ferruginous ſort of gritty ſtone, unlike the clay ſoil of its neighbourhood; and is ſurrounded by two rivers in

56 Splitting of the mountain of Oppido explained.

a ravine deeper and broader than that at Terra Nuova. Inſtead of the mountain on which this city ſtands having ſplit, as was reported, and by its fall ſtopped up the courſe of rivers, it was, as at Terra Nuova, huge pieces of the plain on the edge of the ravine, that had been detached into it, had nearly filled it up, and ſtopped the courſe of the rivers, the waters of which were then forming two great lakes. Part of the rock on which the city ſtood was indeed alſo detached, with ſeveral houſes, into the ravine: "But that (ſays our author) is a trifling circumſtance in compariſon of the very great tracts of land with plantations of vines and olives which had been detached from one ſide

57 A countryman detached with a great tract of land acroſs a ravine.

of the ravine to the other, though the diſtance is more than half a mile. It is well atteſted, that a countryman, who was ploughing his field in this neighbourhood with a pair of oxen, was tranſported with his field and team clear, from one ſide of a ravine to the other, and that neither he nor his oxen were hurt.

"Having walked over the ruins of Oppido (ſays our author), I deſcended into the ravine, and examined carefully the whole of it. Here I ſaw indeed the wonderful force of the earthquake, which has produced exactly the ſame effects as thoſe deſcribed in

58 Mountains and lakes formed by the earthquakes.

the ravine at Terra Nuova, but on a ſcale infinitely greater. The enormous maſſes of the plain, detached from each ſide of the ravine, lie ſometimes in confuſed heaps, forming real mountains, and having ſtopped the courſe of two rivers (one of which is very conſiderable), great lakes are already formed; and if not aſſiſted by nature or art, ſo as to give the rivers their due courſe, muſt infallibly be the cauſe of a general infection in the neighbourhood. Sometimes I met with a detached piece of the ſurface of the plain (of many acres in extent) with the large oaks and olive-trees, with corn or lupins under them, growing as well and in as good order at the bottom of the ravine as their companions from whence they are ſeparated do on their native ſoil, at leaſt 500 feet higher, and at the diſtance of about three quarters of a mile. I met with whole vineyards in the ſame order in the bottom that had likewiſe taken the ſame journey. As the banks 59

59 Obſervations on the ſoil of the detached tracts of land, and the effects of the ſhock upon them.

of the ravine from whence theſe pieces came are now bare and perpendicular, I perceived that the upper ſoil was a reddiſh earth, and the under one a ſandy white clay, very compact, and like a ſoft ſtone. The impulſe theſe huge maſſes received, either from the violent motion of the earth alone, or that aſſiſted with the additional one of the volcanic exhalations ſet at liberty, ſeems to have acted with greater force on the lower and more compact ſtratum than on the upper cultivated cruſt? for I conſtantly obſerved, where theſe cultivated lands lay, the under ſtratum of compact clay had been driven ſome hundred yards farther, and lay in confuſed blocks; and, as I obſerved, many of theſe blocks were in a cubical form. The under ſoil, having had a greater impulſe, and leaving the upper in its flight, naturally accounts for the order in which the trees, vineyards, and vegetation fell, and remain at preſent in the bottom of the ravine.

"In another part of the bottom of the ravine there is a mountain compoſed of the ſame clay ſoil, and which was probably a piece of the plain detached by an earthquake at ſome former period: it is about 250 feet high, and 400 feet diameter at its baſis. This mountain, as is well atteſted, has travelled down the ravine near four miles; having been put in motion by the earthquake of the 5th of February. The abundance of rain which fell at that time, the great weight of the freſh detached pieces of the plain which I ſaw heaped up at the back of it, the nature of the ſoil of which it is compoſed, and particularly its ſituation on a declivity, accounts well for this phenomenon; whereas the reports which came to Naples of a mountain having leaped four miles, had rather the appearance of a miracle. I found ſome ſingle timber-trees alſo with a lump of their native ſoil at their roots, ſtanding upright in the bottom of the ravine, and which had been detached from the bottom of the plain abovementioned. I obſerved alſo, that many confuſed heaps of the looſe ſoil, detached by the earthquake from the plains on each ſide of the ravine, had actually run like a volcanic lava (having probably been aſſiſted by the heavy rain), and produced many effects much reſembling thoſe of lava during their courſe down a great part of the ravine. At Santa Criſtina, near Oppido, the like phenomena have been exhibited, and the great force of the earthquake of the 5th of February ſeems to have been exerted on theſe parts, and at Caſal Nuova, and Terra Nuova."

60 Removal of the hill accounted for.

61 Some parts of the ſoil run like a volcanic lava.

From Oppido Sir William proceeded to the towns of Seminara and Palmi. The former, being ſituated

 higher

Earthquake.

higher up, had ſuffered leſs than Palmi which ſtood nearer the ſea. Fourteen hundred lives were loſt at this place, and ſome ſingular circumſtances occurred. The town being a great market for oil, there were upwards of 4000 barrels of that liquid in it at the time of its deſtruction; ſo that by the breaking of theſe barrels and jars, a rivulet of oil ran from the ruins for many hours into the ſea. Here our author was informed by the perſon who conducted him, that he had been buried in the ruins of his houſe by the firſt ſhock; and that after the ſecond, which followed immediately, he found himſelf ſitting aſtride a beam at leaſt 15 feet high in the air. After Sir William's departure from Palmi, in going through one of the narrow paſſes among the mountains of Bagnara and Solano, he felt a very ſmart ſhock of an earthquake attended with a loud exploſion like that of ſpringing a mine; but fortunately it did not detach any rocks or trees from the high mountains which hung over their heads. In this country he was aſſured by ſeveral fiſhermen, that during the earthquake on the 5th of February, at night, the ſea was hot, and that they ſaw fire iſſue from the earth in many parts. This laſt circumſtance was frequently repeated in different parts of the plain, ſo that there ſeems to remain no doubt of its authenticity. The idea of Sir William Hamilton is, that "the exhalations which iſſued during the violent commotions of the earth were full of electrical fire; juſt as the ſmoke of volcanoes conſtantly is during violent eruptions: for I ſaw no mark (ſays he), in any part of my journey, of any volcanic matter having iſſued from the fiſſures of the earth; and I am convinced that the whole has been done by vapours and exhalations only. The firſt ſhock felt at this place, as I was aſſured, was lateral, and then vorticoſe, and exceedingly violent; but what they call violent here muſt have been nothing in comparifon of what was felt in the plain of Caſa Nuova, Poliſtene, Palmi, Terra Nuova, Oppido, &c. &c. where all agreed that the violence of the fatal ſhock of February was inſtantaneous, without warning, and from the bottom upwards."

62 Singular circumſtance of a rivulet of oil by the breaking of the veſſels in Palmi.

63 A ſhock with an exploſion felt by Sir William Hamilton.

64 Fire iſſuing from the earth ſuppoſed to be electric.

At Reggio the ſhock had been much leſs violent than in the places hitherto viſited by our author; and "though there was not a houſe in it inhabited or habitable, yet (ſays he) after having been ſeveral days in the plain, where every building is levelled with the ground, a houſe with a roof, or a church with a ſteeple, was to me a new and refreſhing object." In this place he had an account from the archbiſhop of the earthquakes of 1770 and 1780, which obliged the inhabitants, in number 16,400, to encamp or remain in barracks for ſeveral months, without having done any conſiderable damage to the town. He was informed alſo, that all animals and birds are in a greater or leſſer degree much more ſenſible of an approaching ſhock of an earthquake than any human being; but that geeſe, above all, ſeem to be the ſooneſt and moſt alarmed at the approach of a ſhock: if in the water, they quit it immediately; and there are no means of driving them into it for ſome time after. The ſhock which damaged Reggio came on gently, ſo that the people had time to make their eſcape, and only 126 were killed; but in the plain this ſhock was as inſtantaneous as it was violent and deſtructive.

65 Brute animals ſenſible of the approach of earthquakes.

On the 14th of May, Sir William Hamilton having taken leave of Reggio, ſet ſail for Meſſina, which he viſited next morning; and found that the ſhock, tho' very violent there, had been far inferior to what he had ſeen the effects of in other places. Many houſes, even in the lower part of the town, were ſtanding, and ſome little damaged; but in the upper and more elevated ſituations, the earthquakes ſeemed to have ſcarce had any effect. "A ſtrong inſtance (ſays our author) of this is, that the convent of Santa Barbara, and that called the *Novitiato de Geſuiti*, both on an elevated ſituation, have not a crack in them; and that the clock of the latter has not been deranged in the leaſt by the earthquakes, which have afflicted this country for four months paſt, and which ſtill continue in ſome degree."

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66 Earthquake leſs violent at Meſſina than in Italy.

Notwithſtanding this comparative mildneſs, however, the ſhock at Meſſina had been very terrible. All the beautiful front of the palazzate, which extended in very lofty uniform buildings, in the ſhape of a creſcent, had been in ſome parts totally ruined, in others leſs; and there were cracks in the earth of the quay, a part of which had ſunk above a foot below the level of the ſea. Theſe cracks were probably occaſioned by the horizontal motion of the earth in the ſame manner as the pieces of the plain were detached into the ravines at Oppido and Terra Nuova; for the ſea at the edge of the quay is ſo very deep, that the largeſt ſhips can lie along ſide. The earth, therefore, in its violent commotion, wanting ſupport on that ſide next the ſea, began to crack and ſeparate; and as where there is one crack there are generally others leſs conſiderable in lines parallel to the firſt, our author ſuppoſes, that the great damage done to the houſes neareſt the quay was owing to ſuch cracks below their foundations. It is ſaid, that during the earthquake fire had been ſeen to iſſue from the cracks of the quay; but our author is perſuaded, that this, as in other caſes, was only a vapour charged with electrical fire or a kind of inflammable air. Here alſo he was informed, that the ſhock of the 5th of February had been from the bottom upwards; but the ſubſequent ones generally horizontal or vorticoſe. A remarkable circumſtance was obſerved at Meſſina, and through the whole coaſt of Calabria, which had been moſt affected by the earthquake, *viz.* that a ſmall fiſh called *cicirelli*, reſembling the Engliſh white bait, but larger, and which uſually lie at the bottom of the ſea buried in the ſand, had, ever after the commencement of the earthquakes to the time this account was written, continued to be taken near the ſurface, and that in ſuch abundance as to be common food for the pooreſt ſort of people; whereas before the earthquakes this fiſh was rare, and reckoned among the greateſt delicacies. Fiſh of all kinds alſo were taken in greater abundance on theſe coaſts after the commencement of the earthquakes than before; which our author ſuppoſes to have been occaſioned either by the volcanic matter having heated the bottom of the ſea, or that the continual tremor of the earth had forced them out of their retreats. At Meſſina our author was likewiſe informed, that on the 5th of February, and for three days following, the ſea about a quarter of a mile from the citadel roſe and boiled in an extraordinary manner, and with a moſt horrid and alarming noiſe; the water in other parts of the ſtrait being perfectly calm. "This (ſays

67 Effects of it there.

68 Remarkable circumſtance reſpecting a kind of ſmall fiſhes.

69 Extraordinary boiling of the ſea near Meſſina.

Earthquake.

(says our author) seems to point out exhalations or eruptions from cracks at the bottom of the sea, which may very probably have happened during the violence of the earthquakes; all of which I am convinced have here a volcanic origin."

70 Account of the great wave which destroyed the inhabitants of Scilla.

The next inquiry made by this curious traveller was concerning the great wave which occasioned such destruction at Scilla, as has already been related. Having left Messina on the 17th of May, he proceeded in his boat to the entrance of the Faro, where he met with a priest who had been there on the night between the 5th and 6th of February, when the wave passed over that point of land. Here it carried off boats with 24 people, tore up trees by the roots, and left a considerable quantity of fish behind it. This priest had himself been covered by the wave, and with difficulty saved his life. He at first said the water was hot; but on being pressed with other questions, it amounted to no more than that the water was as warm as it usually is in summer. The wave, he said, rose to a great height, and came on with noise and such rapidity that it was impossible to escape.

71 The water was not hot as had been reported.

On crossing over to Scilla, Sir William was perfectly satisfied concerning the nature of this formidable wave, and found that the following was the true state of the fact: "The prince of Scilla having remarked, that during the first horrid shock, which happened about noon the fifth of February, part of a rock near Scilla had been detached into the sea; and fearing that the rock of Scilla, on which his town and castle are situated, might also be detached, he thought it safer to prepare boats, and retire to a little port or beach seated at the foot of it, and likewise surrounded by rocks. But the second shock of the earthquake about midnight, having detached a whole mountain much higher than that of Scilla, situated between the latter and Torre del Cavallo, it fell into the sea with such violence as to raise the fatal wave abovementioned. This having broken on the point of land called *Punto del Faro*, in the manner already related, instantly returned with great noise and celerity upon the beach, where the unfortunate prince and his subjects had taken refuge, and either dashed them with their boats and effects against the rocks, or whirled them into the sea. Those who had escaped the first and greatest wave, were carried off by a second and third less considerable, but which immediately followed the first. Our author spoke with many who had been involved in that wave, and violently hurt by it; but all of them agreed in asserting that the water was not hot.

72 This wave raised by a mountain falling into the sea.

73 Conjecture concerning a volcanic explosion in the bottom of the sea.

The earthquakes were not perfectly settled even in 1784, when Sir William Hamilton wrote the account of the state of Vesuvius, &c. to the Royal Society. In a postscript to that letter he adds the following confirmation of his conjecture, that the volcanic matter, which he supposed to have occasioned the earthquakes, had vented itself at the bottom of the sea betwixt Calabria and Sicily. "The pilot of one of his Sicilian majesty's sciabecques having some time after the earthquakes cast anchor off the point of Palizzi, where he had often anchored in 25 fathom water, found no bottom till he came to 65; and having sounded for two miles out at sea towards the point of Spartivento in Calabria, he still found the same considerable alteration in the depth. The inhabitants of Palizzi likewise declare, that during the great earthquake on the 5th of February 1783, the sea had boiled and frothed up tremendously off the point."

74 Hypotheses concerning the cause of earthquakes.

To explain the phenomena of earthquakes, various hypotheses have been invented. Till lately, the hypotheses of modern philosophers were much the same with those of the ancients. Anaxagoras supposed the cause of earthquakes to be subterraneous clouds bursting out into lightning, which shook the vaults that confined them. Others imagined, that the arches, which had been weakened by continual subterraneous fires, at length fell in. Others derived these accidents from the rarefied steam of waters, heated by some neighbouring fires; and some, among whom was Epicurus, and several of the Peripatetic school, ascribed these terrible accidents to the ignition of certain inflammable exhalations.

This last hypothesis has been adopted by many of the most celebrated moderns, as Gassendus, Kircher, Schottus, Varenius, Des Cartes, Du Hamel, Honorius, Fabri, &c. The philosopher last mentioned indeed supposed, that waters prodigiously rarefied by heat might sometimes occasion earthquakes. The others supposed, as their hypothesis necessarily requires, that there are many and vast cavities under ground which have a communication with one another: some of which abound with waters; others with vapours and exhalations, arising from inflammable substances, as nitre, bitumen, sulphur, &c. These combustible exhalations they supposed to be kindled by a subterraneous spark, or by some active flame gliding through a narrow fissure from without, or by the fermentation of some mixture; and when this happened, they must necessarily produce pulses, tremors, and ruptures at the surface, according to the number and diversity of the cavities, and the quantity and activity of the inflammable matter. This hypothesis is illustrated by a variety of experiments, such as mixtures of iron-filings and brimstone buried in the earth, gun-powder confined in pits, &c. by all which a shaking of the earth will be produced.

75 Hypothesis of Dr Woodward.

Dr Woodward suggests another hypothesis. He supposes that the subterraneous heat or fire, which is continually elevating water out of the abyss, which, according to him, occupies the centre of the earth, to furnish rain, dew, springs, and rivers, may be stopped in some particular part. When this obstruction happens, the heat causes a great swelling and commotion in the waters of the abyss; and at the same time, making the like effort against the superincumbent earth, that agitation and concussion of it is occasioned which we call an earthquake.

76 Of Mr Amontons.

Mr Amontons of the Royal Academy of Sciences suggests an hypothesis entirely different from any of the abovementioned ones. According to the received philosophical principles, which suppose the atmosphere to be about 45 miles high, and that the density of the air increases in proportion to the absolute height of the superincumbent column of fluid; it is shown, that at the depth of 43.528 fathoms below the surface of the earth, air is but one-fourth lighter than mercury. Now, this depth of 43,528 fathoms is only

only a 74th part of the semidiameter of the earth; and the vast sphere beyond this depth, in diameter 6,451,538 fathoms, may probably be only filled with air; which will be here greatly condensed, and much heavier than the heaviest bodies we know of in nature. But it is found by experiment, that the more air is compressed, the more does the same degree of heat increase its spring, and the more capable does it render it of a violent effect; and that, for instance, the degree of heat of boiling water increases the spring of the air above what it has in its natural state, in our climate, by a quantity equal to a third of the weight wherewith it is pressed. Whence we may conclude, that a degree of heat, which on the surface of the earth will only have a moderate effect, may be capable of a very violent one below. And as we are assured, that there are in nature degrees of heat much more considerable than that of boiling water, it is very possible there may be some, whose violence, further assisted by the exceeding weight of the air, may be more than sufficient to break and overturn this solid orb of 43,528 fathoms; whose weight, compared to that of the included air, would be but a trifle.

77
All these hypotheses rejected by Dr Stukeley.

Though none of these hypotheses were sufficient for explaining the phenomena of earthquakes in a satisfactory manner, one or another of them continued to be adopted by almost all philosophers till the year 1749. In the month of March that year, an earthquake was felt at London and several other places in Britain. Dr Stukeley, who had been much engaged in electrical experiments, began to suspect that phenomena of this kind ought to be attributed not to vapours or fermentations generated in the bowels of the earth, but to electricity. In a paper published by him on this subject, he rejects all the abovementioned hypotheses for the following reasons.

1. That there is no evidence of any remarkable cavernous structure of the earth; but that, on the contrary, there is rather reason to presume that it is in a great measure solid, so as to leave little room for internal changes and fermentations within its substance; nor do coal-pits, he says, when on fire, ever produce any thing resembling an earthquake.

2. In the earthquake at London, in March 1749, there was no such thing as fire, vapour, smoke, smell, or an eruption of any kind observed, though the shock affected a circuit of 30 miles in diameter. This consideration alone of the extent of surface shaken by an earthquake, he thought sufficient to overthrow the supposition of its being owing to the expansion of any subterraneous vapours. For as small fire-balls bursting in the air, propagate a sulphureous smell to the distance of several miles, it cannot be supposed, that so immense a force acting instantaneously on that compass of ground should never break the surface of it, nor become discoverable either to the sight or the smell: besides, that the operation of such a fermentation would be many days in continuance, and the evaporation of so much inflammable matter would require a long space of time. That such an effect, therefore, should be produced instantaneously, can be accounted for by electricity only; which acknowledges no sensible transition of time, no bounds.

3. If vapours and subterraneous fermentations, explosions and eruptions, were the cause of earthquakes, they would absolutely ruin the whole system of springs and fountains, wherever they had once been; which is contrary to fact, even when they have been frequently repeated. Even in the earthquake in Asia Minor, A. D. 17, which destroyed 13 great cities, and shook a mass of earth 300 miles in diameter, nothing suffered but the cities; neither the springs nor the face of the country being injured, which indeed remains the same to this day.

4. That any subterraneous power sufficient to move 30 miles in diameter, as in the earthqnake which happened at London, must be lodged at least 15 or 20 miles below the surface; and therefore must move an inverted cone of solid earth, the base of which is 30 miles in diameter, and the axis 15 or 20; an effect impossible to any natural power whatever, except electricity. So in Asia Minor, such a cone must have been 300 miles in the diameter of the base, and 200 in the axis; which not all the gun-powder that has been made since the invention of it, much less any vapours generated so far below the surface, could possibly effect.

5. A subterraneous explosion will not account for the manner in which ships, far from land, are affected during an earthquake; which seem as if they struck upon a rock, or as if something thumped against their bottoms. Even the fishes are affected. A subterraneous explosion would only produce a gradual swell, and not give so quick an impulse to the water as would make it feel like a stone.

From comparing these circumstances, the Doctor says, he had always thought that an earthquake was a shock of the same kind as those which commonly occur in electrical experiments. And this hypothesis was confirmed by the phenomena attending earthquakes; particularly those of 1749 and 1750, which gave rise to his publication. 78

78
His method of accounting for earthquakes.

The weather, for five or six months before, had been uncommonly warm; the wind south and south-west, without rain; so that the earth must have been in a state peculiarly ready for an electrical shock. The flat country of Lincolnshire had been under an exceeding great drought. The uncommonness of the first of these circumstances, he remarks, is the reason why earthquakes are less frequently experienced in the northern than in the southern regions of the world, where the warmth and dryness of the air, so necessary to electricity, are more usual: And the latter shows how fit the dry surface was for an electrical vibration; and (which is of great importance) that earthquakes reach but little below the surface of the earth.

Before the earthquake at London, all vegetables had been uncommonly forward. And electricity is well known to quicken vegetation. The aurora borealis had been frequent about that time; and just before the earthquake, had been twice repeated in such colours as had never been seen before. It had also removed southerly, contrary to what is common in England; so that the Italians, and those among whom earthquakes were frequent, actually foretold the earthquake. The year had been remarkable for fire-balls, lightning, and coruscations; and these are rightly judged to be meteors of an electrical nature.

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In these circumstances of the earth and air, nothing, he says, is wanting to produce an earthquake, but the touch of some non-electric body; which must necessarily be had *ab extra* from the region of the air or atmosphere. Hence he infers, that if a non-electric cloud discharge its contents upon any part of the earth, in that highly electrical state, an earthquake must necessarily ensue. As the discharge from an excited tube produces a commotion in the human body, so the discharge of electric matter from the compass of many miles of solid earth must needs be an earthquake; and the snap from the contact, the horrid uncouth noise attending it.

The Doctor had been informed by those who were up and abroad the night preceding the earthquake, and early in the morning, that coruscations in the air were extremely frequent; and that a little before the earthquake, a large and black cloud suddenly covered the atmosphere, which probably occasioned the shock by the discharge of a shower.

A sound was observed to roll from the Thames towards Temple Bar before the houses ceased to nod, just as the electrical snap precedes the shock. This noise (which generally precedes earthquakes) the Doctor thought could be accounted for only on electrical principles: for, in a subterraneous eruption, the direct contrary would happen.

The flames and sulphureous smells, which are sometimes observed in earthquakes, might, he thought, be more easily accounted for, on the supposition of their being electrical phenomena, than from their being occasioned by eruptions from the bowels of the earth. So also the suddenness and expedition of the concussion, it being felt at the same instant over such a large surface, and the little damage also which earthquakes generally occasion; sufficiently point out what sort of a motion it is: not a convulsion of the bowels of the earth; but an uniform vibration along its surface, like that of a musical string, or a glass when rubbed on the edge with one's finger.

The circumstance of earthquakes chiefly affecting the sea-coast, places along rivers (and, adds Doctor Priestley, eminences), is a farther argument of their being electrical phenomena. This is illustrated by a particular account of the direction in which the earthquake was conveyed.

The last argument he uses is taken from the effects which it had on persons of weak constitutions, who were, for a day or two after it happened, troubled with pains in the back, rheumatisms, hysterics, and nervous disorders; just in the same manner as they would have been after an actual electrification; to some these disorders proved fatal.

As to the manner in which the earth and atmosphere are put into this state, which prepares them to receive such a shock, and whence the electric matter comes, the Doctor does not pretend to determine; but thinks it as difficult to be accounted for as magnetism, gravitation, and many other secrets of nature.

79
Hypothesis of S. Beccaria;

The same hypothesis was advanced by Signior Beccaria, without knowing any thing of Dr Stukeley's discoveries. But this learned Italian imagined the electric matter which occasions earthquakes to be lodged deep in the bowels of the earth, agreeably to his hypothesis concerning lightning.

Now, as it appears that the quantity of electric matter in the simplest thunder-storms is so inconceivably great, that it is impossible to be contained by any cloud or number of clouds; and as, during the progress of a thunder-storm which he observed, though the lightning frequently struck to the earth, the same clouds were the next moment ready to make a still greater discharge; it was evident, that they must have received at one place, the moment a discharge was made from them in another. Let us suppose these clouds ever so great, if the lightning proceeded only from them, the quantity must be lessened by every discharge; and no recruits that any new clouds might bring can bear any proportion to the discharge which must ensue from the collision of so great a number as combine to form a thunder-storm. It seems therefore most likely, that the electric matter is continually darting from the clouds in one place, at the same time that it is discharged from the earth in another; and, consequently, that the clouds serve as conductors to convey the electric fluid from those places of the earth which are overloaded with it, to those which are exhausted.

This theory being admitted, there will, he thinks, be little difficulty in attributing earthquakes to the same cause. For if the equilibrium of the electric matter be by any means lost in the bowels of the earth; so that the best method of restoring it shall be by the fluid bursting into the air, and traversing several miles of the atmosphere, to come at the place where it is wanted; it may be easily imagined, that violent concussions will be given to the earth by the sudden passage of so powerful an agent. This, in his opinion, was confirmed by the flashes of light, exactly resembling lightning, which have been frequently seen to rush from the top of Mount Vesuvius, at the time that ashes and other light matters have been carried out of it into the air, and dispersed uniformly over a large tract of country. And it is well known, that volcanoes have a near connection with earthquakes.

A rumbling noise like thunder, and flashes of light rising from the ground, have been generally observed to attend earthquakes. And lightning itself has been known to be attended with small shakings of the earth. So also *ignes fatui*, in mines, he looked upon as an argument that the electric fluid was sometimes collected in the bowels of the earth. 80

Of Dr Priestley,

Dr Priestley, in his History of Electricity, observes upon these theories, that a more probable hypothesis may perhaps be formed out of both of them. "Suppose (says he) the electric matter to be, some way or other, accumulated on one part of the surface of the earth, and on account of the dryness of the season not easily to diffuse itself; it may, as Signior Beccaria supposes, force its way into the higher regions of the air, forming clouds in its passage out of the vapours which float in the atmosphere, and occasion a sudden shower, which may further promote the passage of the fluid. The whole surface, thus unloaded, will receive a concussion, like any other conducting substance, on parting with, or receiving a quantity of the electric fluid. The rushing noise will likewise sweep over the whole

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whole extent of the country. And upon this supposition also, the fluid, in its discharge from the country, will naturally follow the course of the rivers, and also take the advantage of any eminences to facilitate its ascent into the higher regions of the air."

The Doctor, making experiments with a battery on the passage of the electrical fluid over different conducting substances, and, among these, over water;—and remarking a resemblance between its passage over the surface of the water, and that which Dr Stukeley supposed to sweep the surface of the earth, when a considerable quantity of it is discharged to the clouds during an earthquake: immediately suspected that the water over which it passed, and which was visibly thrown into a tremulous motion, must receive a concussion resembling that which is given to the waves of the sea on such an occasion.

To try this, he himself and others present put their hands into the water at the time that the electrical flash passed over its surface; and they felt a sudden concussion given to them, exactly like that which is supposed to affect ships at sea during an earthquake. This percussion was felt in various parts of the water, but was strongest near the place where the explosion was made. The same experiment, with a little variation, being afterwards made with a single jar, at some distance below the surface of the water, produced the like effect, though in a weaker degree. "This similarity in the effect (the Doctor observes) is a considerable evidence of a similarity in the cause.

"Pleased with this resemblance of the earthquake (says he), I endeavoured to imitate that great natural phenomenon in other respects: and it being frosty weather, I took a plate of ice, and placed two sticks about three inches high on their ends, so that they would just stand with ease; and upon another part of the ice I placed a bottle, from the cork of which was suspended a brass ball with a fine thread. Then, making the electrical flash pass over the surface of the ice, which it did with a very loud report, the nearer pillar fell down, while the more remote stood; and the ball which had hung nearly still, immediately began to make vibrations about an inch in length, and nearly in a right line from the place of the flash.

"I afterwards diversified this apparatus, erecting more pillars, and suspending more pendulums, &c. sometimes upon bladders stretched on the mouth of open vessels, and at other times on wet boards swimming in a vessel of water. This last method seemed to answer the best of any: for the board representing the earth, and the water the sea, the phenomena of them both during an earthquake may be imitated at the same time; pillars, &c. being erected on the board, and the electric flash being made to pass either over the board, over the water, or over them both."

81 Deficiency of all these hypotheses.

These three hypothesis concerning the cause of earthquakes, though somewhat differing from one another, yet agree in the main; but if a particular solution of the phenomena is required, every one of them will be found deficient.

If, according to Dr Stukeley's hypothesis, the electric matter is lodged only on the surface of the earth, or but a small depth below, how are we to account for those violent effects which often take place in the bowels of the earth? In the earthquake at Lisbon, a large quay sunk to an unfathomable depth. We are certain that the cause of the earthquake must have been below this depth, however great it was, and have opened the earth for an immense way downwards. At the same time an hill in Barbary clave asunder, and the two halves of it fell different ways. This shows, that the cause of the earthquake operated not on the surface of the hill, but on the solid foundation and contents of it; nor can it be explained by any superficial action whatever. From what the miners at Eyam bridge in Derbyshire observed, it is also evident, that the shock was felt at the depth of 396 feet below the surface of the ground more than at the surface itself; and consequently there is all the reason in the world to think that the cause lay at a depth vastly greater.

Again, though the earthquake at London was supposed to begin with a black cloud and shower; yet in that of 1755, the effects of which were incomparably greater, the air was calm and serene almost in every place where it was felt. It doth not appear that there is at any time a considerable difference between the electricity of the atmosphere and that of the earth, or indeed that there can be so. For if the earth is electrified *plus* and the atmosphere *minus*, there are innumerable points on the surface of the earth which must be imperceptibly drawing off the superfluous electric matter into the air. The vapours also, with which the atmosphere abounds, would always be ready in the same service; and thus thunder and lightning might indeed sometimes be produced, but not earthquakes. But lastly, neither the air nor the earth does always show any remarkable signs of electricity before earthquakes happen. For, the summer before the earthquake at Manchester in 1777, there had scarce been any thunder, lightning, or other signs of electricity in the atmosphere, and vegetation had been extremely backward; and, according to the best accounts, the weather continued remarkably fine.

For these reasons, Dr Stukeley's hypothesis seems not to be satisfactory. That of Signior Beccaria is not indeed liable to the abovementioned objections; but seems highly improbable on another account. The atmosphere is known to be a substance through which the electric matter makes its way with the utmost difficulty. It is a vastly worse conductor than water or than moist earth. If therefore the equilibrium of this fluid is lost in the bowels of the earth, it is impossible to give a reason why it should not rather go to the places where it is wanted through the earth itself, than through the atmosphere. Besides, if this was the case, the shock of an earthquake could only be felt at those places where the electric fluid issued from the earth, and where it entered. All the intermediate places ought to be free from any shock, and to be sensible only of a violent concussion in the atmosphere; but of this we have no example in any history of earthquakes whatever.

Dr Priestley's hypothesis is liable to the same objections with that of Dr Stukeley; for any superficial operation will never account for those effects abovementioned, which take place at great depths below the surface. His experiment cannot be admitted as any way conclusive with regard to the cause of earthquakes, because no quantity of electric fire is seen to pass over the

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the earth and sea, like the flash attending the explosion of an electric battery; and the force of his earthquake (being but just able to throw down a stick that could hardly stand by itself) seems by far too little. The utmost force of electricity which man can raise, is indeed very trifling, when compared with the great operations of nature: but it is certain, that the force of an electric battery is by no means contemptible; and was its whole power to be employed in producing an imitation of an earthquake, it certainly would do much more than throw down a small stick. The bad success of this experiment therefore shows, that the Doctor's theory is erroneous: for almost the whole of his electric power was spent another way; and we cannot suppose that any considerable part of the force which produces earthquakes is spent any other way than in the very production of the earthquake itself.

82
Principles on which the phenomena may be explained.

If it is attempted to give an explanation of the phenomena of earthquakes, which shall be free from the objections abovementioned, and from all others, it will be necessary, in the first place, to consider those parts of the system of nature which seem to be most affected during the terrible phenomena we treat of. These parts are, the air, the solid earth, and the water. Of these the two former are electrics *per se;* the latter is a conductor, though a bad one.* Hence it follows,

1. That in proportion to the quantity of earth which is mixed with any quantity of water, that mixture will approach nearer to the nature of an electric *per se*, and *vice versa*.

2. It also follows, that whatever quantity of electricity is communicated to the solid earth, will be quickly taken off from it by the water which is mixed with it, in the same manner that the electric matter is carried off from an excited globe by a metallic conductor.

3. The whole earth is moist, and therefore in some degree a conductor. Nevertheless, as earth of all kinds, when perfectly dry, is found to be an electric capable of receiving a charge like glass, it is therefore possible, that the electric power of the earth may be excited to such a degree, that the moisture of the solid parts cannot easily contain the quantity of electricity communicated.

4. In this case, the earth must either give undoubted signs of its being excited in the same manner that other excited electrics do, or the electricity must be discharged somewhere else.

5. To receive any superfluous quantity of electric matter that may be communicated to the solid earth, the waters of the ocean are always ready. These, being a much better conductor than earth, must be a principal mean of preserving the equilibrium of electricity in the different parts of the earth; and hence we see a natural reason why the waters of the ocean should cover so large a proportion of the globe as they are known to do. See OCEAN.

6. It is known, that fire is also a conductor of electricity. Therefore, wherever a quantity of electric matter is collected in any part of the solid earth, if it can neither be conveniently received by the moisture which the earth naturally contains, nor by the ocean in its neighbourhood, it will discharge itself by any volcano that happens to be in an active state, near the place where that collection of electric matter is.

7. It is also found, that the electric fluid, being violently resisted by the superincumbent atmosphere, hath always a tendency to discharge itself in those places where that resistance is least. The tops of high mountains, therefore, where the weight of the atmosphere is greatly diminished, will also afford a ready passage for the electric fluid when it is collected in very great quantity in the bowels of the earth.

8. If, from some natural causes, the electric matter shall happen to be collected in the bowels of the earth in any particular place, and at the same time such obstacles are thrown in its way, that it can neither discharge itself into the ocean, nor into the atmosphere by the tops of high mountains, nor by the more open passages of volcanoes; the most terrible consequences must ensue: the matter being pent up, and the cause by which it is collected continuing still to act, its impulse becomes at last irresistible. It then flies against every obstacle with inconceivable violence. It breaks out in all those places where there is the least resistance, and therefore the shock is directed a great number of different ways at once. Houses, steeples, trees, &c. by their height take off somewhat of the pressure of the atmosphere; and therefore the electric matter flies against them very violently. The houses and other buildings being bad conductors, are thrown down; the trees affording a readier passage to the fluid are not hurt, though even they also are sometimes split. The height of the mountains renders them the objects of the destructive force of this fluid much more than any buildings whatever. Hence they are often rent, and rocks thrown down from them. The water contained in the solid parts of the earth, being a conductor of electricity, becomes overloaded with it; and when it can receive no more, is forced to yield to the impulse of the rest, and therefore is thrown out of the earth in great quantities. For the same reason, the waters on the surface of the earth are most violently agitated. The small quantities contained in wells are thrown out at the tops of them: The rivers and lakes, which contain too great a quantity of water to be thrown off from the earth, rise in billows: The ocean itself, receiving more electric matter than can be immediately dispersed through the whole body of water, or evaporate into the atmosphere, retreats from the land, and is raised in vast mountains. The solid earth, being unable either to conduct the fluid quietly to those parts where it is wanted, or to retain it, is violently shaken or rent in multitudes of places; and this not only on the surface, but to great depths. The electricity being now in some measure discharged from the earth, the ocean rushes forward with fury to discharge in its turn the excess of electric matter it just before received from the earth. If there are volcanoes in the neighbourhood, the violent discharge of electricity is sure to manifest itself by setting them in a flame; and thus, till the equilibrium is restored, all nature seems to be threatened with dissolution.—Even in those places where the force of the electric fluid is not able to shake the solid parts of the earth, it manifests its power by agitating the waters in the manner above described. Water being a much better conductor of electricity than earth, this subtile fluid, as soon as it can get out from the solid earth, flies to the water. The consequence is, that the water immediatly swells up, and is

* See *Electricity*.

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is attracted by whatever part of the earth has lefs electricity than itfelf. Hence thofe ftrange irregular motions of the waters in different places, fo particularly obferved at the time of the earthquake at Lifbon; and which it feems impoffible to account for from any other caufe than an immediate difcharge of electric matter from the earth into them.

9. As it is impoffible that any part of the earth can be electrified without communicating a proportionable fhare of electricity to the animals that live upon it, and have a conftant communication with it, it thence follows, that there can be no confiderable commotion in the electric matter lodged in the bowels of the earth, without affecting that which is contained in the bodies of the animals. Hence the brutes, who feem to be more fenfible of fuch commotions than we, run about, and fhow figns of fear, before the earthquake comes on; and hence the giddinefs, ficknefs, &c. which the human race are fubject to during the time of the fhock, even though they do not feel it, as was the cafe at Gibraltar.

10. As the atmofphere hath a communication with the earth, it is fcarce to be fuppofed that the earth can, for any length of time, contain a confiderable quantity of electric matter, without communicating to the atmofphere a proportionable quantity. Before an earthquake, therefore, we muft fuppofe the electricity of the earth and air to be in perfect equilibrio. Hence the weather is ferene, there is no wind, nor any other fign in the atmofphere, of the terrible cataftrophe that is about to enfue. But the moment the difcharge is made from the earth, the equilibrium between the terreftrial and atmofpherical electricity is broken; the air either begins to receive the fluid from the earth, or the earth from the air. As there is not then time for the collection of thunder-clouds by which the electricity may be brought down in fudden flafhes of lightning, the fluid breaks through the fubftance of the air itfelf with difmal and horrid noifes, which always accompany an earthquake. That this is the cafe, feems highly probable from an experiment of M. de Romas, when, having brought down a vaft quantity of electric matter from the clouds by means of a kite, he heard the noife it made in the air, like the continual blowing of a fmall forge bellows. In general, a confiderable change of weather takes place at the time of an earthquake, though not always. In the earthquake which happened in England in 1777, there was no remarkable change of weather there; but, foon after, there was a great deal of thunder and lightning in the fouthern parts of Scotland: which feems to indicate, that the electric fluid difcharged from the earth in England had taken its courfe northward, and produced the phenomena beforementioned in Scotland. The fame obfervation may likewife be made with regard to 1789, when there were flight fhocks of an earthquake both in England and Scotland. That in England being the firft, was followed by an uncommon frequency of thunder and lightning in the fouthern parts of Scotland; by reafon of the progrefs of the electric matter northward after it was difcharged into the atmofphere: but the fhocks which happened in the northern part of Scotland (*viz.* about Crief in Perthfhire) were not followed by any thunder to the fouthward; becaufe the electric matter, though difcharged into the atmofphere, cannot return to the fouth without firft going north, and rifing up into the higher regions.

83 Circumftances in the earthquakes of 1783 feemingly oppofite to this theory.

In the earthquakes in Calabria, in the year 1783, there were fome circumftances which feem to militate againft the theory juft now laid down. The moft remarkable of thefe is their attacking the places fituated on the plain much more than thofe which ftood on the higher grounds. This is particularly infifted upon by Sir William Hamilton. "If two towns (fays he) were fituated at an equal diftance from the centre of the force of the earthquake), the one on a hill, the other on the plain or in a bottom, the latter always fuffered greatly more from the fhocks of the earthquake than the former; a fufficient proof to me of the caufe coming from beneath, as this muft naturally have been productive of fuch an effect. And I have reafon to believe, that the bottom of the fea, being ftill nearer the volcanic caufe, would be found, if it could be feen, to have fuffered ftill more than the plain itfelf: but the philofophers, who do not eafily abandon their ancient fyftems, make the prefent earthquakes to proceed from the high mountains of the Apennines that divide Calabria Ultra, fuch as the Monte Dejo, Monte Caulone, and Afpramonte. I would afk them this fimple queftion, Did the Eolian or Lipari iflands (all which rofe undoubtedly from the bottom of the fea by volcanic explofions, at different and perhaps very diftant periods) owe their birth to the Apennines in Calabria, or to veins of minerals in the bowels of the earth and under the bottom of the fea? Stromboli, an active volcano, and probably the youngeft of thofe iflands, is not above 50 miles from thofe parts of Calabria that have fuffered moft by the late earthquakes. The vertical fhocks, or, in other words, thofe whofe impulfe was from the bottom upwards, have been the moft deftructive to the unhappy towns in the plain. Did they proceed from Monte Dejo, Monte Caulone, or Afpramonte? In fhort, the idea I have of the prefent local earthquakes is, that they have been caufed by the fame kind of matter that gave birth to the Eolian iflands; that perhaps an opening may have been made at the bottom of the fea, and moft probably between Stromboli and Calabria Ultra; for from that quarter all agree that the fubterraneous noifes feem to have proceeded; and that the foundation of a new ifland or volcano may have been laid, though it may be ages, which to nature are but moments, before it is completed and appears above the furface of the fea. Perhaps, too, the whole deftruction I have been defcribing may have proceeded fimply from the exhalations of confined vapours generated by the fermentation of fuch minerals as produce volcanoes, which have efcaped where they meet with the leaft refiftance, and muft naturally, in a greater degree, have affected the plain than the high and folid grounds around it."

84 This earthquake lefs violent among the Apennine mountains than elfewhere.

85 Sir William Hamilton's opinion of the caufe.

86 Electricity denied by M Dolomieu to have any fhare in the production of earthquakes.

In a memoir on this earthquake by M. Dolomieu, that author endeavours to exclude electricity from having had any fhare in the matter. "The fea (fays he), during the earthquakes of 1783, had little fhare in the fhocks of the main land. The mafs of water experienced no general movement or fluctuation or ofcillation; the waves did not rife above their ordinary limits. Thofe which, on the night of the 5th of February, beat againft the coaft of Scilla, and which afterwards

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terwards covered the point of the Faro of Meſſina, were only the effects of a particular cauſe. The fall of a mountain into the ſea raiſed the waters, which received an undulating motion, as happens always in ſimilar caſes. The undulation reached from the point of Sicily beyond the Cape of Roſacolmo, extending in length along the coaſt which runs to the ſouth; but always with a decreaſe in elevation as it was more remote from Sicily. Whatever inquiries the author has made, he has not been able to diſcover, in all the details which have been given him, any proofs of the exiſtence of electrical phenomena; no ſpark, no diſengagement of the electrical fluid, which the Neapolitan naturaliſts wiſh to aſſign as the cauſe of earthquakes.

87 Of the ſtate of the atmoſphere.

"The ſtate of the atmoſphere was not the ſame in the whole range of earthquakes. While the tempeſts and the rain ſeemed to have conſpired with them for the deſtruction of Meſſina, the interior part of Calabria enjoyed very fine weather. A little rain fell in the plain in the morning of the 5th of February; but the ſky was clear during the reſt of the day. This month and that of March were not only pretty ſerene, but likewiſe warm. There were ſome ſtorms and rain; but they were the natural attendants of the ſeaſon.

"The moving force ſeems to have reſided under Calabria itſelf, ſince the ſea which ſurrounds it had no ſhare in the oſcillations or vibrations of the continent. This force ſeems alſo to have advanced along the ridge of the Apennines in aſcending from the ſouth to the north. But what power in nature is capable of producing ſuch effects? I exclude electricity, which cannot accumulate continually during the courſe of a year, in a country ſurrounded with water, where every thing conſpires to place this fluid in equilibrio. Fire remains to be conſidered. This element, by acting directly upon the ſolids, can only dilate them; then their expanſion is progreſſive, and cannot produce violent and inſtantaneous movements. When fire acts upon fluids, ſuch as air and water, it gives them an aſtoniſhing expanſion; and we know that then their elaſtic force is capable of overcoming the greateſt reſiſtances. Theſe appear the only means which nature could employ to operate the effects we ſpeak of; but in all Calabria there is no veſtige of a volcano; nothing to point out any interior combuſtion; no fire concealed in the centre of mountains, or under their baſe; a fire which could not exiſt without ſome external ſigns. The vapours dilated, the air rarefied by a heat conſtantly active, muſt have eſcaped through ſome of the crevices or clefts formed in the ſoil; they muſt there have formed currents. Both flame and ſmoke muſt have iſſued by ſome one or other of theſe paſſages. Theſe once opened, the preſſure would have ceaſed; the force not meeting with any more reſiſtance, would have loſt its effect; and the earthquakes could have no longer continued. None of theſe phenomena took place: we muſt then renounce the ſuppoſition of a combuſtion acting directly under Calabria. Let us ſee if having recourſe to a fire at ſome diſtance from this province, and acting upon it only as an occaſional cauſe, we ſhall be able to explain all the phenomena which have accompanied the ſhocks. Let us take for example Ætna in Sicily, and ſuppoſe large cavities under the mountains of Calabria; a ſuppoſition which *cannot be refuſed*. It is certain that immenſe ſubterraneous cavities do exiſt, ſince Ætna, in elevating itſelf by the accumulation of its exploſions, muſt leave in the heart of the earth cavities proportioned to t e greatneſs of the maſs.

88 Subterraneous fire ſuppoſed to be the cauſe.

89 Whence a ſupply of water ſufficient to produce ſuch effects might be derived.

"The autumn of 1782 and the winter of 1783 were very rainy. The interior waters, augmented by thoſe of the ſurface, may have run into thoſe caverns which form the focus of Ætna: there they muſt have been converted into vapour capable of the higheſt degree of expanſion, and muſt have preſſed forcibly againſt every thing which oppoſed their dilatation. If they found canals to conduct them into the cavities of Calabria, they could not fail to occaſion there all the calamities of which I have given the deſcription.

"If the firſt cavity is ſeparated from the ſecond by a wall (ſo to ſpeak) or ſome ſlight diviſion, and this ſeparation is broken down by the force of the elaſtic vapour, the whole force will act againſt the bottom and ſides of the ſecond. The focus of the ſhocks will appear to have changed place, and become weaker in the ſpace which was agitated moſt violently by the firſt earthquake.

"The plain, which was undoubtedly the moſt ſlender part of the vault, yielded moſt eaſily. The city of Meſſina, placed upon low ground, experienced a ſhock which the buildings on higher grounds did not. The moving force ceaſed at once as ſuddenly as it acted violently. When, at the periods of the 7th of February and the 28th of March, the focus appeared changed, the plain ſcarce ſuffered any thing. The ſubterraneous noiſe, which preceded and accompanied the ſhocks, appeared always to come from the ſouthweſt, in the direction of Meſſina. It ſeemed like thunder under ground, which reſounded beneath vaults.

"If Ætna, then, has been the occaſional cauſe of the earthquakes, it has alſo prepared, for ſome time, the misfortunes of Calabria, by gradually opening a paſſage along the coaſt of Sicily to the foot of the Neptunian mountains: for during the earthquakes of 1780, which diſturbed Meſſina the whole ſummer, they felt, the whole length of that coaſt, from Taormina even to the Faro, conſiderable ſhocks; but near the village of Alli and Fiume de Niſi, which are ſituated about the middle of that line, ſhocks ſo violent were experienced, that they dreaded leſt the mouth of a volcano ſhould open. Each ſhock reſembled the effort of a mine that had not ſtrength to make an exploſion. It appears, that then the volcano opened a free paſſage for the expanſion of its vapours, and that they have ſince circulated without reſtraint; ſince in the year 1783 the earthquake was almoſt nothing upon that part of Sicily, at the time that Meſſina buried under its ruins the half of its inhabitants."

90 Diſagreement with regard to facts betwixt M. Dolomieu and Sir William Hamilton.

On this theory it is firſt to be obſerved, that there is a conſiderable diſagreement in points of *fact* betwixt M. Dolomieu and Sir William Hamilton. The former could find no account of any ſpark or other electrical phenomenon: the latter on the contrary, was aſſured that flames had often been ſeen to iſſue from the earth; and theſe he expreſsly attributes to a vapour charged with *electrical fire*. M. Dolomieu takes little notice of the rains that fell; while Sir William Hamilton attributes to them ſeveral of thoſe diſruptions of the earth, which, without them, would have ſeemed very extraordinary. The latter likewiſe informs

 us,

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us, that before a shock the clouds remained motionless; and that, after a heavy shower of rain, a smart shock followed. These were phenomena that showed some connection between what passed in the earth and in the atmosphere: but betwixt these two there is no agent that we know of excepting electricity, at least there is none of sufficient strength to produce any violent effects by communication between the one and the other. The most enthusiastic imagination cannot suppose that huge cauldrons of boiling water under Mount Ætna should make the clouds stand still over Calabria; and the quick succession of the shock to an heavy shower of rain showed that the cause, whatever it was, lay in the ground on which the rain fell, and that it could be put in action by what affected the surface of the ground. But the cause of earthquakes appears, from the facts related n° 25, to lie at a greater depth in the earth than 396 feet; but no shower of rain could affect the earth to this depth unless by making some alteration in its electricity. These phenomena, which M. Dolomieu has overlooked, evidently show that electricity was concerned in this earthquake as well as others.

91 Proofs of electricity being concerned.

92 M. Dolomieu's hypothesis insufficient.

93 Of the foreknowledge which brute animals had of the shock.

Another circumstance, which M. Dolomieu himself mentions, is a sufficient proof of electricity being concerned; and that is the presentiment which animals had of its approach. "The presentiment of animals (says he) at the approach of earthquakes, is a singular phenomenon, and which cannot fail to surprise us so much the more, as we know not by what organs it is communicated to them. Every species of animals experiences it, especially dogs, geese, and poultry. The howlings of the dogs in the streets of Messina were so loud, that orders were issued to kill them." Now, we know that many animals have a presentiment of a change of weather; which may happen either from a change of the density of the atmosphere, or from some alteration in its electricity: but steam pent up in the bowels of the earth could affect no animal until it began to exert its effects. Sir William Hamilton likewise informs us, that geese seemed more affected by this cause when in the water than out of it; which may easily be explained upon electrical principles, but not at all, at least not without the most extravagant suppositions, by steam pent up in caverns nobody knows where.

94 Erroneous method of arguing pursued by M. Dolomieu.

Again, it is evident that Mr Dolomieu's hypothesis is supported in the worst manner imaginable, viz. by arguing from things unknown to what we see; but the true method of argument always is from what we see to things unknown. By this unhappy error he has made choice of causes which cannot possibly answer the purpose. Let any quantity of water we please be poured into the focus of mount Ætna; nay, let the sea itself break into it: the consequence could only have been what happened in 1755, viz. not an earthquake in Calabria, but a vast effusion of boiling water from the top of the mountain itself. Nature here made the experiment; and we have no reason to imagine that any other consequence would have followed, though it had been repeated ever so often. Our author seems also to have forgot, that aqueous steam is capable of condensation, and that when it is admitted into a cold place it instantly loses its expansive power. Let us suppose caverns upon caverns extended in any way he pleases: the greater their bulk, the more will he be embarrassed; for thus the steam would have room to circulate; and far from producing those dreadful convulsions, must have returned quietly into water, without being able to stir the earth in the least. It would appear indeed, that the power of aqueous steam is very much over-rated both by M. Dolomieu and other writers. An anonymous author in the *Journal de Physique* for August 1785, has drawn a comparison between volcanoes and steam-engines; and expresses his surprise that nobody has taken notice of it sooner. "A steam-engine (says he), consists of a caldron or boiler, covered with a lid, having an opening in the middle, to which is fitted an hollow cylinder, &c. The boiler is set over a fire and from the water in it rises a vapour, the expansive force of which raises the piston of the machine. The action of the vapour is afterwards instantaneously annihilated by a jet of cold water into the cylinder through a hole, when the weight of the atmosphere takes place, forces down the piston, and consequently raises the water in the pump.

95 The earthquakes could not be occasioned by water poured into Mount Ætna.

96 Comparison between volcanoes and steam-engines.

"It is known that vapour occupies a space of 15,000 or 16,000 times greater than the bulk of the water which produced it; hence it follows that the smaller the space is in which it is contained, the force of its expansion will be the greater. It has sometimes happened, that vapour, in a steam-engine, not having sufficient play, has burst the vessels in which it was contained, destroyed the building, and thrown the stones and boiling water to a great distance. It is now furnished with holes, by which the quantity of water can be ascertained, and with a valve which gives way when the vapour is superabundant. When the vapour issues by this valve, it strikes the air with such force as to occasion a very loud hissing noise. The force of vapour sufficient for raising a piston of a given diameter is equal to the weight of a column of water 22 feet in height, and of a base equal to the piston; so that, suppose a cubic foot of water to weigh 70 pounds, and the piston to be a foot square, the force of the vapour sufficient for raising it will be 1540 pounds; an agent so powerful, that hardly any thing else in nature can be compared with it.

97 Volcanoes, earthquakes, &c. all supposed to be owing to steam.

"Now if we recollect the descriptions of volcanoes, their eruptions, the earthquakes and hissing noises which sometimes precede or accompany them; the stones of different sorts, boiling water, sulphur, and bitumens which they discharge; if we hear of rocks thrown to the distance of seven or eight miles from the mouth of the volcano; clouds of ashes, and torrents of lava, seas overflowing, rivers left dry, &c. &c. we will find all these the effects of great natural steam-engines: that is to say, they are produced by masses of combustible matter set on fire by fermentation, placed in the neighbourhood of caverns filled with the waters of the sea, of rivers or lakes. We cannot doubt that the interior parts of the earth are hollowed out into numberless caverns that extend in different directions, and to various depths; and that mountains and other inequalities, and the buildings raised by men, are merely the lid or covering, more or less thick, of these caverns, which vary in shape, and in the materials of which they are composed. Places therefore covered with buildings and mountains, are more liable

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ble to earthquakes, becauſe they are leſs able to give way to the ſhock: and the farther places are diſtant from volcanoes, the leſs they have to fear from earthquakes; becauſe the vapour having room to expand itſelf by the ramifications of the ſubterraneous paſſages, the ſhocks will be leſs violent and leſs frequent. It is this which, in all probability, has hitherto ſaved Naples.

"Now, let it not be ſaid, that we have miſtaken the cauſe of earthquakes: for if, on the one hand, we attentively conſider the ſteam-engine and its effects, and on the other, obſerve volcanoes always in the neighbourhood of water, we will be convinced, that they differ in nothing from that machine, but becauſe this is under the command and direction of art. The diſappearance and formation of iſlands and mountains may be explained from the ſinking in of caverns, or from their being lifted up by the force of vapour.—Laſtly, thoſe vapours which, in the year 1783, covered at the ſame time, and almoſt during four months, a part of Europe, Aſia, and Africa, were probably vapour eſcaped from thoſe great internal caverns, heated by a ſufficient quantity of combuſtible matters, ſet on fire by fermentation in the great chemical laboratories in the bowels of the earth.. In certain diſtricts of Burgundy, theſe vapours were found to be hot, for they dried up and deſtroyed the grapes."

98
This hypotheſis utterly inſufficient.

That the power of ſteam-engines is very great, there is no doubt; but all that we ſee them uſually perform, is little more than merely overcoming the preſſure of the atmoſphere on the piſton of the cylinder. Now this preſſure is equally ſtrong over the whole ſurface of the earth; ſo that before the ground could be ſhaken in the ſmalleſt degree, the whole preſſure of the atmoſphere incumbent upon it muſt be removed. But if we begin to make any calculations with regard even to this force, which muſt be removed as a preliminary, we ſhall find it to be inconceivably great. A ſquare mile contains 27,878,400 ſquare feet; and upon each of theſe the preſſure is 2160 pounds. The atmoſpherical preſſure on a ſquare mile is the product of theſe two numbers, or 60,217,344,000 pounds; but the great earthquake of 1755 ſhook no leſs than 4,000,000 of ſquare miles of the earth; and therefore muſt in the firſt place have overcome a preſſure of more than 240,000 millions of millions of pounds: and after all this, it had ſtill a much greater obſtacle, viz. the immenſe weight and coheſion of the earth itſelf. Dr Stukeley * has calculated, that no conceivable quantity of gunpowder could have moved the earth ſhaken by the earthquake in Aſia Minor, which affected a circle of 300 miles diameter: but the earthquake of 1755 muſt have required not only a much greater power to move the earth, as affecting a ſurface much greater than that of a circle 300 miles in diameter, but alſo the atmoſpherical preſſure abovementioned, which does not enter into the Doctor's calculation. There cannot therefore be any conceivable quantity of water, of fire, or of ſteam in the bowels of the earth, ſufficient to produce ſuch effects; nor is there any power in nature to which we can with the ſmalleſt probability attribute them, electricity alone excepted. Calculations have indeed been made, that the force of ſteam is 28 times greater than that of gunpowder: but this ſeems only to be in one particular caſe, viz. when water is thrown upon melted copper; which cannot poſſibly take place in the bowels of the earth. In other caſes water explodes with much leſs violence; and, when thrown upon melted glaſs, does not explode at all. The very violent effects of water when thrown upon copper in fuſion, therefore moſt probably are to be attributed to a decompoſition of the water, one part of it being united to the calx of the metal, and the other ſuddenly converted into an aerial vapour; the inſtantaneous production and rarefaction of which ſeems in moſt caſes to be the cauſe of exploſion *. The ſimple preſſure of ſteam, and the burſting of a veſſel by it when long continued, cannot at all be introduced as a parallel caſe, nor are the effects in any degree ſimilar; becauſe we cannot imagine ſolid metallic veſſels in the bowels of the earth to confine the ſteam till it acquired ſuch ſtrength. At all events the ſteam muſt have penetrated the looſe earth, which it could not fail to meet with in many places, looſened it, and condenſed itſelf; and if any perſon will cover a ſteam engine with ſtones and rubbiſh inſtead of a cloſe lid, he will certainly find this to be the caſe.

99
Exceſſive preſſure of the atmoſphere to be overcome before an earthquake can take place.

* See n°77.

100
Power of ſteam generally over-rated.

101
Exploſion of water with copper probably occaſioned by a decompoſition.

* See *Exploſion*.

102
Of the uſes of earthquakes.

The only power with which we are acquainted, and which is capable of producing earthquakes, then, being that of the electrical fluid, it only remains to conſider what uſes they may be thought to anſwer in the ſyſtem of nature. As they are the effects of the very higheſt natural power, it cannot be ſuppoſed that they are produced merely for the purpoſes of deſtruction; and, on the other hand, as they certainly do a great deal of miſchief, it ſeems as difficult to aſſign any benevolent purpoſe they can anſwer. It is very generally ſuppoſed, indeed, that earthquakes are the means by which Nature raiſes mountains and land from the bottom of the ſea; but this can never be admitted. We have many inſtances of mountains being ſwallowed up and loſt by earthquakes, but not a ſingle well atteſted one of a mountain being raiſed by them; and even when volcanoes are taken into the account, by which ſome mountains and iſlands have certainly been raiſed, the balance appears againſt them, and more land ſeems to have been ſunk by them than ever was raiſed *. It ſeems moſt probable therefore that earthquakes are accidental, and that the miſchief they do is only to prevent a greater evil. This we ſee takes place throughout the whole ſyſtem of nature. Thunder and lightning, violent rains, ſtorms of wind, &c. are all productive of much damage on certain occaſions; but we by no means ſuppoſe theſe phenomena to take place merely for deſtruction; and therefore we name ſuch effects *accidents*. To the ſame account, though on a larger ſcale, muſt we place earthquakes; and it only now remains to conſider what are the diſaſters ſtill more terrible than earthquakes which we ſhould have occaſion to dread, did they not interpoſe to prevent them.

103
They cannot be the means of raiſing mountains.

* See *Volcano*.

104
Are probably accidental circumſtances, by which greater evils are prevented.

Theſe evils are naturally to be dreaded from any general commotion of the electric fluid diſperſed thro' the whole globe of earth. That it does prevade it to the centre, is what we can have no reaſon to doubt; but in the internal parts it ſeems to lie dormant, or to be employed in operations which never manifeſt themſelves to us. Towards the ſurface it is manifeſtly ſet in motion by the light of the ſun; which, as proved under the article Electricity, and in various other parts of this work, is the very ſame fluid. This produces

duces a conſtant current through the bowels of the earth from the equator towards the poles; for as the equatorial parts abſorb more of the light than thoſe

105 A conſtant current of electric matter from the equator to the poles.

farther ſouth or north, it muſt naturally be driven out in the northern and ſouthern regions in proportion to the quantity abſorbed at the equator. In what manner earthquakes are then produced by it, has already been explained at length. They are the ſhocks occaſioned by its paſſing in great quantity from one place where it is preſſed and confined, to another from which it has a free paſſage; or from a part of

106 Dreadful conſequences of an univerſal commotion in the electric fluid.

the earth poſitively electrified, to one that is negatively ſo. Let us ſuppoſe, however, that ſuch obſtructions are thrown in its way, that it cannot get out of the earth by any paſſage. The conſequence of this muſt very ſoon be, that the motion of the light acting upon the equatorial parts would be propagated through the whole globe; and this would be productive of conſequences much more terrible than any we can conceive. We ſee that by ſetting it in motion in a ſmall part of the atmoſphere or of the earth, the moſt violent effects enſue; but ſhould this tremendous fluid be obliged to *put forth all its ſtrength*, the earth muſt be ſhaken from the centre. Inſtead of plantations and little hills removed from their places, as in Calabria, it is more than probable that the largeſt iſlands and continents

107 Why this can never take place.

would be detached from their baſes, or perhaps an univerſal diſſolution enſue. Happily, however, ſuch an effect never can take place, becauſe the electric matter always vents itſelf by the ſuperficial parts; for the depths to which even the cauſes of earthquakes and volcanoes deſcend, are undoubtedly ſuperficial in compariſon of the vaſt thickneſs of the body of the earth itſelf. The great bulk of electric fluid therefore lies quietly in the central parts; and is never moved by the commotions of that which lies on the ſurface, any more than the water at the bottom of the ocean is moved by the ſtorms which ruffle the upper part.

108 Progreſs of the electric matter diſcernible after the earthquake in Calabria.

In the earthquakes in Calabria, the progreſs of the electric matter northward might be traced both thro' the bowels of the earth and through the atmoſphere. The great ſhocks happened in the month of February, but continued more or leſs through the whole ſummer. It was obſerved that Stromboli ſmoked leſs than uſual, and no particular eruption happened either of Ætna or Veſuvius. This ſhowed that the electric

109 Occaſions violent eruptions of fire in Greenland and Iceland.

matter was going ſomewhere elſe; nor was it long of diſcovering the courſe it had taken. In the beginning of ſummer a violent volcanic eruption took place in Greenland; its extent and power, however, were not known; but in the beginning of June a volcanic earthquake commenced in Iceland, and continued for eleven days without intermiſſion. This was followed by the

110 Violent thunder-ſtorms throughout all Europe.

moſt extraordinary effuſion of lava recorded in hiſtory, which continued till the 12th of Auguſt. All this time there were violent and numerous thunder ſtorms, firſt in the ſouthern and then in the more northerly parts of Europe; the air was covered with a never-ceaſing haze, not of a moiſt nature, as our author in the *Journal de Phyſique* ſuppoſes, and which he abſurdly ſays *dried* the grapes in Burgundy, but plainly

111 Appears in the great meteor of 1783.

of ſome other kind, and which prevented the light of the ſun from having its uſual effect. Six days after the immenſe volcanic eruption in Iceland had ceaſed, the great meteor made its appearance, which no doubt was the very ſame quantity of electric matter that had raiſed ſuch horrid commotions in the earth and atmoſphere, returning thro' the higher ſpaces to the ſouth from whence it had originally proceeded.

112 Why earthquakes do not happen in the time of thunder ſtorms.

Before we diſmiſs this article, it many ſtill be neceſſary to obviate an objection which may be raiſed from what is ſaid under the article Lightning. It is there ſhown, that in the time of a thunder ſtorm, the parts of the earth which lie directly under the cloud are divided for ſome ſpace downward into alternate zones poſitively and negatively electrified; that the lightning from the cloud ſtrikes not the uppermoſt ſtratum directly, but only as it is impoſſible to avoid it, becauſe it lies betwixt the cloud and the zone by which the electric matter is attracted. It may then be aſked, Why an earthquake is not produced by the diſcharge of theſe two oppoſite electricities into one another directly, without the production of any thunder? Here, however, we muſt obſerve, that the electricity is originally accumulated in the atmoſphere, where the vapours ſerve as conductors, and the ſurrounding air and upper ſurface of the earth being electrified the ſame way, prevent the electric matter from ſilently diſcharging itſelf, by inſulating the clouds in the ſame manner that the conductor of a machine is inſulated by the electric ſubſtance on which it ſtands. The flaſh of lightning muſt therefore burſt out from theſe conductors in the very ſame manner that a ſpark proceeds from the prime conductor of an electrical machine, rather than from the globe or atmoſphere next to it, though both of them are undoubtedly very highly electrified at the time the machine is ſet in motion. At the ſame time it muſt be conſidered, that this continual flaſhing of the atmoſpherical electricity towards the earth, prevents any very high degree of it from accumulating in either of the terreſtrial zones already mentioned, ſo as to produce any diſcharge between them, which would indeed produce a ſhock of an earthquake.

113 Of electrical exploſions proceeding from the earth.

From an unhappy accident which happened in 1785, related by Mr Brydone in the Phil. Tranſ. for that year we learn, that though in a thunder ſtorm the atmoſpherical electricity and that of the earth are the ſame, yet at ſome diſtance there is a difference betwixt them, and diſcharges are made from the one to the other.

114 A fatal accident by one of them accounted for.

The accident alluded to was the deſtruction of a man and two horſes by an electrical exploſion from the earth in the time of a thunder ſtorm. At the place where the exploſion happened, there was an interval of 25 or 30 ſeconds betwixt the flaſh and the clap of thunder, ſo that it muſt have been at the diſtance of between five or ſix miles; the great exploſion ſuddenly burſt out from the ſpot over which the cart-wheels paſſed to which the horſes were yoked, partially melted the iron of the wheels, killed the man who ſat on the fore-part of the cart, and tore his clothes almoſt to pieces. Two circular holes of about 20 inches diameter were made in the ground, and the earth and ſtones ſcattered about; but no fire was perceived. About an hour before the exploſion, ſome fiſhermen were caught in a violent whirlwind, which felt hot and ſultry. A lamb was killed by another exploſion about a quarter of an hour before the great one, and a woman received a violent ſtroke on the foot without being able to tell whence it proceeded. At the time the lamb was killed, the ſhepherd

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shepherd said he felt a sensation as if fire had passed over his face.

By these explosions, particularly the great one, the equilibrium of electricity in the atmosphere was instantly restored, and the clouds forthwith began to separate. The reason of this is explained under the article LIGHTNING; here it is sufficient to observe, that where there is a difference between the electricity of the atmosphere and that of the earth, an earthquake cannot happen. Those electrical explosions experimentally demonstrate the truth of what is argued from the principles of electricity, n° 82, *viz.* that just before an earthquake there is a perfect equilibrium between the electricity of the atmosphere and that of the surface of the earth. When this equilibrium is broken, the earth discharges its superfluous quantity either silently, by means of trees, grass, &c. or sometimes by explosions in different places; but as there is no general conductor, there cannot be any general discharge of the whole at once. The singular case of the great discharge in 1785 was owing only to the accidental presence of a good conductor, *viz.* the iron of the cart-wheels passing over the spot where the electric matter happened to be collected in great quantity. Had not this taken place, it is possible that a fire-ball might have risen from the earth; for the explosion produced effects extremely similar to those of the bursting of fire-balls*: but still this could have no effect in producing any shock of an earthquake; because the latter would have required a general discharge betwixt two great strata of earth, where there cannot be any conductor to make partial ones.

115 Earthquakes cannot happen where there is a difference betwixt the electricity of the atmosphere and that of the earth.

* See *Lightning* and *Meteors*.

116 Conical hollows in the earth observed by Sir William Hamilton accounted for.

In the time of earthquakes, however, there are undoubtedly many such electrical discharges from the earth as those just mentioned; and they are most probably the cause of those conical hollows observed by Sir William Hamilton. When water is abundant in any part of the earth, it serves as a conductor for some quantity of the electricity, and that fluid is violently thrown out into the air: but where there is a deficiency of water, the fire breaks forth in its proper form with loud explosions, as was observed; as well as the water spouts in Calabria in the year 1783. That year also the quantity of electric matter discharged by the earth into the air was manifest by the vast number of thunder storms which immediately followed them. No fire was observed at the time of the explosion which put an end to the thunder-storm abovementioned; but this must have arisen partly from its happening in the day-time, and partly from the electric matter having so many conductors to spend its force upon.

117 Ultimate cause of all the phenomena.

Having thus explained all the phenomena attending earthquakes, it remains only to show by what means the equilibrium of electricity can be broken in the bowels of the earth in such a manner as to produce these phenomena. The ultimate cause of this is mentioned under the article AURORA BOREALIS, n° 5. It is there shown, that the warmth of the sun must necessarily bring down to the earth much greater quantities of electric matter in the regions within the tropics than in the northern and southern climates. It is impossible, as is there also observed, that there can be a perpetual accumulation of electricity in one part of the earth, unless there is a passage for it into the atmosphere through some other. Hence, if the electric matter descends from the air into one place of the earth, it must necessarily ascend from the earth into the air in some other place. There must be therefore a continual current of electricity through the bowels of the earth, beginning at the equator, and extending northward and southward to both poles. While this current has a free passage from the earth in the northern and southern regions, every thing goes on quietly; and whatever storms may happen in the atmosphere, the solid earth cannot be affected. Innumerable circumstances, however, may tend to hinder this discharge, and consequently to accumulate the electric matter in particular places. One very obvious cause of this kind, is an excessive frost taking place in any part of the earth whence the electric matter was wont to be discharged. This renders the air itself so electric, that it cannot receive the fluid; at the same time that the water on the surface of the earth, being hard frozen, becomes electric also, and incapable of conducting. Very dry seasons likewise contribute to produce the same effect; and thus the accumulation of electricity in the warmer climates becomes prodigiously great. Hence perhaps we have some reason to conclude, that the excessive cold which prevailed over all Europe in 1782 was a principal cause of the earthquakes in 1783.

It must, however, be observed, that with regard to the operations of nature we cannot always reason analogically from our electric experiments. If a quantity of electricity is collected in any substance by artificial means, that quantity is taken off in a moment by the touch of any metallic substance or other good conductor. As the whole earth, therefore, is filled with a conducting substance, namely water, it may very naturally be asked, Why does not the superfluous quantity of electric matter collected in one place, immediately disperse itself through all other parts of the earth by means of the water with which it abounds?—To obviate this difficulty, however, it needs only be remembered, that as the earth is quite full of electric matter all round, no quantity can enter any particular part without being resisted by the rest which is diffused through the whole globe. This resistance will be proportioned to the facility with which it can escape at other places; and this it never can do, unless the earth is in a proper condition for emitting, and the atmosphere for receiving it. The pressure, therefore, upon the accumulated quantity of electric matter soon becomes exceedingly great, and its disposition to burst out with violence is every day increased. At last, as the sun still continues to occasion the descent of more and more of the electric fluid, that particular part of the earth becomes fully charged. The consequence of this is, that the waters of fountains become foul; the electric matter being lodged in great quantity in the water, forces it into unusual agitations, by which the earth is mixed with it. The ocean, for the same reason, is raised in huge billows, &c.; and these appearances prognosticate the shock, in the same manner that slight flashes from the knob of an electrified bottle prognosticate a discharge of all the electricity contained in it.

Besides the earthquakes above described, of which the cause seems to depend entirely on a collection of electric matter in the bowels of the earth, there are others frequently felt in the neighbourhood of volcanoes, which

which are plainly owing to the efforts of the burning matter to discharge itself. These, however, are but slight, and seldom extend to any considerable distance from the burning mountain. For a particular account of them, see the article VOLCANO.

EASEL PIECES, among painters, such smaller pieces, either portraits or landscapes, as are painted on the easel, *i. e.* the frame whereon the canvas is laid.—They are thus called, to distinguish them from larger pictures drawn on walls, cielings, &c.

EASEMENT, in law, a privilege or convenience which one neighbour has of another, whether by charter or prescription, without profit: such are a way through his lands, a sink, or the like. These, in many cases, may be claimed.

EASING, in the sea-language, signifies the slackening a rope or the like. Thus, to ease the bow-line or sheet, is to let them go slacker; to ease the helm, is to let the ship go more large, more before the wind, or more larboard.

EAST, one of the four cardinal points of the world; being that point of the horizon where the sun is seen to rise when in the equinoctial.

The word *east* is Saxon. In Italy, and throughout the Mediterranean, the east wind is called the *levante*: in Greek, ανατολη and απηλιωτης, because it comes from the side of the sun, απ' ηλιȣ; in Latin, *eurus*.

EASTER, a festival of the Christian church, observed in memory of our Saviour's resurrection.

The Greeks call it *pasga*, the Latins *pascha*, an Hebrew word signifying *passage*, applied to the Jewish feast of the passover. It is called *easter* in English, from the goddess Eostre, worshipped by the Saxons with peculiar ceremonies in the month of April.

The Asiatic churches kept their easter upon the very same day that Jews observed their passover, and others on the first Sunday after the first full moon in the new year. This controversy was determined in the council of Nice; when it was ordained that easter should be kept upon one and the same day, which should always be a Sunday, in all Christian churches in the world. For the method of finding easter by calculation, see CHRONOLOGY, n° 31.

EASTER Island, an island in the South Sea, lying in N. Lat. 27. 5. W. Long. 109. 46. It is thought to have been first discovered in 1686 by one DAVIS an Englishman, who called it *Davis's Land*. It was next visited by Commodore Roggewein, a Dutchman, in 1722; who gave it the name of *Easter Island*, and published many fabulous accounts concerning the country and its inhabitants. It was also visited by a Spanish ship in 1770, the captain of which gave it the name of *St Carlos*. The only authentic accounts of this island, however, which have yet appeared, are those published by Captain Cook and Mr Forster, who visited it in the month of March 1774.—According to these accounts, the island is about 10 or 12 leagues in circumference, and of a triangular figure; its greatest length from north-west to south-east is about four leagues, and its greatest breadth two. The hills are so high, that they may be seen at the distance of 15 or 16 leagues. The north and east points of the island are of a considerable height; between them, on the south-east side, the shore forms an open bay, in which Captain Cook thinks the Dutch anchored in 1722. He himself anchored on the west side of the island, three miles northward from the south point. This, he says, is a good road with easterly winds; but a dangerous one when the wind blows from the contrary quarter, as the other on the south-east side must be with easterly winds: so that there is no good accommodation to be had for shipping round the whole island.

The island itself is extremely barren; and bears evident marks not only of a volcanic origin, but of having been not very long ago entirely ruined by an eruption. As they approached the south point, Mr Forster informs us, that they observed the shore to rise perpendicularly. It consisted of broken rocks, whose cavernous appearance, and black or ferruginous colour, seemed to indicate that they had been thrown up by subterraneous fire. Two detached rocks lie about a quarter of a mile off this point: one of them is singular on account of its shape, and represents a huge column or obelisk; and both these rocks were inhabited by multitudes of sea-fowls. On landing and walking into the country, they found the ground covered with rocks and stones of all sizes, which appeared to have been exposed to a great fire, where they seemed to have acquired a black colour and porous texture. Two or three shrivelled species of grasses grew among these stones, and in some measure softened the desolate appearance of the country. The farther they advanced, the more ruinous the face of the country seemed to be. The roads were intolerably rugged, and filled with heaps of volcanic stones, among which the Europeans could not make their way but with the greatest difficulty; but the natives leaped from one stone to another with surprising agility and ease. As they went northward along the island, they found the ground still of the same nature; till at last they met with a large rock of black melted lava, which seemed to contain some iron, and on which was neither soil nor grass, nor any mark of vegetation. Notwithstanding this general barrenness, however, there are several large tracts covered with cultivated soil, which produces potatoes of a gold yellow colour, as sweet as carrots, plantains, and sugar-canes. The soil is a dry hard clay; and the inhabitants use the grass which grows between the stones in other parts of the island as a manure, and for preserving their vegetables when young from the heat of the sun.

The most remarkable curiosity belonging to this island is a number of Colossian statues; of which, however, very few remain entire. These statues are placed only on the sea-coast. On the east side of the island were seen the ruins of three platforms of stone-work, on each of which had stood four of these large statues; but they were all fallen down from two of them, and one from the third: they were broken or defaced by the fall. Mr Wales measured one that had fallen, which was 15 feet in length, and six broad over the shoulders: each statue had on its head a large cylindric stone of a red colour, wrought perfectly round. Others were found that measured near 27 feet, and upwards of eight feet over the shoulders; and a still larger one was seen standing, the shade of which was sufficient to shelter all the party, consisting of near 30 persons, from the rays of the sun. The workmanship is rude, but not bad, nor are the features of the face ill formed; the ears are long, according to the distortion

tion practised in the country, and the bodies have hardly any thing of a human figure about them. How these islanders, wholly unacquainted with any mechanical power, could raise such stupendous figures, and afterwards place the large cylindric stones upon their heads, is truly wonderful! The most probable conjecture seems to be, that the stone is factitious; and that each figure was gradually erected, by forming a temporary platform round it, and raising it as the work advanced: but they are at any rate very strong proofs of the ingenuity and perseverance of the islanders in the age when they were built, as well as that the ancestors of the present race had seen better days than their descendants enjoy. The water of this island is in general brackish, there being only one well that is perfectly fresh, which is at the east end of the island: and whenever the natives repair to it to slake their thirst, they wash themselves all over; and if there is a large company, the first leaps into the middle of the hole, drinks, and washes himself without ceremony; after which another takes his place, and so on in succession. This custom was much disrelished by their new friends, who stood greatly in need of this valuable article, and did not wish to have it contaminated by such ablutions.

The people are of a middle size. In general they are rather thin; go entirely naked; and have punctures on their bodies, a custom common to all the inhabitants of the South Sea islands. Their greatest singularity is the size of their ears, the lobe of which is stretched out so that it almost rests on their shoulder; and is pierced with a very large hole, capable of admitting four or five fingers with ease. The chief ornaments for their ears are the white down of feathers and rings which they wear in the inside of the hole, made of the leaf of the sugar-cane, which is very elastic, and for this purpose is rolled up like a watch-spring. Some were seen clothed in the same cloth used in the island of Otaheite, tinged of a bright orange-colour with turmeric; and these our voyagers supposed to be chiefs. Their colour is a chesnut-brown; their hair black, curling, and remarkably strong; and that on the head as well as the face is cut short. The women are small, and slender-limbed: they have punctures on the face, resembling the patches sometimes used by European ladies; they paint their face all over with a reddish brown ruddle, and above this they lay a fine orange-colour extracted from turmeric-root; the whole is then variegated with streaks of white shell-lime. But the most surprising circumstance of all with regard to these people, is the apparent scarcity of women among them. The nicest calculation that could be made, never brought the number of inhabitants in this island to above 700, and of these the females bore no proportion in number to the males. Either they have but few females, or else their women were restrained from appearing during the stay of the ship; notwithstanding, the men showed no signs of a jealous disposition, or the women any scruples of appearing in public: in fact, they seemed to be neither reserved nor chaste; and the large pointed cap which they wore gave them the appearance of professed wantons. But as all the women who were seen were liberal of their favours, it is more than probable that all the married and modest ones had concealed themselves from their impetuous visitants in some inscrutable parts of the island; and what further strengthens this supposition is, that heaps of stones were seen piled up into little hillocks, which had one steep perpendicular side, where a hole went under ground. The space within, says Mr Forster, could be but small; and yet it is probable that these cavities served, together with their miserable huts, to give shelter to the people at night; and they may communicate with natural caverns, which are very common in the lava currents of volcanic countries. The few women that appeared were the most lascivious of their sex that perhaps have been ever noticed in any country, and shame seemed to be entirely unknown to them.

EATON, a town of Buckinghamshire, situated on the north side of the Thames, opposite to Windsor, and famous for its collegiate school, founded by King Henry VI. being a seminary for King's College, Cambridge, the fellows of which are all from this school.

EAU de Carmes. See Pharmacy.

Eau de Luce. See Chemistry, n° 1037.

EAVES, in architecture, the margin or edge of the roof of an house; being the lowest tiles, slates, or the like, that hang over the walls, to throw off water to a distance from the wall.

Eaves-Droppers, are such persons as stand under the eaves, or walls, and windows of a house, by night or day, to hearken after news, and carry it to others, and thereby cause strife and contention in the neighbourhood. They are called *evil members of the commonwealth* by the stat. of West. 1. c. 33. They may be punished either in the court-leet by way of presentment and fine, or in the quarter-sessions by indictment and binding to good behaviour.

EBBING of the Tides. See Tide.

EBDOMARIUS, in ecclesiastical writers, an officer formerly appointed weekly to superintend the performance of divine service in cathedrals, and prescribe the duties of each person attending in the choir, as to reading, singing, praying, &c. To this purpose the ebdomary, at the beginning of his week, drew up in form a bill or writing of the respective persons, and their several offices, called *tabula*, and the persons there entered were styled *intabulati*.

EBDOME, Ἑβδόμη, in antiquity, a festival kept on the seventh of every lunar month, in honour of Apollo, to whom all seventh days were sacred, because one of them was his birth-day; whence he was sometimes called *Ebdomagenes*. For the ceremonies of this solemnity see *Potter's Archæol. Græc.* lib. ii. cap. 20.

EBENUS, the ebony tree: A genus of the decandria order, belonging to the diadelphia class of plants: and in the natural method ranking under the 32d order, *Papilionaceæ*. The segments of the calyx are the length of the corolla, and the latter has scarce any alæ: there is one rough seed. There is but one species, the cretica, a native of the island of Crete, and some others in the Archipelago. It rises with a shrubby stalk three or four feet high; which puts out several side-branches garnished with hoary leaves at each joint, composed of five narrow spear-shaped lobes, which join at their tails to the footstalk, and spread out like the fingers of a hand. The branches are terminated by thick spikes of large purple flowers, which are of the butterfly or pea-bloom kind. The plants may be propagated from seeds sown in the autumn. In this country the plants must be protected during the winter, as they are unable to bear the cold.

EBION, the author of the heresy of the EBIONITES, was a disciple of Cerinthus, and his successor. He improved upon the errors of his master, and added to them new opinions of his own. He began his preaching in Judea: he taught in Asia, and even at Rome. His tenets infected the isle of Cyprus. St John opposed both Cerinthus and Ebion in Asia; and it is thought, that this apostle wrote his gospel, in the year 97, particularly against this heresy.

EBIONITES, ancient heretics, who rose in the church in the very first age thereof, and formed themselves into a sect in the second century, denying the divinity of Jesus Christ.

Origen takes them to have been so called from the Hebrew word *ebion*, which in that language signifies *poor*; because, says he, they were poor in sense, and wanted understanding. Eusebius, with a view to the same etymology, is of opinion they were thus called, as having poor thoughts of Jesus Christ, taking him for no more than a mere man.

It is more probable the Jews gave this appellation to the Christians in general out of contempt; because in the first times there were few but poor people that embraced the Christian religion. This opinion Origen himself seems to give into, in his book against Celsus, where he says, that they called *Ebionites*, such among the Jews as believed that Jesus was truly the expected Messiah.

It might even be urged, with some probability, that the primitive Christians assumed the name themselves, in conformity to their profession. It is certain, Epiphanius observes, they valued themselves on being poor, in imitation of the apostles. The same Epiphanius, however, is of opinion, that there had been a man of the name EBION, the chief and founder of the sect of Ebionites, contemporary with the Nazarenes and Cerinthians. He gives a long and exact account of the origin of the Ebionites, making them to have risen after the destruction of Jerusalem, when the first Christians, called *Nazarenes*, went out of the same to live at Pella.

The Ebionites are little else than a branch of Nazarenes: only that they altered and corrupted, in many things, the purity of the faith held among those first adherents to Christianity. For this reason, Origen distinguishes two kinds of Ebionites, in his answer to Celsus: the one believed that Jesus Christ was born of a virgin; and the other, that he was born after the manner of other men.

The first were orthodox in every thing, except that to the Christian doctrine they joined the ceremonies of the Jewish law, with the Jews, Samaritans, and Nazarenes; together with the traditions of the Pharisees. They differed from the Nazarenes, however, in several things, chiefly as to what regards the authority of the sacred writings; for the Nazarenes received all for scripture contained in the Jewish canon; whereas the Ebionites rejected all the prophets, and held the very names of David, Solomon, Isaiah, Jeremiah, and Ezekiel, in abhorrence. They also rejected all St Paul's epistles whom they treated with the utmost disrespect.

They received nothing of the Old Testament but the Pentateuch; which should intimate them to have descended rather from the Samaritans than from the Jews. They agreed with the Nazarenes in using the Hebrew gospels of St Matthew, otherwise called the Gospel of the Twelve Apostles: but they had corrupted their copy in abundance of places; and particularly, had left out the genealogy of our Saviour which was preserved entire in that of the Nazarenes, and even in those used by the Cerinthians.

Some, however, have made this gospel canonical, and of greater value than our present Greek gospel of St Matthew: See NAZARENES. These last, whose sentiments, as to the birth of our Saviour, were the same with those of the Ebionites, built their error on this very genealogy.

Beside the Hebrew gospel of St Matthew, the Ebionites had adopted several other books, under the names of St James, John, and the other apostles: they also made use of the Travels of St Peter, which are supposed to have been written by St Clement; but had altered them so, that there was scarce any thing of truth left in them. They even made that saint tell a number of falsehoods, the better to authorise their own practices. See St Epiphanius, who is very diffusive on the ancient heresy of the Ebionites, *Hær.* 30. But his account deserves little credit, as, by his own confession, he has confounded the other sects with the Ebionites, and has charged them with errors to which the first adherents of this sect were utter strangers.

EBONY of CRETE. See EBENUS.

EBONY Wood is brought from the Indies, exceedingly hard and heavy, susceptible of a very fine polish, and on that account used in mosaic and inlaid works, toys, &c. There are divers kinds of ebony: the most usual among us are black, red, and green, all of them the product of the island of Madagascar, where the natives call them indifferently *hazon mainthi*, q. d. *blackwood*. The island of St Maurice, belonging to the Dutch, likewise furnishes part of the ebonies used in Europe.

Authors and travellers give very different accounts of the tree that yields the black ebony. By some of their descriptions, it should be a sort of palm-tree; by others, a cytisus, &c. The most authentic of them is that of M. Flacourt, who resided many years in Madagascar as governor thereof; he assures us, that it grows very high and big, its bark being black, and its leaves resembling those of our myrtle, of a deep, dusky, green colour.

Tavernier assures us, that the islanders always take care to bury their trees, when cut down, to make them the blacker, and to prevent their splitting when wrought. F. Plumier mentions another black ebony-tree, discovered by him at St Domingo, which he calls *spartium portulacæ foliis aculeatum ebeni materiæ*. Candia also bears a little shrub, known to the botanists under the name of *EBENUS Cretica*, above described.

Pliny and Dioscorides say the best ebony comes from Ethiopia, and the worst from India; but Theophrastus prefers that of India. Black ebony is much preferred to that of other colours. The best is a jet black, free of veins and rind, very massive, astringent, and of an acrid pungent taste. Its rind, infused in water, is said to purge pituita, and cure venereal disorders; whence Matthiolus took guaiacum for a sort of ebony. It yields an agreeable perfume when laid on burning coals: when green, it readily takes fire from the abundance of its fat. If rubbed against a stone, it becomes brown. The Indians make statues of their gods, and sceptres for their princes, of this wood. It was first brought to Rome by Pompey, after he subdued Mithridates. It is now much less used among us than anciently; since the discovery of so many ways of giving other hard woods a black colour.

As to the green ebony, besides Madagascar and St Maurice, it likewise grows in the Antilles, and especially in the isle of Tobago. The tree that yields it is very bushy; its leaves are smooth, and of a fine green colour. Beneath its bark is a white blea, about two inches thick; all beneath which, to the very heart, is a deep green, approaching towards a black, tho' sometimes streaked with yellow veins. Its use is not confined to mosaic work: it is likewise good in dyeing, as yielding a fine green tincture. As to red ebony, called also *grenadilla*, we know little of it more than the name.

The cabinet-makers, inlayers, &c. make pear-tree and other woods pass for ebony, by giving them the black colour thereof. This some do by a few washes of a hot decoction of galls; and when dry, adding writing ink thereon, and polishing it with a stiff brush, and a little hot wax; and others heat or burn their wood black. See DYEING.

EBORACUM (anc. geog.), a famous city of the Brigantes in Britain, the residence of Septimius Severus and Constantius Chlorus, and where they both died; a Roman colony; and the station of the Legio Sexta Victrix. Now *York*. W. Long. 50. Lat. 54. *Caer-frock*, or *Caer-effroc*, in British (Camden).

EBRO, anciently IBERUS, a large river of Spain, which, taking its rise in Old Castle, runs thro' Biscay and Arragon, passes by Saragosa, and, continuing its course thro' Catalonia, discharges itself with great rapidity into the Mediterranean, about 20 miles below the city of Tortosa.

EBUDÆ, or HEBUDES (anc. geog.), islands on the west of Scotland. The ancients differ greatly as to their situation, number, and names; said in general to lie to the north of Ireland and west of Scotland. Now called the *Western Isles*, also *Hebrides*; this last a modern name, the reason of which does not appear, unless it be a corruption of *Hebudes*. By Beda called *Mevaniæ*, an appellation equally obscure.

EBULLITION, the same with BOILING. The word is also used in a synonymous sense with EFFERVESCENCE.

EBUSUS (anc. geog.), the greater of the two islands called Pityusæ, in the Mediterranean, near the east coast of Spain, to the south-west of Majorca. Famous for its pastures for cattle, and for its figs. Now *Ivica*, 100 miles in compass, without any noxious animals but rabbits, who often destroy the corn.

ECALESIA, Εκαλησια, in antiquity, a festival kept in honour of Jupiter, surnamed *Hecalus*, or *Hecalesius*, from *Hecale*, one of the borough-towns in Attica.

ECASTOR, in antiquity, an oath wherein Castor was invoked. It was a custom for the men never to swear by Castor, nor the women by Pollux.

ECATÆA, Εκαταια, in antiquity, statues erected to the goddess Hecate, for whom the Athenians had a great veneration, believing that she was the overseer of their families, and that she protected their children.

ECATESIA, Εκατησια, in antiquity, an anniversary solemnity, observed by the Stratonicensians, in honour of Hecate. The Athenians likewise had a public entertainment or supper every new moon, in honour of the same goddess. The supper was provided at the charge of the richer sort; and was no sooner brought to the accustomed place but the poor people carried all off, giving out that Hecate had devoured it. For the rest of the ceremonies observed on this occasion, see *Pott. Arch. Græc.* lib. ii. cap. 20.

ECATOMBÆON, Εκατομβαιων, in chronology, the first month of the Athenian year. It consisted of 30 days, and began on the first new moon after the summer solstice, and consequently answered to the latter part of our June and beginning of July. The Bœotians called it *Hippodromus*, and the Macedonians *Lous*. See MONTH. The word is a derivative from the Greek ηκατομβη, *a hecatomb*, because of the great number of hecatombs sacrificed in it.

ECAVESSADE, in the manege, is used for a jerk of the cavesson.

ECBATANA (anc. geog.), the royal residence and the capital of Media, built by Deioces king of the Medes, according to Herodotus: Pliny says, by Seleucus; but that could not be, because it is mentioned by Demosthenes. It was situated on a gentle declivity, distant 12 stadia from Mount Orontes, and was in compass 150 stadia. Here stood the royal treasury and tombs. It was an open unwalled town, but had a very strong citadel, encompassed with seven walls, one within and rising above another. The extent of the utmost was equal to the whole extent of Athens, according to Herodotus; the situation favouring this construction, as being a gentle ascent, and each wall was of a different colour.—Another *Ecbatana* of Persia, a town of the Magi (Pliny).—A third of Syria.

ECCENTRICITY. See EXCENTRICITY.

ECCHELLENSIS (Abraham), a learned Maronite, whom the president le Jai employed in the edition of his Polyglott Bible. Gabriel Sionita, his countryman, drew him to Paris, in order to make him his fellow-labourer in publishing that bible. They fell out. Gabriel complained to the parliament, and cruelly defamed his associate; their quarrel made a great noise. The congregation *de propaganda fide* associated him, 1536, with those whom they employed in making an Arabic translation of the scripture. They recalled him from Paris, and he laboured in that translation at Rome in the year 1652. While he was professor of the Oriental languages at Rome, he was pitched upon by the great duke Ferdinand II. to translate from the Arabic into Latin the 5th, 6th, and 7th books of Apollonius's Conics; in which he was assisted by John Alphonso Borelli, who added commentaries to them. He died at Rome in 1664.

ECCHYMOSIS, from εκχυω to *pour out*, or from εξ. *out of*, and χυμος *juice*. It is an effusion of humours from their respective vessels, under the integuments; or, as Paulus Ægineta says, "When the flesh is bruised by the violent collision of any object, and its small veins broken, the blood is gradually discharged from them." This blood, when collected under the skin, is called an *ecchymosis*, the skin in the mean time remaining entire; sometimes a tumor is formed by it, which is soft and livid, and generally without pain. If the quantity of blood is uot considerable, it is usually resorbed; if much, it suppurates: it rarely happens that

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that any further inconvenience follows; though, in case of a very bad habit of body, a mortification may be the result, and in such a case regard must be had thereto.

ECCLAIRCISSEMENT. See Esclaircissement.

ECCLESIASTES, a cononical book of the Old Testament, the design of which is to show the vanity of all sublunary things.

It was composed by Solomon; who enumerates the several objects on which men place their happiness, and then shows the insufficiency of all worldly enjoyments.

The Talmudists made king Hezekiah to be the author of it; Grotius ascribes it to Zorobabel, and others to Isaiah; but the generality of commentators believe this book to be the produce of Solomon's repentance, after having experienced all the follies and pleasures of life.

ECCLESIASTICAL, an appellation given to whatever belongs to the church: thus we say, ecclesiastical polity, jurisdiction, history, &c.

Ecclesiastical Courts. In the time of the Anglo-Saxons there was no sort of distinction between the lay and the ecclesiastical jurisdiction: the county-court was as much a spiritual as a temporal tribunal: the rights of the church were ascertained and asserted at the same time, and by the same judges, as the rights of the laity. For this purpose the bishop of the diocess, and the alderman, or in his absence the sheriff of the county, used to sit together in the county-court, and had there the cognizance of all cases as well ecclesiastical as civil; a superior deference being paid to the bishop's opinion in spiritual matters, and to that of the lay-judges in temporal. This union of power was very advantageous to them both: the presence of the bishop added weight and reverence to the sheriff's proceedings; and the authory of the sheriff was equally useful to the bishop, by enforcing obedience to his decrees in such refractory offenders as would otherwise have despised the thunder of mere ecclesiastical censures.

Blackst. Comment.

But so moderate and rational a plan was wholly inconsistent with those views of ambition that were then forming by the court of Rome. It soon became an established maxim in the papal system of policy, that all ecclesiastical persons, and all ecclesiastical causes, should be solely and entirely subject to ecclesiastical jurisdiction only: which jurisdiction was supposed to be lodged in the first place and immediately in the pope, by divine indefeasible right and investiture from Christ himself, and derived from the Pope to all inferior tribunals. Hence the canon law lays it down as a rule, that "*sacerdotes a regibus honorandi sunt, non judicandi*; and places an emphatical reliance on a fabulous tale which it tells of the emperor Constantine, That when some petitions were brought to him, imploring the aid of his authority against certain of his bishops accused of oppression and injustice, he caused (says the holy canon) the petitions to be burnt in their presence, dismissing them with this velediction: "*Ite, et inter vos causas vestras discutite, quia dignum non est ut nos judicemus Deos.*"

It was not, however, till after the Norman conquest, that this doctrine was received in England; when William I. (whose title was warmly espoused by the monasteries which he liberally endowed, and by the foreign clergy whom he brought over in shoals from France and Italy, and planted in the best preferments of the English church), was at length prevailed upon to establish this fatal encroachment, and separate the ecclesiastical court from the civil; whether actuated by principles of bigotry, or by those of a more refined policy, in order to discountenance the laws of king Edward abounding with the spirit of Saxon liberty, is not altogether certain. But the latter, if not the cause, was undoubtedly the consequence, of this separation: for the Saxon laws were soon overborne by the Norman justiciaries, when the county-court fell into disregard by the bishop's withdrawing his presence, in obedience to the charter of the conqueror; which prohibited any spiritual cause from being tried in the secular courts, and commanded the suitors to appear before the bishop only, whose decisions were directed to conform to the canon law.

King Henry I. at his accession, among other restorations of the laws of king Edward the Confessor, revived this of the union of the civil and ecclesiastical courts. Which was, according to Sir Edward Coke, after the great heat of the conquest was past, only a restitution of the ancient law of England. This however was ill relished by the Popish clergy, who, under the guidance of that arrogant prelate archbishop Anselm, very early disapproved of a measure that put them on a level with the profane laity, and subjected spiritual men and causes to the inspection of the secular magistrates: and therefore, in their synod at Westminster, 3 Hen. I. they ordained, that no bishop should attend the discussion of temporal causes; which soon dissolved this newly effected union. And when, upon the death of king Henry I. the usurper Stephen was brought in and supported by the clergy, we find one article of the oath which they imposed upon him was, that ecclesiastical persons and ecclesiastical causes should be subject only to the bishop's jurisdiction. And as it was about that time that the contest and emulation began between the laws of England and those of Rome, the temporal courts adhering to the former, and the spiritual adopting the latter, as their rule of proceeding; this widened the breach between them, and made a coalition afterwards impracticable; which probably would else have been effected at the general reformation of the church.

Ecclesiastical Courts are various; as the Archdeacon's, the Consistory, the Court of Arches, the Peculiars, the Prerogative, and the great court of appeal in all ecclesiastical causes, viz. the Court of Delegates. See these articles.

As to the method of proceeding in the spiritual courts, it must (in the first place) be acknowledged to their honour, that though they continue to this day to decide many questions which are properly of temporal cognizance, yet justice is in general so ably and impartially administered in those tribunals (especially of the superior kind), and the boundaries of their power are now so well known and established, that no material inconvenience at present arises from this jurdiction still continuing in the ancient channel. And, should any alteration be attempted, great confusion would probably arise, in overturning long established forms,

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forms, and new modelling a course of proceedings that has now prevailed for seven centuries.

The establishment of the civil-law process in all the ecclesiastical courts was indeed a master-piece of papal discernment, as it made a coalition impracticable between them and the national tribunals, without manifest inconvenience and hazard. And this consideration had undoubtedly its weight in causing this measure to be adopted, though many other causes concurred. In particular, it may be here remarked, that the pandects, or collections of civil law, being written in the Latin tongue, and referring so much to the will of the prince and his delegated officers of justice, sufficiently recommended them to the court of Rome, exclusive of their intrinsic merit. To keep the laity in the darkest ignorance, and to monopolize the little science which then existed entirely among the monkish clergy, were deep-rooted principles of papal policy. And as the bishops of Rome affected in all points to mimic the imperial grandeur, as the spiritual prerogatives were moulded on the pattern of the temporal, so the canon-law process was formed on the model of the civil law; the prelates embracing, with the utmost ardor, a method of judicial proceedings, which was carried on in a language unknown to the bulk of the people, which banished the intervention of a jury (that bulwark of Gothic liberty), and which placed an arbitrary power of decision in the breast of a single man.

The proceedings in the ecclesiastical courts are therefore regulated according to the practice of the civil and canon laws; or rather to a mixture of both, corrected and new-modelled by their own particular usages, and the interposition of the courts of common law. For, if the proceedings in the spiritual court be ever so regularly consonant to the rules of the Roman law, yet if they be manifestly repugnant to the fundamental maxims of the municipal laws, to which, upon principles of sound policy, the ecclesiastical process ought in every state to conform (as if they require two witnesses to prove a fact, where one will suffice at common law); in such cases a prohibition will be awarded against them. But, under these restrictions, their ordinary course of proceeding is, first, by *citation*, to call the party injuring before them. Then by *libel (libellus*, "a little book"), or by articles drawn out in a formal *allegation*, to set forth the complainant's ground of complaint. To this succeeds the *defendant's answer* upon oath; when if he denies or extenuates the charge, they proceed to *proofs* by witnesses examined, and their depositions taken down in writing by an officer of the court. If the defendant has any circumstances to offer in his defence, he must also propound them in what is called his *defensive allegation*, to which he is intitled in his turn to the *plaintiff's answer* upon oath, and may from thence proceed to *proofs* as well as his antagonist. The canonical doctrine of *purgation*, whereby the parties were obliged to answer upon oath to any matter, however criminal, that might be objected against them (though long ago over-ruled in the court of chancery, the genius of the English law having broken through the bondage imposed on it by its clerical chancellors, and asserted the doctrines of judicial as well as civil liberty), continued till the middle of the last century, to be upheld by the spiritual courts; when the legislature was obliged to interpose, to teach them a lesson of similar moderation. By the statute of 13 Car. II. c. 12. it is enacted, that it it shall not be lawful for any bishop, or ecclesiastical judge, to tender or administer to any person whatsoever, the oath usually called the oath *ex officio*, or any other oath whereby he may be compelled to confess, accuse, or purge himself of any criminal matter or thing, whereby he may be liable to any censure or punishment. When all the pleadings and proofs are concluded, they are referred to the consideration, not of a jury, but of a single judge; who *takes information* by hearing advocates on both sides, and thereupon forms his *interlocutory decree*, or *definitive sentence*, at his own discretion: from which there generally lies an *appeal*, in the several stages mentioned in the articles above referred to; though if the same be not appealed from him in 15 days, it is final, by the statute 25 Hen. VIII. c. 19.

But the point in which these jurisdictions are the most defective, is that of enforcing their sentences when pronounced; for which they have no other process but that of *excommunication;* which would be often despised by obstinate or profligate men, did not the civil law step in with its aid. See EXCOMMUNICATION.

ECCLESIASTICAL Corporations, are where the members that compose them are *spiritual* persons. They were erected for the furtherance of religion and perpetuating the rights of the church. See CORPORATIONS.

ECCLESIASTICAL State. See CLERGY.

ECCLESIASTICUS, an apocryphal book, generally bound up with the scriptures, so called, from its being read in the church, *ecclesia*, as a book of piety and instruction, but not of infallible authority.

The author of this book was a Jew, called *Jesus the son of Sirach*. The Greeks call it the *Wisdom of the son of Sirach*.

ECCOPROTICS, in medicine, laxative or loosening remedies, which purge gently, by softening the humours and excrements, and fitting them for expulsion.—The word is composed of the Greek particle εκ, and κοπρος *excrement.*

ECDICI, Εκδικοι, among the ancients, patrons of cities, who defended their rights, and took care of the public money. The office resembled that of the modern syndics.

ECHAPE, in the manege, a horse begot between a stallion and a mare of different breeds and countries.

ECHAPER, in the manege, a gallicism used in the academies implying to give a horse head, or to put on at full speed.

ECHENEIS, the REMORA, in ichthyology; a genus belonging to the order of thoracici. The head is fat, naked, depressed, and marked with a number of transverse ridges; it has ten rays in the branchiostege membrane; and the body is naked. There are two species, viz. 1. The Remora, or sucking-fish, with a forked tail, and 18 striæ on the head. It is found in the Indian ocean. 2. The neucrates, with an undivided tail, and 16 striæ on the head. It is likewise a native of the Indian ocean. These fishes are often found adhering so strongly to the sides of sharks and other great fish, by means of the structure of its head, as to be got off with difficulty. This fish was believed, by all the ancients to have most wonderful powers, and to be able, by adhering to the bottom, to arrest the

Plate CLXXIII.

the motion of a ſhip in its fulleſt courſe; and in love affairs, to deaden the warmeſt affections of both ſexes (*Plin.* lib. ix. c. 25.).

ECHEVIN, in the French and Dutch polity, a magiſtrate elected by the inhabitants of a city or town, to take care of their common concerns, and the decoration and cleanlineſs of the city.

At Paris, there is a prevôt and four echevins; in other towns, a mayor and echevins. At Amſterdam, there are nine echevins; and at Rotterdam ſeven.

In France, the echevins take cognizance of rents, taxes, and the navigation of rivers, &c. In Holland, they judge of civil and criminal cauſes; and if the criminal confeſſes himſelf guilty, they can ſee their ſentence executed without appeal.

ECHINATE, or ECHINATED, an appellation given to whatever is prickly, thereby reſembling the hedgehog.

ECHINITES, in natural hiſtory, the name by which authors call the foſſile centronia, frequently found in chalk-pits. See CENTRONIA.

ECHINOPHORA, in botany: A genus of the digynia order, belonging to the pentandria claſs of plants, and in the natural method ranking under the 45th order, *Umbellatæ*. The male florets are lateral, with the central one hermaphrodite; there is one ſeed, ſunk into an indurated involucrum.

ECHINOPS, in botany: A genus of the polygamia ſegregatæ order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The calyx is uniflorous; the corollulæ tubulated and hermaphrodite; the receptacle briſtly; the pappus indiſtinct.

ECHINUS, in zoology, a genus of inſects belonging to the order of vermes molluſca. The body is roundiſh, covered with a bony cruſt, and often beſet with moveable prickles; and the mouth is below, and conſiſts of five valves. 1. The eſculentus, or eatable echinus, is of a hemiſpherical form, covered with ſharp ſtrong ſpines, above half an inch long; commonly of a violet colour; moveable; adherent to ſmall tubercles elegantly diſpoſed in rows. Theſe are their inſtruments of motion by which they change their place. This ſpecies is taken in dredging, and often lodges in cavities of rocks juſt within low water mark. They are eaten by the poor in many parts of England, and by the better ſort abroad. In old times they were a favourite diſh. They were dreſſed with vinegar, honied wine or mead, parſley or mint; and thought to agree with the ſtomach. They were the firſt diſh in the famous ſupper of Lentulus, when he was made *flamen Martialis*, or prieſt of Mars. By ſome of the concomitant diſhes, they ſeem to have been deſigned as a whet for the ſecond courſe, to the holy perſonages, prieſts and veſtals invited on that occaſion. Many ſpecies of ſhell-fiſh made part of that entertainment. 2. The lacunoſus, or oval echinus, is of an oval depreſſed form; on the top it is of a purple colour, marked with a quadrefoil, and the ſpaces between tuberculated in waved rows; the lower ſide ſtudded, and divided by two ſmooth ſpaces. Length, four inches. When clothed, it is covered with ſhort thickſet briſtles mixed with very long ones. There are 15 other ſpecies, all natives of the ſea. See two ſpecimens delineated on Plate CLXXIII.

ECHINUS, in architecture, a member or ornament near the bottom of the Ionic, Corinthian, and Compoſite capitals.

ECHITES, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 30th order, *Contortæ*. There are two long and ſtraight follicles; the ſeeds pappous; the corolla funnel-ſhaped, with the throat naked. The corymboſa, a ſpecies of this genus, is ſuppoſed to yield the elaſtic gum according to Jaquin. See CAOUTCHOUC.

ECHIUM, VIPER'S BUGLOSS, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 41ſt order, *Aſperifoliæ*. The corolla is irregular, with the throat naked. There are ſeven ſpecies, three of which are natives of Britain. None of them have any remarkable property, except that the flowers of one ſpecies (the vulgare) are very grateful to bees. It is a native of many parts of Britain. The ſtem is rough with hairs and tubercles. The leaves are ſpear-ſhaped, and rough with hair. The flowers come out in lateral ſpikes. They are firſt red, afterwards blue; ſometimes purple or white.—Cows and ſheep are not fond of the plant; horſes and goats refuſe it.

ECHO, or ECCHO, a ſound reflected or reverberated from a ſolid, concave, body, and ſo repeated to the ear*. The word is formed from the Greek ηχος *ſound*, which comes from the verb ηχεω *ſono*. * See *Acouſtics*, n° 26.

The ancients being wholly unacquainted with the true cauſe of the echo, aſcribed it to ſeveral cauſes ſufficiently whimſical. The poets, who were not the worſt of their philoſophers, imagined it to be a perſon of that name metamorphoſed, and that ſhe affected to take up her abode in particular places; for they found by experience, that ſhe was not to be met with in all. (See below, ECHO in *fabulous hiſtory*.) But the moderns who know ſound to conſiſt in a certain tremor or vibration in the ſonorous body communicated to the contiguous air, and by that means to the ear, give a more conſiſtent account of echo.

For a tremulous body, ſtriking on another ſolid body, it is evident, may be repelled without deſtroying or diminiſhing its tremor; and conſequently a ſound may be redoubled by the reſilition of the tremulous body, or air.

But a ſimple reflection of the ſonorous air, is not enough to ſolve the echo: for then every plain ſurface of a ſolid hard body, as being fit to reflect a voice or ſound, would redouble it; which we find does not hold.

To produce an echo, therefore, it ſhould ſeem that a kind of concameration or vaulting were neceſſary, in order to collect, and by collecting to heighten and increaſe, and afterwards reflect, the ſound; as we find is the caſe in reflecting the rays of light, where a concave mirror is required.

IN effect, as often as a ſound ſtrikes perpendicularly on a wall, behind which is any thing of a vault or arch, or even another parallel wall; ſo often will it be reverberated in the ſame line, or other adjacent ones.

For an echo to be heard, therefore, it is neceſſary the ear be in the line of reflection: for the perſon who made the ſound to hear its echo, it is neceſſary he be per-

perpendicular to the place which reflects it: and for a manifold or tautological echo, it is necessary there be a number of walls, and vaults or cavities, either placed behind or fronting each other.

A single arch or concavity, &c. can scarce ever stop and reflect all the sound; but if there be a convenient disposition behind it, part of the sound propagated thither, being collected and reflected as before, will present another echo: or, if there be another concavity, opposed at a due distance to the former, the sound reflected from the one upon the other will be tossed back again by this latter, &c.

Many of the phenomena of echoes are well considered by the bishop of Leighs, &c. who remarks, that any sound, falling either directly or obliquely on any dense body of a smooth, whether plain or arched superficies, is reflected, or echoes, more or less. The surface, says he, must be smooth; otherwise the air, by reverberation, will be put out of its regular motion, and the sound thereby broken and extinguished. He adds, that it echoes more or less, to show, that when all things are as before described, there is still an echoing, tho' it be not always heard: either because the direct sound is too weak to beat quite back again to him that made it; or that it does return to him, but so weak, that it cannot be discerned; or that he stands in a wrong place to receive the reflected sound, which passes over his head, under his feet, or on one side of him; and which therefore may be heard by a man standing in the place where the reflected sound does come, provided no interposed body intercepts it, but not by him that first made it.

Echoes may be produced with different circumstances. For, 1. A *plane* obstacle reflects the sound back in its due tone and loudness; allowance being made for the proportionable decrease of the sound, according to its distance.

2. A *convex* obstacle reflects the sound somewhat smaller and somewhat quicker, though weaker, than otherwise it would be.

3. A *concave* obstacle echoes back the sound, bigger, slower, and also inverted; but never according to the order of words.

Nor does it seem possible to contrive any single echo, that shall invert the sound, and repeat backwards; because, in such case, the word last spoken, that is, which last occurs to the obstacle, must be repelled first; which cannot be. For where in the mean time should the first words hang and be concealed; or how, after such a pause, be revived, and animated again into motion?

From the determinate concavity or archedness of the reflecting bodies, it may happen that some of them shall only echo back one determinate note, and only from one place.

4. The echoing body being removed farther off, it reflects more of the sound than when nearer; which is the reason why some echoes repeat but one syllable, some one word, and some many.

5. Echoing bodies may be so contrived and placed, as that reflecting the sound from one to the other, either directly and mutually, or obliquely and by succession, out of one sound, a multiple echo or many echoes shall arise.

Add, that a multiple echo may be made, by so placing the echoing bodies at unequal distances, that they may reflect all one way, and not one on the other; by which means, a manifold successive sound will be heard; one clap of the hands, like many; one *ha*, like a laughter; one single word, like many of the same tone and accent; and so one viol, like many of the same kind, imitating each other.

Lastly, echoing bodies may be so ordered, that from any one sound given, they shall produce many echoes different both as to tone and intention. By which means a musical room may be so contrived, that not only one instrument playing therein shall seem many of the same sort and size, but even a concert of different ones, only by placing certain echoing bodies so, that any note played shall be returned by them in 3ds, 5ths, and 8ths.

Echo, is also used for the place where the repetition of the sound is produced or heard.

Echoes are distinguished into divers kinds, *viz.*

1. *Single*, which return the voice but once. Whereof some are *tonical*, which only return a voice when modulated into some particular musical tone: Others, *polysyllabical*, which return many syllables, words, and sentences. Of this last kind is that fine echo in Woodstock-park, which Dr Plott assures us, in the day-time, will return very distinctly seventeen syllables, and in the night twenty.

2. *Multiple*, or *tautological*; which return syllables and words the same oftentimes repeated.

In echoes, the place where the speaker stands is called the *centrum phonicum*; and the object or place that returns the voice, the *centrum phonocampticum*.

At the sepulchre of Metella, wife of Crassus, was an echo, which repeated what a man said five times. Authors mention a tower at Cyzicus, where the echo repeated seven times. One of the finest echoes we read of is that mentioned by Barthius, in his notes on Statius's *Thebais*, lib. vi. 30. which repeated the words a man uttered 17 times: it was on the banks of the Naha, between Coblentz and Bingen. Barthius assures us, that he proved what he writes; and had told 17 repetitions. And whereas, in common echoes, the repetition is not heard till some time after hearing the word spoke, or the notes sung; in this, the person who speaks or sings is scarce heard at all; but the repetition most clearly, and always in surprising varieties; the echo seeming sometimes to approach nearer, and sometimes to be further off. Sometimes the voice is heard very distinctly, and sometimes scarce at all. One hears only one voice, and another several: one hears the echo on the right, and the other on the left, &c. At Milan in Italy, is an echo which reiterates the report of a pistol 56 times; and if the report is very loud, upwards of 60 reiterations may be counted. The first 20 echoes are pretty distinct; but as the noise seems to fly away, and answer at a greater distance, the reiterations are so doubled, that they can scarce be counted. See an account of a remarkable echo under the article Paisley.

Echo, in architecture, a term applied to certain kinds of vaults and arches, most commonly of the elliptic and parabolic figures, used to redouble sounds, and produce artificial echoes.

Echo, in poetry, a kind of composition wherein the last words or syllables of each verse contains some meaning, which, being repeated apart, answers to some question

ſtion or other matter contained in the verſe; as in this beautiful one from Virgil:

Crudelis mater magis, an puer improbus ille?
Improbus ille puer, crudelis tu quoque mater.

The elegance of an echo conſiſts in giving a new ſenſe to the laſt words; which reverberate, as it were, the motions of the mind, and by that means affect it with ſurpriſe and admiration.

Echo, in fabulous hiſtory, a daughter of the Air and Tellus, who chiefly reſided in the vicinity of the Cephiſus. She was once one of Juno's attendants, and became the confident of Jupiter's amours. Her loquacity however diſpleaſed Jupiter, and ſhe was deprived of the power of ſpeech by Juno, and only permitted to anſwer to the queſtions which were put to her. Pan had formerly been one of her admirers, but he never enjoyed her favours. Echo, after ſhe had been puniſhed by Juno, fell in love with Narciſſus; but being deſpiſed by him, pined herſelf to death, having nothing but her voice left.

ECHOMETER, among muſicians, a kind of ſcale or rule, with ſeveral lines thereon, ſerving to meaſure the duration and length of ſounds, and to find their intervals and ratios.

ECHOUERIES. See under Trichecus.

ECKIUS (John), an eminent and learned divine, profeſſor in the univerſity of Ingoldſtadt, memorable for the oppoſition he gave to Luther, Melancthon, Caraloſtadius, and other leading Proteſtants in Germany. He wrote many polemical tracts; and among the reſt, a *Manual of Controverſies*, printed in 1535, in which he diſcourſes upon moſt of the heads conteſted between the Proteſtants and Papiſts. He was a man of uncommon learning, parts, and zeal, and died in 1543.

ECLECTICS (*eclectici*), a name given to ſome ancient philoſophers, who, without attaching themſelves to any particular ſect, took what they judged good, and ſolid, from each. Hence their denomination; which, in the original Greek, ſignifies, "that may be choſen," or "that chooſes;" of the verb εκλεγω *I chooſe*.—Laertius notes, that they were alſo, for the ſame reaſon, denominated *analogetici*; but that they call themſelves *Philalethes*, i. e. lovers of truth.

The chief or founder of the eclectici was one Potamon of Alexandria, who lived under Auguſtus and Tiberius; and who, weary of doubting of all things with the Sceptics and Pyrrhonians, formed the eclectic ſect; which Voſſius calls the *eclective*.

Towards the cloſe of the ſecond century a ſect aroſe in the Chriſtian church under the denomination of *Eclectics*, or modern *Platonics*. They profeſſed to make truth the only object of their enquiry, and to be ready to adopt from all the different ſyſtems and ſects, ſuch tenets as they thought agreeable to it. However, they preferred Plato to the other philoſophers, and looked upon his opinions concerning God, the human ſoul, and things inviſible, as conformable to the ſpirit and genius of the Chriſtian doctrine. One of the principal patrons of this ſyſtem was Ammonius Saccas, who at this time laid the foundation of that ſect, afterwards diſtinguiſhed by the name of the new *Platonics*, in the Alexandrian ſchool. See Ammonius and Platonists.

Eclectics were alſo a certain ſet of phyſicians among the ancients, of whom Archigenes, under Trajan, was the chief, who ſelected from the opinions of all the other ſects, that which appeared to them beſt and moſt rational; hence they were called *eclectics*, and their preſcriptions *medicina eclectica*.

ECLIPSE, in aſtronomy, the deprivation of the light of the ſun, or of ſome heavenly body, by the interpoſition of another heavenly body between our ſight and it. See Astronomy-*Index*.

ECLIPTA, in botany; a genus of the polygamia ſuperflua-order, belonging to the ſyngeneſia claſs of plants. The receptacle is chaffy; there is no pappus, and the corollulæ of the diſk quadrifid.

ECLIPTIC, in aſtronomy, a great circle of the ſphere, ſuppoſed to be drawn through the middle of the zodiac, making an angle with the equinoctial of about 23° 30′, which is the ſun's greateſt declination; or, more ſtrictly ſpeaking, it is that path or way among the fixed ſtars, that the earth appears to deſcribe to an eye placed in the ſun. See Astronomy-*Index*.

Some call it *via Solis*, "the way of the ſun;" becauſe the ſun in his apparent annual motions never deviates from it, as all the other planets do more or leſs.

Ecliptic, in geography, a great circle on the terreſtrial globe, not only anſwering to, but falling within, the plane of the celeſtial ecliptic. See Geography.

ECLOGUE, in poetry, a kind of paſtoral compoſition, wherein ſhepherds are introduced converſing together. The word is formed from the Greek εκλογη *choice*; ſo that, according to the etymology, *eclogue* ſhould be no more than a ſelect or choice piece; but cuſtom has determined it to a farther ſignification, viz. a little elegant compoſition in a ſimple natural ſtyle and manner.

Idyllion and eclogue, in their primary intention, are the ſame thing: thus, the idyllia, ειδυλλια, of Theocritus, are pieces wrote perfectly in the ſame vein with the *eclogæ* of Virgil. But cuſtom has made a difference between them, and appropriated the name *eclogue* to pieces wherein ſhepherds are introduced ſpeaking; *idyllion*, to thoſe wrote like the eclogue, in a ſimple natural ſtyle, but without any ſhepherds in them.

ECLUSE, a ſmall but ſtrong town of the Dutch Low Countries, in the county of Flanders, with a good harbour and ſluices. The Engliſh beſieged it in vain in 1405, and the people of Bruges in 1436. But the Dutch, commanded by Count Maurice of Naſſau, took it in 1644. It is defended by ſeveral forts, and ſtands near the ſea. E. Long. 3. 10. N. Lat. 50. 25.

ECPHRACTICS, in medicine, remedies which attenuate and remove obſtructions. See Attenuants, and Deobstruents.

ECSTASY. See Extasy.

ECSTATICI, Εκϛατικοι, from εξιϛημι *I am entranced*, in antiquity, a kind of diviners who were caſt into trances or ecſtaſies, in which they lay like dead men, or aſleep, deprived of all ſenſe and motion; but, after ſome time, returning to themſelves, gave ſtrange relations of what they had ſeen and heard.

ECTHESIS, in church-hiſtory, a confeſſion of faith, in the form of an edict, publiſhed in the year 639, by the emperor Heraclius, with a view to pacify the troubles occaſioned by the Eutychian hereſy in the eaſtern church. However, the ſame prince revoked it,

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on being informed that pope Severinus had condemned it, as favouring the Monothelites; declaring at the same time, that Sergius, patriarch of Constantinople, was the author of it.

ECTHLIPSIS, among Latin grammarians, a figure of prosody whereby the *m* at the end of a word, when the following word begins with a vowel, is elided, or cut off, together with the vowel preceding it, for the sake of the measure of the verse: thus they read *mult' ille*, or *multum ille*.

ECTROPIUM, in surgery, is when the eye-lids are inverted, or retracted, so that they show their internal or red surface, and cannot sufficiently cover the eye.

ECTYLOTICS, in pharmacy, remedies proper for consuming callosities.

ECU, or Escu, a French crown; for the value of which, see Money.

EDDA, in antiquities, is a system of the ancient Icelandic or Runic mythology, containing many curious particulars of the theology, philosophy, and manners, of the northern nations of Europe; or of the Scandinavians, who had migrated from Asia, and from whom our Saxon ancestors were descended. Mr Mallet apprehends that it was originally compiled, soon after the Pagan religion was abolished, as a course of poetical lectures, for the use of such young Icelanders as devoted themselves to the profession of a *scald* or poet. It consists of two principal parts; the *first* containing a brief system of mythology, properly called the *Edda*; and the *second* being a kind of art of poetry, and called *scalda* or *poetics*. The most ancient Edda was compiled by Soemund Sigfusson, surnamed the *Learned*, who was born in Iceland about the year 1057. This was abridged, and rendered more easy and intelligible about 120 years afterwards, by Snorro Sturleson, who was supreme judge of Iceland in the years 1215 and 1222; and it was published in the form of a dialogue. He added also the second part in the form of a dialogue, being a detail of different events transacted among the divinities. The only three pieces that are known to remain of the more ancient Edda of Soemund, are the Voluspa, the Havamaal, and the Runic chapter. The Voluspa, or prophecy of Vola or Fola, appears to be the text, on which the Edda is the comment. It contains in two or three hundred lines the whole system of mythology, disclosed in the Edda, and may be compared to the Sibylline verses, on account of its laconic yet bold style, and its imagery and obscurity. It is professedly a revelation of the decrees of the Father of nature, and the actions and operations of the gods. It describes the chaos, the formation of the world, with its various inhabitants, the function of the gods, their most signal adventures, their quarrels with Loke their great adversary, and the vengeance that ensued; and concludes with a long description of the final state of the universe, its dissolution and conflagration, the battle of the inferior deities, and the evil beings, the renovation of the world, the happy lot of the good, and the punishment of the wicked. The Havamaal, or Sublime Discourse, is attributed to the god Odin, who is supposed to have given these precepts of wisdom to mankind; it is comprised in about 120 stanzas, and resembles the book of Proverbs. Mr Mallet has given several extracts of this treatise on the Scandinavian ethics. The Runic chapter contains a short system of ancient magic, and especially of the enchantments wrought by the operation of Runic characters, of which Mr Mallet has also given a specimen. A manuscript copy of the Edda of Snorro is preserved in the library of the university of Upsal; the first part of which hath been published with a Swedish and Latin version by M. Goranson. The Latin version is printed as a supplement to M. Mallet's Northern Antiquities. The first edition of the Edda was published by Resenius, professor at Copenhagen, in a large quarto volume, in the year 1665; containing the text of the Edda, a Latin translation by an Icelandic priest, a Danish version, and various readings from different MSS. M. Mallet, has also given an English translation of the first part, accompanied with remarks; from which we learn, that the Edda teaches the doctrine of the Supreme, called the *Universal Father*, and *Odin*, who lives for ever, governs all his kingdom, and directs the great things as well as the small; who formed the heaven, earth, and air; made man, and gave him a spirit or soul, which shall live, after the body shall have mouldered away; and then all the just shall dwell with him in a place *Gimle* or *Vingolf*, the palace of friendship; but wicked men shall go to Hela, or death, and from thence to Nifleheim, or the abode of the wicked, which is below in the ninth world. It inculcates also the belief of several inferior gods and goddesses, the chief of whom is Frigga or Frea, i. e. *lady*, meaning hereby the earth, who was the spouse of Odin or the Supreme God; whence we may infer that, according to the opinion of these ancient philosophers, this Odin was the active principle or soul in the world, which uniting itself with matter, had thereby put it into a condition to produce the intelligences or inferior gods, and men and all other creatures. The Edda likewise teaches the existence of an evil being called *Loke*, the calumniator of the gods, the artificer of fraud, who surpasses all other beings in cunning and perfidy. It teaches the creation of all things out of an abyss or chaos; the final destruction of the world by fire; the absorption of the inferior divinities, both good and bad, into the bosom of the grand divinity, from whom all things proceeded, as emanations of his essence, and who will survive all things; and the renovation of the earth in an improved state.

EDDISH, or Eadish, the latter pasture or grass that comes after mowing or reaping; otherwise called *eagrass* or *earsh* and *etch*.

EDDOES or Edders, in botany; the American name of the Arum *esculentum*.

EDDY (Saxon), of *ed* "backward," and *ea* "water," among seamen, is where the water runs back contrary to the tide; or that which hinders the free passage of the stream, and so causes it to return again. That eddy water which falls back, as it were, on the rudder of a ship under sail, the seamen call the *dead-water*.

Eddy-Wind is that which returns or is beat back from a sail, mountain, or any thing that may hinder its passage.

EDELINCK (Gerard), a famous engraver, born at Antwerp, where he was instructed in drawing and engraving. He ſettled at Paris, in the reign of Louis XIV. who made him his engraver in ordinary. Edelinck was alſo counſellor in the Royal Academy of Painting. His works are particularly eſteemed for the neatneſs of the engraving, their brilliant caſt, and the prodigious eaſe apparent in the execution; and to this facility is owing the great number of plates we have of his; among which are excellent portraits of a great number of illuſtrious men of his time. Among the moſt admired of his prints, the following may be ſpecified as holding the chief place. 1. A Battle between four Horſemen, with three figures lying ſlain upon the ground, from Leonardo da Vinci. 2. A holy Family, with Elizabeth, St John, and two Angels, from the famous picture of Raphael in the king of France's collection. The firſt impreſſions are before the arms of M. Colbert were added at the bottom of the plate; the ſecond are with the arms; and in the third they are taken out, but the place where they had been inſerted is very perceptible. 3. Mary Magdalen bewailing her ſins, and trampling upon the riches of the world, from Le Brun. The firſt impreſſions are without the narrow border which ſurrounds the print. 4. Alexander entering into the Tent of Darius, a large print on two plates, from Le Brun. This engraving belongs to the three battles, and triumphal entry of Alexander into Babylon, by Girard Audran, and completes the ſet. The firſt impreſſions have the name of *Goyton* the printer at the bottom. 5. Alexander entering into the Tent of Darius (finiſhed by P. Drevet), from Peter Mignard. Edelinck died in 1707, in an advanced age, at the Hotel Royal at the Gobelins, where he had an apartment. He had a brother named *John*, who was a ſkilful engraver, but died young.

EDEN (Moſes), the name of a country, with a garden, in which the progenitors of mankind were ſettled by God himſelf: The term denotes pleaſure or delight. It would be endleſs to recount the ſeveral opinions concerning its ſituation, ſome of them very wild and extravagant. Moſes ſays, that "a river went out of Eden to water the garden, and from thence it was parted and became into four heads." This river is ſuppoſed to be the common channel of the Euphrates and Tigris, after their confluence; which parted again, below the garden, into two different channels: ſo that the two channels before, and the other two after their confluence, conſtitute the heads mentioned by Moſes. Which will determine the ſituation of the garden to have been in the ſouth of Meſopotamia, or in Babylonia. The garden was alſo called *Paradiſe;* a term of Perſic original, denoting a garden. See PARADISE.

EDGINGS, in gardening, the ſeries of ſmall but durable plants, ſet round the edges or borders of flower-beds, &c. The beſt and moſt durable of all plants for this uſe, is box; which, if well planted, and rightly managed, will continue in ſtrength and beauty for many years. The ſeaſons for planting this, are the autumn, and very early in the ſpring: and the beſt ſpecies for this purpoſe is the dwarf Dutch box.

Formerly, it was alſo a very common practice to plant borders, or edgings, of aromatic herbs; as thyme, ſavory, hyſſop, lavender, and the like: but theſe are all apt to grow woody, and to be in part, or wholly, deſtroyed in hard winters. Daiſies, thrift, or ſea july-flower, and camomile, are alſo uſed by ſome for this purpoſe: but they require yearly tranſplanting, and a great deal of trouble, elſe they grow out of form; and they are alſo ſubject to periſh in very hard ſeaſons.

EDHILING, or EDHILINGUS, an ancient appellation of the nobility among the Anglo-Saxons.

The Saxon nation, ſays Nithard (Hiſt. lib. iv.) is divided into three orders or claſſes of people; the *edhilingi,* the *frilingi,* and the *lazzi;* which ſignify the nobility, the freemen, and the vaſſals or ſlaves.

Inſtead of *edhiling*, we ſometimes meet with *atheling*, or *ætheling;* which appellation was likewiſe given to the king's ſon, and the preſumptive heir of the crown. See ATHELING.

EDICT, in matters of polity, an order or inſtrument, ſigned and ſealed by a prince, to ſerve as a law to his ſubjects. We find frequent mention of the edicts of the prætor, the ordinances of that officer in the Roman law. In the French law, the edicts are of ſeveral kinds: ſome importing a new law or regulation; others, the erection of new offices; eſtabliſhments of duties, rents, &c.; and ſometimes articles of pacification. In France, edicts are much the ſame as a proclamation is with us: but with this difference, that the former have the authority of a law in themſelves, from the power which iſſues them forth; whereas the latter are only declarations of a law, to which they refer, and have no power in themſelves.

EDILE, or ÆDILE. See ÆDILE.

EDINBURGH, a city of Mid-Lothian in Scotland, ſituated in W. Long. 3°, and N. Lat. 56°, near the ſouthern bank of the river Forth.—The origin of the name, like that of moſt other cities, is very uncertain. 1 Origin of the name.
Some imagine it to be derived from Eth, a ſuppoſed king of the Picts; others from Edwin, a Saxon prince of Northumberland, who over-ran the whole or greateſt part of the territories of the Picts about the year 617; while others chooſe to derive it from two Gaelic words *Dun Edin*, ſignifying the face of a hill. The name *Edinburgh* itſelf, however, ſeems to have been unknown in the time of the Romans. The moſt ancient title by which we find this city diſtinguiſhed is that of *Caſtelh Mynyd Agned*; which, in the Britiſh language, ſignifies "the fortreſs of the hill of St Agnes." Afterwards it was named *Caſtrum Puellarum*, becauſe the Pictiſh princeſſes were educated in the caſtle (a neceſſary protection in thoſe barbarous ages) till they were married.—The ages in which theſe names were given cannot indeed now be exactly aſcertained: but the town certainly cannot boaſt of very great antiquity; ſince, as Mr Whittaker informs us, the celebrated King Arthur fought a battle on the ſpot where it is ſituated towards the end of the fifth century. 2 Time of its foundation uncertain.

The Romans, during the time they held the dominion of part of this iſland, divided their poſſeſſions into ſix provinces. The moſt northerly of theſe was called *Valentia,* which comprehended all the ſpace between the walls of ADRIAN and SEVERUS. Thus, Edinburgh, lying on the very out-ſkirts of that province which was moſt expoſed to the ravages of the barbarians, became per-

Edinburgh. perpetually subject to wars and devastations; by means of which, the time of its first foundation cannot now be guessed at.

The castle is certainly very ancient. It continued in the hands of the Saxons or English from the invasion of Octa and Ebusa in the year 452 till the defeat of Egfrid king of Northumberland in 685 by the Picts, who then repossessed themselves of it. The Saxon kings of Northumberland reconquered it in the ninth century; and it was retained by their successors till the year 956, when it was given up to Indulphus king of Scotland. In 1093 it was unsuccessfully besieged by the usurper Donald Bane. Whether the city was at that time founded or not is uncertain. Most probably it was: for as protection from violence was necessary in those barbarous ages, the castle of Edinburgh could not fail of being an inducement to many people to settle in its neighbourhood; and thus the city would gradually be founded and increase.—In 1128, King David I. founded the Abbey of Holyroodhouse, for certain canons regular; and granted them a charter, in which he styled the town *Burgo meo de Elwinesburg*, "my borough of Edinburgh." By the same charter he granted these canons 40 shillings yearly out of the town revenues; and likewise 48 shillings more, from the same, in case of the failure of certain duties payable from the king's revenue; and likewise one half of the tallow, lard, and hides, of all the beasts killed in Edinburgh.

3
Castle surrendered to the English.

In 1174, the castle of Edinburgh was surrendered to Henry II. of England, in order to purchase the liberty of King William I. who had been defeated and taken prisoner by the English. But when William recovered his liberty, he entered into an alliance with Henry, and married his cousin Ermengarde; upon which the castle was restored as part of the queen's dower.

In 1215, this city was first distinguished by having a parliament and provincial synod held in it.—In 1296, the castle was besieged and taken by Edward I. of England; but was recovered in 1313 by Randolf Earl of Moray, who was afterwards regent of Scotland during the minority of King David II. At last King Robert destroyed this fortress, as well as all others in Scotland, lest they should afford shelter to the English in any of their after incursions into Scotland.—It lay in ruins for a considerable number of years; but was afterwards rebuilt by Edward III. of England, who placed a strong garrison in it.

In 1341 it was reduced by the following stratagem. A man, pretending to be an English merchant, came to the governor, and told him that he had on board his ship in the Forth some wine, beer, biscuits, &c. which he would sell him on very reasonable terms. A bargain being made, he promised to deliver the goods next morning at a very reasonable rate: but at the time appointed, twelve men, disguised in the habit of sailors, entered the castle with the goods and supposed merchant; and having instantly killed the porter and centinels, Sir William Douglas, on a preconcerted signal, rushed in with a band of armed men, and quickly made himself master of the place, after having cut most of the garrison in pieces.

4
Cruel execution of the murderers of James I.

The year 1437 is remarkable for the execution of the Earl of Athol and his accomplices, who had a concern in the murder of James I. The crime, it must be owned, was execrable; but the punishment was altogether shocking to humanity. For three days successively the assassins were tortured by putting on their heads iron crowns heated red hot, dislocating their joints, pinching their flesh with red hot pincers, and carrying them in that dreadful situation through the streets upon hurdles. At last an end was put to their sufferings, by cutting them up alive, and sending the parts of their mangled bodies to the principal towns of the kingdom.

5
Edinburgh becomes the capital of Scotland.

About the end of the 14th century it was customary to consider Edinburgh as the capital of the kingdom. The town of Leith, with its harbour and mills, had been bestowed upon it by Robert I. in 1329; and his grandson John Earl of Carrick, who afterwards ascended the throne by the name of Robert III. conferred upon all the burgesses the singular privilege of building houses in the castle, upon the sole condition that they should be persons of good fame; which we must undoubtedly consider as a proof that the number of these burgesses was at that time very small. In 1461 a very considerable privilege was conferred on the city by Henry VI. of England when in a state of exile; *viz.* that its inhabitants should have liberty to trade to all the English ports on the same terms with the city of London. This extraordinary privilege was bestowed in consequence of the kindness with which that king was treated in a visit to the Scottish monarch at Edinburgh; but as Henry was never restored, his gratitude was not attended with any benefit to this city. From this time, however, its privileges continued to be increased from various causes. In 1482 the citizens had an opportunity of liberating King James from the oppression of his nobles, by whom he had been imprisoned in the castle. On this account the provost was by that monarch made hereditary high sheriff within the city, an office which he continues still to enjoy. The council at the same time were invested with the power of making laws and statutes for the government of the city; and the trades, as a testimony of the royal gratitude for their loyalty, received the banner known by the name of the *Blue Blanket*; an ensign formerly capable of producing great commotions, but which has not now been displayed for many years past. However, it still exists; and the convener of the trades has the charge of keeping it.

6
Venereal disease imported.

It was not long after the discovery of America that the venereal disease, imported from that country, made its way to Edinburgh. As early as 1497, only five years after the voyage of Columbus, we find it looked upon as a most dreadful plague; and the unhappy persons affected with it were separated as effectually as possible from society. The place of their exile was Inchkeith, a small island near the middle of the Forth; which, small as it is, has a spring of fresh water, and now affords pasture to some sheep.

Origin of the town-guard.

By the overthrow of James IV. at the battle of Flowden, the city of Edinburgh was overwhelmed with grief and confusion, that monarch having been attended in his unfortunate expedition by the Earl of Angus, then provost, with the rest of the magistrates, and a number of the principal inhabitants, most of whom perished in the battle. After this disaster, the inhabitants being alarmed for the safety of their city,

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it was enacted that every fourth man ſhould keep watch at night; the fortifications of the town were renewed, the wall being alſo extended in ſuch a manner as to encloſe the Graſsmarket, and the field on which Heriot's Hoſpital, the Grey Friars Church, and Charity Workhouſe, ſtand. On the eaſt ſide it was made to encloſe the College, Infirmary, and High School; after which, turning to the north, it met the old wall at the Netherbow-port. After this alarm was over, the inhabitants were gradually relieved from the trouble of watching at night, and a certain number of militia appointed to prevent diſturbances; who continue to this day, and are known by the name of the *Town Guard*. Before theſe new encloſures, moſt of the principal people lived in the Cowgate without the wall; and the burying place was ſituated where the Parliament Cloſe now is. In theſe days of peace, when no alarm of an enemy is at all probable, great part of the walls, with all the gates, have been taken down, and the city laid quite open, in order to afford more ready paſſage to the great concourſe of people with whom the ſtreet is daily filled. But at the period we ſpeak of, not only were the inhabitants much leſs numerous by reaſon of the ſmall extent of the city, but it was depopulated by a dreadful plague: ſo that, to ſtop if poſſible the progreſs of the infection, all houſes and ſhops were ſhut up for 14 days, and ſome where infected perſons had died were pulled down altogether.

8
Erection of wooden houſes.

In 1504, the tract of ground called the *Burrough Muir* was totally overgrown with wood, though now it affords not the ſmalleſt veſtige of having been in ſuch a ſtate. So great was the quantity at that time, however, that it was enacted by the town-council, that whoever inclined to purchaſe as much wood as was ſufficient to make a new front for their houſe, might extend it ſeven feet into the ſtreet. Thus the city was in a ſhort time filled with houſes of wood inſtead of ſtone; by which, beſides the inconvenience of having the ſtreet narrowed 14 feet, and the beauty of the whole entirely marred, it became much more liable to accidents by fire: but almoſt all theſe are now pulled down; and in doing this a ſingular taſte in the maſonry which ſupported them is ſaid to have been diſcovered.

9
Edinburgh deſtroyed by the Engliſh.

1542, a war with England having commenced through the treachery of Cardinal Beaton, an Engliſh fleet of 200 ſail entered the Forth; and having landed their forces, quickly made themſelves maſters of the towns of Leith and Edinburgh. They next attacked the caſtle, but were repulſed from it with loſs; and by this they were ſo enraged, that they not only deſtroyed the towns of Edinburgh and Leith, but laid waſte the country for a great way round.—Theſe towns, however, ſpeedily recovered from their ruinous ſtate; and, in 1547, Leith was again burned by the Engliſh after the battle of Pinkey, but Edinburgh was ſpared.

Several diſturbances happened in this capital at the time of the Reformation, of which an account is given under the article SCOTLAND; but none of theſe greatly affected the city till the year 1570, at which time there was a civil war on account of Q. Mary's forced reſignation. The regent, who was one of the contending parties, bought the caſtle from the perfidious governor (Balfour) for 5000l. and the priory of Pittenweem. He did not, however, long enjoy the fruits of this infamous bargain. Sir William Kirkaldy, the new governor, a man of great integrity and bravery, declared for the Queen. The city in the mean time was ſometimes in the hands of one party and ſometimes of another; during which contentions, the inhabitants, as may eaſily be imagined, ſuffered extremely. In the year 1570 abovementioned, Queen Elizabeth ſent a body of 1000 foot and 300 horſe, under the command of Sir William Drury, to aſſiſt the king's party. The caſtle was ſummoned to ſurrender; and ſeveral ſkirmiſhes happened during the ſpace of two years, in which a kind of predatory war was carried on. At laſt a truce was agreed on till the month of January 1573; and this opportunity the Earl of Morton, now regent, made uſe of to build two bulwarks acroſs the high-ſtreet, nearly oppoſite to the tolbooth, to defend the city from the fire of the caſtle.

10
Siege of the caſtle in Queen Elizabeth's time.

On the firſt of January, early in the morning, the governor began to cannonade the city. Some of the cannon was pointed againſt the fiſh-market, then held on the high ſtreet; and the bullets falling among the fiſhes, ſcattered them about in a ſurpriſing manner, and even drove them up ſo high in the air, that they fell down upon the tops of the houſes. This unuſual ſpectacle having brought a number of people out of their houſes, ſome of them were killed and others dangerouſly wounded. Some little time afterwards, ſeveral houſes were ſet on fire by ſhot from the caſtle, and burned to the ground; which greatly enraged the people againſt the governor.—A treaty was at laſt concluded between the leaders of the oppoſite factions; but Kirkaldy refuſed to be comprehended in it. The regent therefore ſolicited the aſſiſtance of Queen Elizabeth, and Sir William Drury was again ſent into Scotland with 1500 foot and a train of artillery. The caſtle was now beſieged in form, and batteries raiſed againſt it in different places. The governor defended himſelf with great bravery for 33 days; but finding moſt of the fortifications demoliſhed, the well choaked up with rubbiſh, and all ſupplies of water cut off, he was obliged to ſurrender. The Engliſh general, in the name of his miſtreſs, promiſed him honourable treatment; but the Queen of England ſhamefully gave him up to the regent, by whom he was hanged.

Soon after this, the ſpirit of fanaticiſm, which ſomehow or other ſucceeded the Reformation, produced violent commotions, not only in Edinburgh, but thro' the whole kingdom. The foundation of theſe diſturbances, and indeed of moſt others which have ever happened in Chriſtendom on account of religon, was that pernicious maxim of Popery, that the church is independent of the ſtate. It is not to be ſuppoſed that this maxim was at all agreeable to the ſovereign; but ſuch was the attachment of the people to the doctrines of the clergy, that King James found himſelf obliged to compound matters with them. This, however, anſwered the purpoſe but very indifferently; and at laſt a violent uproar was excited. The King was then ſitting in the Court of Seſſion, which was held in the Tolbooth, when a petition was preſented to him by ſix perſons, lamenting the dangers which threatened religion; and being treated with very little reſpect by one Bruce a miniſter, his Majeſty aſked who they were that dared to convene againſt his proclamation? He was anſwered

11
The city incurs the diſpleaſure of James VI.

ed by Lord Lindsay, that they dared to do more, and would not suffer religion to be overthrown. On this the King perceiving a number of people crowding into the room, withdrew into another without making any reply, ordering the door to be shut. By this the petitioners were so much enraged, that on their return to the church the most furious resolutions were taken; and had it not been for the activity of Sir Alexander Home the provost, and Mr Watt the deacon-convener who assembled the crafts in his Majesty's behalf, it is more than probable that the door would have been forced, and an end put to his life. This affront was so much resented by the King, that he thought proper to declare Edinburgh an unfit place of residence for the court or the administration of justice. In consequence of this declaration, he commanded the college of justice, the inferior judges, and the nobility and barons, to retire from Edinburgh, and not to return without express licence. This unexpected declaration threw the whole town into consternation, and brought back the magistrates and principal inhabitants to a sense of their duty. With the clergy it was far otherwise. They railed against the King in the most furious manner; and endeavouring to persuade the people, to take up arms, the magistrates were ordered to imprison them: but they escaped by a timely flight. A deputation of the most respectable burgesses was then sent to the King at Linlithgow, with a view to mitigate his resentment. But he refused to be pacified; and on the last day of December 1596 entered the town between two rows of his soldiers who lined the streets, while the citizens were commanded to keep within their houses. A convention of the estates was held in the Tolbooth, before whom the magistrates made the most abject submissions, but all in vain. The convention declared one of the late tumults, in which an attack had been made upon the King's person, to be high treason; and ordained, that if the magistrates did not find out the authors, the city itself should be subjected to all the penalties due to that crime. It was even proposed to raze the town to the foundation, and erect a pillar on the spot where it had stood, as a monument of its crimes. The inhabitants were now reduced to the utmost despair; but Queen Elizabeth interposing in behalf of the city, the King thought proper to abate somewhat of his rigour. A criminal prosecution, however, was commenced, and the town-council were commanded to appear at Perth by the first of February. On their petition, the time for their appearance was prolonged to the first of March; and the attendance of 13 of the common-council was declared sufficient, provided they had a proper commission from the rest. The trial commenced on the fifth day of the month; and one of the number having failed in his attendance, the cause was immediately decided against the council: they were declared rebels, and their revenues forfeited.

12 Is again received into favour.

For 15 days the city continued in the utmost confusion; but at last, on their earnest supplication, and offering to submit entirely to the King's mercy, the community were restored on the following conditions, which they had formerly proffered: That they should continue to make a most diligent search for the authors of the tumult, in order to bring them to condign punishment; that none of the seditious ministers should be allowed to return to their charges, and no others admitted without his Majesty's consent; and that in the election of their magistrates they should present a list of the candidates to the King and his lords of council and session, whom his Majesty and their lordships might approve or reject at pleasure. To these conditions the King now added some others; *viz.* that the houses which had been possessed by the ministers should be delivered up to the King; and that the clergymen should afterwards live dispersed through the town, every one in his own parish: That the town-council house should be appointed for accommodating the court of exchequer; and that the town should become bound for the safety of the lords of session from any attempts of the burgesses, under a penalty of 40,000 merks; and, lastly, that the town should immediately pay 20,000 merks to his Majesty.

Upon these terms a reconciliation took place; which appears to have been very complete, as the King not only allowed the degraded ministers to be replaced, but in 1610 conferred a mark of his favour on the town, by allowing the provost to have a sword of state carried before him, and the magistrates to wear gowns on public occasions. In 1618 he paid his last visit to this city, when he was received with the most extravagant pomp and magnificence. See SCOTLAND.

13 Proceedings of the magistrates, &c.

The events which during this period, regard the internal police of the city, were principally the following. After the unfortunate battle at Pinkey, the magistrates, probably apprehending that now their power was enlarged by reason of the common calamity, proceeded in some respects in a very arbitrary manner; forcing the inhabitants to furnish materials for the public works; enjoining merchants to bring home silver to be coined at the mint; and ordering lanterns to be hung out at proper places to burn till nine at night, &c. Another invasion from England being apprehended in 1558, the city raised 1450 men for its defence, among whom there are said to have been 200 tailors, so that their profession seems to have been in a very flourishing state at that time. During the disturbances which happened at the reformation, and of which a particular account is given under the article SCOTLAND, it was enacted, that the figure of St Giles should be cut out of the town standard, and that of a thistle inserted in its place. It was likewise enacted, that none but those who professed the reformed religion should serve in any office whatever; and the better to preserve that extraordinary appearance of sanctity which was affected, a pillar was erected in the North Loch, for the purpose of ducking fornicators.

In 1595, the boys of the High School rose against their masters; and such was the barbarism of those days, that one of these striplings shot a magistrate with a pistol, who had come along with the rest to reduce them to obedience. The reason of the uproar was, that they were in that year refused two vacations, which had been customary in former times: however, they were at last obliged to submit, and ever since have been allowed only one for about six weeks in the autumn. The same year the house of one of the bailies was assaulted by the tradesmens sons, assisted by journeymen who had not received the freedom of the town; he escaped with his life, but the offenders were banished the city for ever.

Im-

14 Disturbances in the time of Charles I.

In the beginning of the reign of Charles I. a perfect harmony seems to have subsisted between the court and the city of Edinburgh; for in 1627 king Charles I. presented the city with a new sword and gown to be worn by the provost at the times appointed by his father James VI. Next year he paid a visit to this capital, and was received by the magistrates in a most pompous manner; but soon after this the disturbances arose which were not terminated but by the death of that unfortunate monarch. These commenced on an attempt of Charles to introduce Episcopacy into the kingdom; and the first step towards this was the erection of the three Lothians and part of Berwick into a diocese, Edinburgh being the episcopal seat, and the church of St Giles the cathedral. An account of the disturbance occasioned by the first attempt to read the prayer-book there, is given under the article BRITAIN; but though the attempt was given over, the minds of the people were not to be quieted. Next winter they resorted to town in such multitudes, that the privy-council thought proper to publish two acts; by one of which the people were commanded, under severe penalties, to leave the town in 24 hours; and by the other, the court of session was removed to Linlithgow. The populace and their leaders were so much enraged by the latter, that lord Traquair and some of the bishops narrowly escaped with their lives; and next year (1638) matters became still more serious. For now, the king having provoked his subjects throughout all Scotland with the innovations he attempted in religion, Edinburgh was made the general place of rendezvous, and the most formidable associations took place; an account of which has already been given under the article BRITAIN. Each of the towns in Scotland had a copy; and that which belonged to Edinburgh, crowded with 5000 names, is still preserved among the records of the city. Notwithstanding this disagreement, however, the king once more visited Edinburgh in 1641, and was entertained by the magistrates at an expence of 12,000l. Scots. It does not appear that after this the city was in any way particularly concerned with the disturbances which followed either throughout the remainder of the reign of Charles I. the commonwealth, or the reign of Charles II. In 1680 the duke of York with his duchess, the princess Anne, and the whole court of Scotland, were entertained by the city in the Parliament House, at the expence of 15,000l. Scots. At this time it is said that the scheme of building the bridge over the North Loch was first projected by the duke.

15 Regulations made by the magistrates.

From the time that king James VI. paid his last visit to Edinburgh in 1618, till the time of the union in 1707, a considerable number of private regulations were made by the magistrates; some of them evidently calculated for the good of the city, others strongly characteristic of that violent spirit of fanaticism which prevailed so much in the last century. Among the former was an act passed in 1621, that the houses, instead of being covered with straw or boards, should have their roofs constructed of slate, tiles, or lead. This act was renewed in 1667; and in 1698 an act was passed regulating their height also. By this they were restrained to five stories, and the thickness of the wall determined to be three feet at bottom. In 1684 a lantern with a candle was ordered to be hung out in the first floor of every house in order to light the streets at night; and there were two coaches with four horses each ordered to be bought for the use of the magistrates; but it does not appear how long they continued to be used. In 1681 the court of session discontinued its sittings in summer: but as this was found to be attended with inconvenience, an act was passed for their restoration, which has continued ever since. During the time of the civil war in 1649, the city was visited by the plague, which is the last time that dreadful distemper hath made its appearance in this country. The infection was so violent, that the city was almost depopulated, the prisoners were discharged from the tolbooth, and an act was made for giving one Dr Joannes Politius a salary of 80l. Scots per month, for visiting those who were infected with the disease. In 1677 the first coffee-houses were allowed to be opened, but none without a licence: and the same year the town-council regulated the price of penny-weddings; ordaining the men to pay no more than two shillings, and the women 18 pence; very extravagant prices having been exacted before.

In contradistinction to these salutary acts, we may state those which show an extravagant desire of preserving the appearance of virtue in the female sex, as if it had been possible for others to inspire them with virtuous notions if they had not imbibed them of themselves. In 1633 an act of council was passed, by which women were forbidden to wear plaids over their faces, under penalty of five pounds and the forfeiture of the plaid for the first fault. Banishment was the punishment of the third. The reason assigned for this act was, that matrons were not known from strumpets and loose women, while the plaid continued to be worn over the face. This act was renewed in 1637 and 1638. Succeeding town-councils continued to show the same regard to these matters; for in 1695 they enacted, that no inn-keeper, vintner, or ale-seller, should for the future employ women as waiters or servants, under the penalty of five shillings sterling for each.

The following anecdote may perhaps make the virtues of these legislators themselves wear a suspicious aspect. In 1649 the city having borrowed L. 40,000 Scots, in order to raise their quota of men for his majesty, the payment of it was absolutely refused by the town-council when a demand was made for that purpose. That they might not, however, depend entirely upon their own opinion in a matter of such importance, they took that of the General Assembly upon the subject; and it was determined by these reverend divines, that they were not in conscience bound to pay for an unlawful engagement which their predecessors had entered into. But in 1652, Cromwell's parliament who pretended to no less sanctity than they, declared themselves of very different opinion; and on the application of one of the creditors, forced them to repay the sum.

16 Infamous treatment of the marquis of Montrose.

The treatment which the brave marquis of Montrose met with, likewise fixes an indelible stigma both upon the magistrates and clergy at that time. Having been put under sentence of excommunication, no person was allowed to speak to him or do him the least office of friendship. Being met without the city by the magistrates and town-guard, he was by them conducted in a kind of gloomy procession through the streets bare-

Edinburgh. bareheaded, and in an elevated cart made for the purpose; the other prisoners walking two and two before him. At the time of his execution he was attended by one of the ministers, who, according to his own account, did not choose to return till *he had seen him casten over the ladder*.

The union in 1707 had almost produced a war between the two kingdoms which it was designed to unite: and on that occasion Edinburgh became a scene of the most violent disturbances, of which a particular account is given under the article BRITAIN. During the time the act was passing, it was found absolutely necessary for the guards and four regiments of foot to do duty in the city. The disturbances were augmented by the disagreement of the two members of parliament; and notwithstanding the victory gained at that time by the court party, Sir Patrick Johnston the provost, who voted for the union, was obliged afterwards to leave the country. In 1715 the city remained faithful to the royal cause, and proper measures were taken for its defence. A committee of safety was appointed, the city guard increased, and 400 men raised at the expence of the town. The trained bands likewise were ordered out, 100 of whom mounted guard every night: by which precautions the rebels were prevented from attempting the city: they however made themselves masters of the citadel of Leith; but fearing an attack from the duke of Argyle, they abandoned it in the night-time. A scheme was even laid for becoming masters of the castle of Edinburgh; for which purpose they bribed a serjeant to place their scaling ladders. Thus some of the rebels got up to the top of the walls before any alarm was given; but in the mean time the plot being discovered by the serjeant's wife, her husband was hanged over the place where he had attempted to introduce the rebels. The expence of the armament which the city had been at on this occasion amounted to about 1700l. which was repaid by government in the year 1721.

17 Loyalty of the city in 1715 and 1725.

The loyalty of this city was still farther remarkable in the year 1725, when disturbances were excited in all parts of the kingdom, particularly in the city of Glasgow, concerning the excise-bill; for all remained quiet in Edinburgh, notwithstanding the violent outcries that were made elsewhere: and so remarkable was the tranquillity in the metropolis, that government afterwards returned thanks to the magistrates for it. In 1736, however, the city had again the misfortune to fall under the royal displeasure, on the following account. Two smugglers having been detected in stealing their own goods out of a custom-house, were condemned to be hanged. The crime was looked upon as trivial; and therefore a general murmur prevailed among the populace, which was no doubt heightened by the following accident. At that time it had been customary for persons condemned to die to be carried each Sunday to the church, called from that circumstance the *Tolbooth-church*. The two prisoners just mentioned were conducted in the usual way, guarded by three soldiers, to prevent their making their escape: but having once gone thither a little before the congregation met, one of the prisoners seized one of the guards in each hand, and the other in his teeth, calling out to his companion to run; which he immediately did with such speed, that he soon got out of sight, and was never heard of afterwards. The person who had thus procured the life of his companion without regard to his own, would no doubt become a general object of compassion; and of course, when led to the place of execution, the guard were severely pelted by the mob, and some of them, according to the testimony of the witnesses who were sworn on the occasion, pretty much wounded. By this Captain Porteous, who commanded the guard, was so much provoked, that he gave orders to fire, by which six people were killed and eleven wounded. The evidence, however, even of the fact that the orders to fire were given, appears not to have been altogether unexceptionable; nevertheless, on this he was tried and condemned to be executed. At that time the king was absent at Hanover, having left the regency in the hands of the queen; and the case of the unfortunate Porteous having been represented to her, she was pleased to grant him a reprieve: but such was the inveteracy of the people against him, that they determined not to allow him to avail himself of the royal clemency. On the day that had been appointed for his execution, therefore, a number of people assembled, shut the gates of the city, and burnt the door of the prison, the same which the mob would formerly have broke open in order to murder king James. They then took out Porteous, whom it was found impossible to rescue out of their hands, though every method that the magistrates could take for that purpose in such a confusion was made use of. It was even proved, that the member of parliament went to the commander in chief, and requested that he would send a party of soldiers to quell the disturbance, but was absolutely denied this request, because he could not produce a written order from the provost to this purport; which, in the confusion then existing in the city, could neither have been expected to be given by the provost, nor would it have been safe for any person to have carried it about him. Thus the unhappy victim was left in the hands of his executioners; and being dragged by them to the place destined for receiving his fate, was hanged on a dyer's sign-post. As they had not brought a rope along with them, they broke open a shop where they knew they were to be had; and having taken out what they wanted, left the money upon the table, and retired without committing any other disorder.

18 Captain Porteous executed by a mob.

19 Government highly incensed on that account.

Such an atrocious insult on government could not but be highly resented. A royal proclamation was issued, offering a pardon to any accomplice, and a reward of L. 200 to any person who would discover one of those concerned. The proclamation was ordered to be read from every pulpit in Scotland the first Sunday of every month for a twelvemonth: but so divided were the people in their opinions about this matter, that many of the clergy hesitated exceedingly about complying with the royal order, by which they were brought in danger of being turned out of their livings; while those who complied were rendered so unpopular, that their situation was rendered still worse than the others. All the efforts of government, however, were insufficient to produce any discovery; by which, no doubt, the court were still more exasperated: and it was now determined to execute vengeance on the magistrates and city at large. Alexander Wilson, the provost at that time, was imprisoned three weeks before he could

Edinburgh. could be admitted to bail; after which, he and the four bailies, with the lords of justiciary, were ordered to attend the house of peers at London. On their arrival there, a debate ensued, whether the lords should attend in their robes or not? but at last it was agreed, that they should attend in their robes at the bar. This, however, was refused by their lordships, who insisted that they should be examined within the bar; upon which the affair of their examination was dropped altogether. A bill was at last passed both houses, by which it was enacted, that the city of Edinburgh should be fined in 2000 l. for the benefit of Porteus's widow (though she was prevailed upon to accept of L. 1500 for the whole); and the provost was declared incapable of ever serving government again in any capacity whatever. To prevent such catastrophes in time coming, the town-council enacted, that, on the first appearance of an insurrection, the chief officers in the different societies and corporations should repair to the council to receive the orders of the magistrates for the quelling of the tumult, under the penalty of 8 l. 6 s. 8 d. for each omission.

20 The city taken by the rebels in 1745.

In 1745, the city was invested by the pretender's army; and on the 17th of September, the Netherbow-gate being opened to let a coach pass, a party of Highlanders, who had reached the gate undiscovered, rushed in, and took possession of the city. The inhabitants were commanded to deliver up their arms at the palace of Holyroodhouse; a certain quantity of military stores was required from the city, under pain of military execution; and an assessment of 2 s. 6 d. upon the pound was imposed upon the *real* rents within the city and liberties, for defraying that expence.

The pretender's army guarded all the avenues to the castle; but no signs of hostility ensued till the 25th of the month, when the garrison being alarmed from some unknown cause, a number of canon were discharged at the guard placed at the West-port, but with very little effect. This gave occasion for an order to the guard at the weigh-house, to prevent all intercourse between the city and castle; and then the governor acquainted the provost by letter, that unless the communication was preserved, he would be obliged to dislodge the guard by means of artillery. A deputation was next sent to the Pretender; acquainting him with the danger the city was in, and intreating him to withdraw the guard. With this he refused to comply; and the Highland centinels firing at some people who were carrying provisions into the castle, a pretty smart cannonading ensued, which set on fire several houses, killed some people, and did other damage. The Pretender then consented to dismiss the guard, and the cannonading ceased. After the battle of Culloden, the provost of Edinburgh was obliged to stand a very long and severe trial, first at London and then at Edinburgh, for not defending the city against the rebels; which, from the situation and extent of the walls, every one must have seen to be impossible.

During this trial a very uncommon circumstance happened; the jury having sat two days, insisted that they could sit no longer, and prayed for a short respite. As the urgency of the case was apparent, and both parties agreed, the court, after long reasoning, adjourned till the day following, taking the jury bound under a penalty of L. 500 each; when the court continued sitting two days longer, and the jury were one day inclosed. The event was, that the provost was exculpated.

After the battle of Culloden the duke of Cumberland caused fourteen of the rebel standards to be burned at the cross; that of the Pretender was carried by the common executioner, the others by chimney-sweepers; the heralds proclaiming the name of the commanders to whom they belonged as they were thrown into the fire. At this time the city of Edinburgh felt a temporary inconvenience from the election of their magistrates not having taken place at the usual time; so that it became necessary to apply to his majesty for the restoration of the government of the city. This was readily granted, the burgesses being allowed a poll-tax; after which an entire new set of magistrates was returned, all of them friends to the house of Hanover; and soon after the freedom of the city in a gold box was presented to the duke of Cumberland.

21 Government of the city restored.

With these transactions all interferences betwixt government and the metropolis of Scotland were ended; the rest of its history therefore only consists of internal occurrences, the regulations made by its own magistrates for the benefit of the city, their applications to government for leave to improve it, or the execution of these improvements; of which we shall now give a brief detail.

22 Salary bestowed on the provost

In the year 1716, the city first bestowed a settled salary on the provost, in order to enable him to support the dignity of first magistrate. This was at first L. 300; but has since been augmented to L. 500, which his lordship still enjoys. In 1718 it was recommended to the magistrates to distinguish themselves by wearing coats of black velvet, for which they were allowed L. 10; but this act being abrogated in 1754, gold chains were assigned as badges of their office, which they still continue to wear. Provost Kincaid happened to die in office in the year 1777; which being a very rare accident, perhaps the only one of the kind to be met with in the records of Edinburgh, he was buried with great solemnity, and a vast concourse of people attended.

23 Account of tumults.

Tumults have been frequent in Edinburgh, chiefly on account of the dearness of provisions. In 1740 Bell's mills were first attacked by the populace, and afterwards Leith mills: nor could the rioters be dispersed till the military had fired among them, and wounded three, of whom one died; and it was found necessary to order some dragoons into the city in order to preserve tranquillity. In 1742 another violent tumult took place, owing to a custom of stealing dead bodies from their graves for anatomical purposes, which had then become common. The populace beat to arms, threatened destruction to the surgeons; and in spite of all the efforts of the magistrates demolished the house of the beadle at St Cuthbert's. In 1756, new disturbances, which required the assistances of the military, took place: the cause at this time was the impressing of men for the war which was then commencing. A disturbance was likewise excited in 1760. This was occasioned by the footmen, who till then were allowed to follow their masters into the playhouse, and now took upon them to disturb the entertainment of the company; the consequence of which was, that they were turned out, and have ever since been obliged to wait for their masters. In 1763 and 1765, the tumults on account of the price of provisions were renewed; many of the meal-mongers had their

Edinburgh. their houses broken open and their shops destroyed. The magistrates, as usual, were obliged to call in a party of dragoons to quell the disturbance; but at the same time, to put an effectual stop, as far as was in their power, to these proceedings for the future, they gave security, that people who brought grain or provision into the market should be secured in their property. Since that time there have been no tumults directly on the account of provisions; though in 1784 a terrible riot and attack of a distillery at Canonmills took place, on a supposition that the distillers enhanced the price of meal by using unmalted grain. The attack was repelled by the servants of the distillery; but the mob could not be quelled until the sheriff called the soldiers quartered in the castle to his assistance. The same night a party of rioters set out for Ford, a place ten miles to the southward, where there was likewise a large distillery; which, as there was none to make any opposition, they soon destroyed. One man was killed in this riot at Edinburgh by the fire of a servant of the distillery, and several of the rioters were afterwards secured and punished.

In the years 1778 and 1779 two very alarming disturbances happened, which threatened a great deal of bloodshed, though they were happily terminated without any. The first was a mutiny of the earl of Seaforth's Highland regiment, who were at this time quartered in the castle. These having been ordered to embark, for some reason or other unanimously refused, and posted themselves on the top of Arthur's seat, where they continued for two days. Troops were collected to prevent their escape, and the inhabitants were ordered to keep within doors at the first toll of the great bell, which was to be a signal of violence about to take place; but fortunately all the fears, naturally arising from the expectation of this event, were dissipated by an accommodation. The other happened on account of the attempt to repeal the penal laws against the Papists; and was much more alarming than the other, as being the effect of a premeditated scheme and determined resolution to oppose government. On the 2d of February 1779 a mob assembled in the evening, burned a Popish chapel, and plundered another. Next day they renewed their depredations; destroying and carrying off the books, furniture, &c. of several Popish priests and others of that persuasion. The riot continued all that day, though the assistance of the military was called in; but happily no lives were lost, nor was there any firing. The city was afterwards obliged to make good the damage sustained by the Catholics on this occasion, which was estimated at L.1500. This year also an unlucky accident happened at Leith. About 50 Highland recruits having refused to embark, a party of the South Fencibles was sent to take them prisoners. Unexpectedly, however, the Highlanders stood upon their defence; when, after some words, a firing commenced on both sides, and about one half of the Highlanders were killed and wounded, the remainder being taken prisoners and carried to the castle. Captain Mansfield and two or three privates were killed in this affray.

24 General history of the improvements.

We shall close this history of Edinburgh with a general account of the improvements which have lately taken place in it, and of which a particular description will afterwards be given. These began in the year 1753, when the foundation stone of the Exchange was laid, at which time there was a grand procession, and the greatest concourse of people ever known in Edinburgh. A triumphal arch was erected for the purpose, through which the procession passed, and medals were scattered among the populace. In 1756 the high street was cleared by the removal of the cross; though many regretted this, on account of its being a very ancient and elegant building. In the middle it had an unicorn placed on the top of a pillar 20 feet high; but this fine ornament was broken to pieces by the giving way of the tackle by which it was attempted to remove it. It is now again erected at Drum, a seat belonging to lord Somerville, about four miles from Edinburgh. In 1763 the first stone of the north bridge was laid by provost Drummond; and in 1767 an act of parliament was obtained for extending the royalty of the city over the fields to the northward, where the New Town is now situated. About the same time a spot of ground upon the south side of the town was purchased by a private person for L.1200, which being feued out for building, gave rise to the increase of the town on that quarter; and this proceeded the more rapidly, as the houses built there were free from the duties imposed upon others subject to the royalty. In 1774 the foundation of the Register-Office was laid. In 1784 the project for rendering the access to the town equally easy on both sides was begun to be put in execution by laying the foundation of the south bridge. At the same time a great improvement was made by reducing the height of the street several feet all the way from the place where the cross stood to the Netherbow; by which means the ascent is rendered more easy, not only for carriages, but also for persons who walk on foot. At the same time, the street was farther cleared by the removal of the town guard-house, which had long been complained of as an encumbrance. It is still farther in contemplation to remove the Luckenbooths: and when this is accomplished, with other improvements by which it must necessarily be accompanied, it is to be questioned whether any city in Britain will be able to vie with Edinburgh in elegance and beauty.

Having thus given a concise history of the city from its earliest foundation, we shall now proceed to describe it in its most improved state.

25 Description of Edinburgh.

Edinburgh is situated upon a steep hill, rising from east to west, and terminating in a high and inaccessible rock, upon which the castle stands. At the east end or lower extremity of this hill stands the abbey of Holyrood-house, or king's palace, distant from the castle upwards of a mile; and betwixt which, along the top of the ridge, and almost in a straight line, runs the high-street. On each side, and parallel to this ridge or hill, is another ridge of ground lower than that in the middle, and which does not extend so far to the east; that on the south being intercepted by Salisbury-rocks and Arthur's-seat, a hill of about 800 feet of perpendicular height; and that on the north by the Calton-hill, considerably lower than Arthur's-seat: so that the situation of this city is most singular and romantic; the east or lower part of the town lying between two hills; and the west or higher part rising up towards

Edinburgh. towards a third hill, little inferior in height to the highest of the other two, upon which, as has been observed, the castle is built, and overlooks the town.

The buildings of the town terminate at the distance of about 200 yards from the castle-gate; which space affords a most delightful as well as convenient and healthful walk to the inhabitants. The prospect from this spot is perhaps the finest any where to be met with, for extent, beauty, and variety.

In the valley or hollow betwixt the mid and the south ridges, and nearly parallel to the high-street, is another street called the Cowgate; and the town has now extended itself over most part of that south ridge also. Betwixt the mid and the north ridges was a loch, which, till of very late, terminated the town on that side. From the high-street towards the loch on the north, and Cowgate on the south, run narrow cross streets or lanes, called *wynds* and *closes*, which grow steeper and steeper the farther west or nearer the castle; so that, were it not for the closeness and great height of the buildings, this city, from its situation and plan, might naturally be expected to be the best aired, as well as the cleanest, in Europe. The former, notwithstanding these disadvantages, it enjoys in an eminent degree; but we cannot compliment it upon the latter, notwithstanding every possible means has been used by the magistrates for that purpose.

The steepness of the ascent makes the access to the high-street from the north and south very difficult; which no doubt greatly retarded the enlargement of the city. To remedy this inconvenience on the north, and with a view to extend the town on that quarter, a most elegant bridge has been thrown over the north loch, which joins the north ridge to the middle of the high-street, by so easy an ascent as one in sixteen; and in pursuance of the design, a plan of a new town to the north was fixed upon, and is now nearly finished, with an elegance and taste that does honour to this country. In like manner, to facilitate the access from the south side, a bridge has been thrown over the valley through which the Cowgate runs; which, if not equally elegant with the north bridge, is certainly as convenient.

26
Account of the gradual increase of Edinburgh.

The gradual increase of the city of Edinburgh may in some degree be understood from the traces of its ancient walls that still remain. James II. in 1450, first bestowed on the community the privilege of fortifying the city with a wall, and empowered them to levy a tax upon the inhabitants for defraying the expence. When the city was first fortified, the wall reached no further than the present water-house, or reservoir, on the castle-hill: from thence to the foot of Halkerston's wynd, just below the new-bridge, the city was defended by the north-loch; an inconsiderable morass, which, being formerly overflowed, formed a small lake that hath since been drained. From this place to the foot of Leith-wynd, it does not appear how the city was fortified: but from the foot of Leith-wynd to the Nether-bow-port it was defended only by a range of houses; and when these had become ruinous, a wall was built in their place. The original wall of Edinburgh, therefore, began at the foot of the north-east rock of the castle. Here it was strengthened by a small fortress, the ruins of which are still to be seen, and are called the *well-house tower*, from their having a spring in their neighbourhood. When the wall came opposite to the reservoir, it was carried quite across the hill, having a gate on the top for making a communication between the town and castle. In going down the hill, it went slanting in an oblique direction to the first angle in going down the West-bow, where was a gate named the *Upper-bow Port*, one of the hooks of which still remains. Thence it proceeded eastward in such a manner, as would have cut off not only all the Cowgate, but some part of the parliament-house; and being continued as far as the mint-close, it turned to the north-east, and connected itself with the buildings on the north-side of the high-street, where was the original *Nether-bow Port*, about 50 yards west from that which afterwards went by the same name.

Soon after the building of this wall, a new street was formed on the outside of it, named the *Cowgate*, which in the 16th century became the residence of the nobility, the senators of the college of justice, and other persons of the first distinction. After the fatal battle of Flowden, however, the inhabitants of the Cowgate became very anxious to have themselves defended by a wall as well the rest. The wall of the city was therefore extended to its present limits. This new wall begins on the south-east side of the rock on which the castle is built, and to which the town-wall comes quite close. From thence it descends obliquely to the West-port; then ascends part of a hill on the other side, called the *High Riggs*; after which, it runs eastward with but little alteration in its course, to the Bristo and Potter-row ports, and from thence to the Pleasance. Here it takes a northerly direction, which it keeps from thence to the Cowgate-port; after which the inclosure is completed to the Netherbow by the houses of St Mary's wynd. The original Netherbow port being found not well adapted for defence was pulled down, and a new one built in 1571 by the adherents of queen Mary. In 1606, the late handsome building was erected about 50 yards below the place where the former stood. It was two stories high, and had an elegant spire in the middle; but being thought to encumber the street, and the whole building being in a crazy situation, it was pulled down by order of the magistrates in 1764.

In the original wall of Edinburgh there was, as has been already observed, a port on the castle-hill. On the extension of the wall, after building the houses in the Cowgate, this gate was pulled down. That in the upper or west bow stood for a much longer time, and was pulled down within the memory of some persons lately or perhaps still living. Besides these, there was a third, about 50 yards above the head of the Canongate; but whether there were any more, is uncertain. The ports or gates of the new walls were, 1. The *West-port*, situated at the extremity of the Grass-market; beyond which lies a suburb of the town and a borough of regality, called *Portsburgh*. Next to this is a wicket, struck out of the town-wall in 1744, for the purpose of making an easier communication between the town and the public walks in the meadows, than by Bristo-port. The next to this was *Bristo-port*, built in 1515; beyond which lies a suburb called *Bristo-street*. At a small distance from Bristo was the *Potter-row Port*, which took this name from a manufactory of earthen ware in the neighbourhood. Formerly it was called *Kirk of Field*

Edinburgh. *Field Port*. Between this and the Cowgate-port stood another, called *St Mary's Wynd Port*, which extended from east to west across the foot of the Pleasance, and which was demolished only since the middle of the last century.—Close to the middle of this stood the *Cowgate-port;* which opened a communication between the Cowgate and St Mary's wynd, and the Pleasance.—The *Nether-bow Port* has been already spoken of.—At the foot of Leith-wynd was another gate, known by the name of *Leith-wynd Port;* and within it was a wicket giving access to the church of Trinity College, and which still remains. At the foot of Halkerston's wynd was another, which, as well as the former, was built about the year 1560. Both of these were pulled down some years ago, and all the rest in 1785.—Another still remains at the foot of the Canongate, known by the name of the *Water-gate*.

For 250 years the city of Edinburgh occupied the same space of ground, and it is but very lately that its limits have been so considerably enlarged. In the middle of the 16th century, it is described as extending in length about an Italian mile, and about half as much in breadth; which answers very nearly to its present limits, the late enlargements only excepted. This space of ground, however, was not at that time occupied in the manner it is at present. The houses were neither so high nor so crouded upon each other as they are now. This was a consequence of the number of inhabitants increasing, which has occasioned the raising of the houses to such an height as is perhaps not to be paralleled in any other part of the world. Till the time of the Reformation, the burying ground of the city extended over all the space occupied by the Parliament-square, and from thence to the Cowgate. The lands lying to the southward of the Cowgate were chiefly laid out in gardens belonging to the convent of Black-friars, and the church of St Mary in the Field. These extended almost from the Pleasance to the Potter-row-port. From the Bristo to the West-Port, the ground was laid out in gardens belonging to the Gray-friars. The magistrates, on their application to queen Mary, obtained a grant of the Gray-friars gardens for a burying-place; for which it was given as a reason, that they were somewhat distant from the town. Here however, it must be understood, that these gardens were distant from the houses, and not without the walls; for they had been inclosed by them long before.—In the time of James I. the houses within the walls seem to have been in general, if not universally, covered with thatch or broom; and not above 20 feet high. Even in the year 1621, these roofs were so common, that they were prohibited by act of parliament, in order to prevent accidents from fire. —In the middle of the last century, there were neither courts nor squares in Edinburgh. The Parliament close or square is the oldest of this kind in the city. Miln's square, James's court, &c. were built long after; and Argyle's and Brown's squares within these 50 years.

27 New Town. The *New Town* was projected in the year 1752; but as the magistrates could not then procure an extension of the royalty, the execution of the design was suspended for some time. In 1767, an act was obtained, by which the royalty was extended over the fields to the northward of the city; upon which advertisements were published by the magistrates, desiring proper plans to be given in. Plans were given in accordingly, and that designed by Mr James Craig architect was adopted. Immediately afterwards, people were invited to purchase lots from the town-council; and such as purchased became bound to conform to the rules of the plan. In the mean time, however, the town-council had secretly reserved to themselves a privilege of departing from their own plan; which they afterwards made use of in such a manner as produced a law-suit. According to the plan held forth to the purchasers, a canal was to be made through that place where the north-loch had been, and the bank on the north side of it laid out in terraces: but instead of this, by an act of council, liberty was reserved to the town to build upon this spot; and therefore, when many gentlemen had built genteel houses in the new town on faith of the plan, they were surprised to find the spot appointed for terraces and a canal, beginning to be covered with mean irregular buildings, and work-houses for tradesmen. This deviation was immediately complained of; but as the magistrates showed no inclination to grant any redress, a prosecution was commenced against them before the Lords of Session. In that court the cause was given against the pursuers, who thereupon appealed to the House of Lords. Here the sentence of the Court of Session was reversed, and the cause remitted to the consideration of their Lordships. At last, after an expensive contest, matters were accommodated. The principal term of accommodation was, that some part of the ground was to be laid out in terraces and a canal; but the time of disposing it in that manner, was referred to the Lord President of the Court of Session and the Lord Chief Baron of the Exchequer.—The fall of part of the bridge, hereafter mentioned, proved a very considerable disadvantage to the New Town; as it necessarily induced a suspicion that the passage, by means of the bridge, could never be rendered safe. An oversight of the magistrates proved of more essential detriment. A piece of ground lay to the southward of the old town, in a situation very proper for building. This the magistrates had an opportunity of purchasing for 1200l; which, however, they neglected, and it was bought by a private person, who immediately feued it out in lots for building, as has been already mentioned. The magistrates then began to see the consequence, namely, that this spot being free from the duties to which the royalty of Edinburgh is subject, people would choose to reside there rather than in the New Town. Upon this they offered the purchaser 2000l. for the ground for which he had paid 1200l.; but as he demanded 20,000l. the bargain did not take place. Notwithstanding these discouragements, the New Town is now almost finished; and from the advantages of its situation, and its being built according to a regular plan, it hath undoubtedly a superiority over any city in Britain. By its situation, however, it is remarkably exposed to storms of wind, which at Edinburgh, sometimes rage with uncommon violence.

It has three streets, almost a mile in length, running from east to west, intersected with cross-streets at proper

 distances.

Edinburgh. distances. The most northerly, called *Queen's Street*, is 100 feet broad, and commands an extensive prospect of the Forth, the county of Fife, and the shipping in the river. That called *George's Street*, which is in the middle, is no less than 115 feet wide. It is terminated at each end by two very elegant and extensive squares; that on the east end is called *St Andrew's Square*; the other, tho' not yet finished, nor indeed begun, is to be named *Charlotte's Square*. Prince's street is the most southerly; and extends from the northern extremity of the bridge, quite to the west end of the town; tho' as that is not yet finished, we cannot say whether it will be done exactly according to the plan laid down, as there has been a proposal made by a private person of continuing the whole a considerable way farther to the westward, to end in a circus. The reason given for this proposed innovation is, that the road to Glasgow and other parts in the west will thus be rendered more easy, as it will then lie along the new bridge over the Water of Leith at Bell's mills, which is much more convenient than that just now in use.

The most remarkable public buildings in Edinburgh are:

28
Public buildings described.

1. *The Castle.* This stands on a high rock accessible only on the east side. On all others it is very steep, and in some places perpendicular. It is about 300 feet high from its base: so that, before the invention of artillery, it might well have been deemed impregnable; though the event showed that it was not.—The entry to this fortress is defended by an outer barrier of pallisadoes; within this is a dry ditch, draw-bridge, and gate, defended by two batteries which flank it; and the whole is commanded by a half-moon mounted with brass cannon, carrying balls of 12 pounds. Beyond these are two gate-ways, the first of which is very strong, and has two portcullises. Immediately beyond the second gate-way, on the right hand, is a battery mounted with brass cannon, carrying balls of 12 and 18 pounds weight. On the north side are a mortar and some gun batteries.—The upper part of the castle contains a half-moon battery, a chapel, a parade for exercise, and a number of houses in the form of a square, which are laid out in barracks for the officers. Besides these there are other barracks sufficient to contain 1000 men; a powder magazine bomb-proof; a grand arsenal, capable of containing 8000 stand of arms; and other apartments for the same use, which can contain 22,000 more: so that 30,000 stand of arms may be conveniently lodged in this castle. On the east side of the square abovementioned, were formerly royal apartments; in one of which king James VI. was born, and which is still shown to those who visit the castle. In another, the regalia of Scotland were deposited on the 26th of March 1707, and are said to be still kept there; but they are never shown to any body. Hence a suspicion has arisen that they have been carried to London; which is the more confirmed, as the keeper of the jewel-office in the tower of London shows a crown, which he calls that of Scotland; and it is certain that the door of what is called the *Crown-room* has not been publicly known to be opened since the union.

The governor of the castle is generally a nobleman, whose place is worth about 1000l. a-year; and that of deputy-governor, 500l. This last resides in the house appointed for the governor, as the latter never inhabits it. There is also a fort-major, a store-keeper, master gunner, and chaplain; but as this last does not reside in the castle, worship is seldom performed in the chapel. The parliament-house was formerly included in the great square on the top, and the royal gardens were in the marsh afterwards called the *North-loch*; the king's stables being on the south side, where the houses still retain the name, and the place where the barns were still retain the name of Castle-barns.

The castle is defended by a company of invalids, and four or five hundred men belonging to some marching regiment, though it can accommodate 1000, as abovementioned; and this number has been sometimes kept in it. Its natural strength of situation was not sufficient to render it impregnable, even before the invention of artillery, as we have already observed; much less would it be capable of securing it against the attacks of a modern army well provided with cannon. It could not, in all probability, withstand, even for a few hours, a well directed bombardment: for no part but the powder-magazine is capable of resisting these destructive machines; and the splinters from the rock on which the castle is built, could not fail to render them still more formidable. Besides, the water of the well, which is very bad, and drawn up from a depth of 100 feet, is apt to subside on the continued discharge of artillery, which produces a concussion in the rock.

2. *The Palace of Holyrood-house.* This, tho' much neglected, is the only royal habitation in Scotland that is not entirely in ruins. It is a handsome square of 230 feet in the inside, surrounded with piazzas. The front, facing the west, consists of two double towers joined by a beautiful low building, adorned with a double balustrade above. The gateway in the middle is decorated with double stone columns, supporting a cupola in the middle, representing an imperial crown, with a clock underneath. On the right hand is the great staircase which leads to the council chamber and the royal apartments. These are large and spacious, but unfurnished: in one of them the Scotch peers meet to elect 16 of their number to represent them in parliament. The gallery is on the left hand, and measures 150 feet by 27½. It is adorned with the supposed portraits of all the kings of Scotland. In the apartments of the duke of Hamilton, which he possesses as hereditary keeper of the palace, queen Mary's bed of crimson damask, bordered with green fringes and tassels, is still to be seen, but almost reduced to rags. Here also strangers are shown a piece of wainscot hung upon hinges, which opens to a trap-stair communicating with the apartments below. Through this passage Darnley and the other conspirators rushed in to murder the unhappy Rizzio. Towards the outward door of these apartments are large dusky spots on the floor, said to be occasioned by Rizzio's blood, which could never be washed out. In the lodgings assigned to lord Dunmore is a picture by Van Dyke, esteemed a masterly performance, of king Charles I. and his queen going a-hunting. There are likewise the portraits of their present majesties at full length by Ramsay. The lodgings above the royal apartments are occupied by the duke of Argyle as heritable master of the household.

The front of this palace is two stories high; the roof

 roof flat; but at each end the front projects, and is ornamented with circular towers at the angles. Here the building is much higher, and the rest of the palace is three stories in height. The north-west towers were built by James V. for his own residence: his name is still to be seen below a nitch in one of these towers. During the minority of queen Mary, this palace was burned by the English; but soon after repaired and enlarged beyond its present size. At that time it consisted of five courts, the most westerly of which was the largest. It was bounded on the east by the front of the palace, which occupied the same space it does at present; but the building itself extended further to the south. At the north-west corner was a strong gate, with Gothic pillars, arches, and towers, part of which was not long ago pulled down. Great part of the palace was burnt by Cromwell's soldiers; but it was repaired and altered into the present form after the Restoration. The fabric was planned by Sir William Bruce a celebrated architect, and executed by Robert Mylne mason. The environs of the palace afford an asylum for insolvent debtors; and adjoining to it is an extensive park, all of which is a sanctuary.

The abbey church was formerly called the *monastery of Holyrood-house*, and built by king David I. in 1128. He gave it the name of *Holyrood-house*, in memory, as is said, of his deliverance from an engraged hart, by the miraculous interposition of a cross from heaven. This monastery he gave to the canons regular of St Augustine: on whom he also bestowed the church of Edinburgh castle, with those of St Cuthbert's, Corstorphin, and Libberton, in the shire of Mid-Lothian, and of Airth in Stirlingshire; the priories of St Mary's isle in Galloway, of Blantyre in Clydesdale, of Rowadill in Ross, and three others in the Western Isles. To them he also granted the privilege of erecting a borough between the town of Edinburgh and the church of Holyrood-house. From these canons it had the name of the *Canongate*, which it still retains. In this new borough they had a right to hold markets. They had also portions of land in different parts, with a most extensive jurisdiction, and right of trial by duel, and fire and water ordeal. They had also certain revenues payable out of the exchequer and other funds, with fishings, and the privilege of erecting mills on the water of Leith, which still retain the name of *Canon-mills*. Other grants and privileges were bestowed by succeeding sovereigns; so that it was deemed the richest religious foundation in Scotland. At the Reformation, its annual revenues were, 442 bolls of wheat, 640 bolls of bear, 560 bolls of oats, 500 capons, two dozen of hens, as many salmon, 12 loads of salt; besides a great number of swine, and about 250l. sterling in money. At the Reformation, the superiority of North Leith, part of the Pleasance, the barony of Broughton, and the Canongate, was vested in the earl of Roxburgh; and were purchased from him by the town-council of Edinburgh in 1636. In 1544, the church suffered considerably by the invasion of the English; but was speedily repaired. At the Restoration, king Charles II. ordered the church to be set apart as a chapel-royal, and prohibited its use as a common parish church for the future. It was then fitted up in a very elegant manner. A throne was erected for the sovereign, and 12 stalls for the knights of the order of the thistle: but as mass had been celebrated in it in the reign of James VII. and it had an organ, with a spire, and a fine chime of bells on the west side, the Presbyterians at the revolution entirely destroyed its ornaments, and left nothing but the bare walls.—Through time, the roof of the church became ruinous; on which the duke of Hamilton represented its condition to the barons of exchequer, and craved that it might be repaired. This request was complied with: but the architect and mason who were employed, covered the roof with thick flag-stones, which soon impaired the fabric: and on the 2d of December 1768, the roof fell in. Since that time, no attempt has been made to repair it, and it is now entirely fallen to ruin.

The ruins of this church, however, are still sufficient to discover the excellency of the workmanship. Here some of the king's of Scotland are interred; and an odd kind of curiosity has been the occasion of exposing some bones said to be those of lord Darnley and a countess of Roxburgh who died several hundred years ago. Those said to belong to the former were very large, and the latter had some flesh dried upon them. The chapel was fitted up in the elegant manner above-mentioned by James VII. but such was the enthusiasm of the mob, that they not only destroyed the ornaments, but tore up even the pavement, which was of marble.

To the eastward of the palace is the bowling-green, now entirely in disorder; and behind it is a field called *St Ann's Yards*. Beyond this is a piece of ground called *the King's Park*; which undoubtedly was formerly overgrown with wood, though now there is not a single tree in it. It is about three miles in circumference; and was first inclosed by James V. It contains the rocky hills of *Arthur's Seat* and Salisbury Craigs, which last afford an inexhaustible stone quarry; and upon the north side of the hill stands an old ruinous chapel, dedicated to St Anthony. The stones are used in building, as well as for paving the streets and highways. The park was mortgaged to the family of Haddington for a debt due to them; and by the present earl has been divided into a number of inclosures by stone-dykes raised at a considerable expence. A good number of sheep and some black cattle are fed upon it; and it is now rented at 1500 l. annually.

3. *St Giles's Church* is a beautiful Gothic building, measuring in length 206 feet. At the west end, its breadth is 110; in the middle, 129; and at the east end, 76 feet. It has a very elevated situation, and is adorned with a lofty square tower; from the sides and corners of which rise arches of figured stone-work: these meeting with each other in the middle, complete the figure of an imperial crown, the top of which terminates in a pointed spire. The whole height of this tower is 161 feet.

This is the most ancient church in Edinburgh. From a passage in an old author called *Simeon Dunelmensis*, some conjecture it to have been built before the year 854; but we do not find express mention made of it before 1359. The tutelar saint of this church, and of Edinburgh, was St Giles, a native of Greece. He lived in the sixth century, and was descended of an illustrious family. On the death of his parents, he gave

gave all his estate to the poor; and travelled into France, where he retired into a wilderness near the conflux of the Rhone with the sea, and continued there three years. Having obtained the reputation of extraordinary sanctity, various miracles were attributed to him; and he founded a monastery in Languedoc, known long after by the name of *St Giles's*.—In the reign of James II. Mr Preston of Gorton, a gentleman whose descendents still possess an estate in the county of Edinburgh, got possession of the arm of this saint; which relic he bequeathed to the church of Edinburgh. In gratitude for this donation, the magistrates granted a charter in favour of Mr Preston's heirs, by which the nearest heir of the name of Preston was entitled to carry it in all processions. At the same time, the magistrates obliged themselves to found an altar in the church of St Giles's, and appoint a chaplain for celebrating an annual mass for the soul of Mr Preston; and likewise, that a tablet, containing his arms, and an account of his pious donation, should be put up in the chapel.—St Giles's was first simply a parish-church, of which the bishop of Lindisfarn or Holy Iland, in the county of Northumberland, was patron. He was succeeded in the patronage by the abbot and canons of Dunfermline, and they by the magistrates of Edinburgh. In 1466, it was erected into a collegiate church by James III.—At the Reformation, the church was, for the greater convenience, divided into several parts. The four principal ones are appropriated to divine worship, the lesser ones to other purposes. At the same time the religious utensils belonging to this church were seized by the magistrates. They were,—St Giles's arm, enshrined in silver, weighing five pounds three ounces and an half, a silver chalice, or communion-cup, weighing 23 ounces; the great *eucharist* or communion-cup, with *golden weike and stones*; two cruets of 25 ounces; a golden bell, with a heart, of four ounces and a half: a golden unicorn; a golden pix, to keep the host; a small golden heart, with two pearls; a diamond ring; a silver chalice, patine, and spoon, of 32 ounces and a half: a communion-table-cloth of gold brocade; *St Giles's coat*, with a little piece of red velvet which hung at his feet; a round silver *eucharist*: two silver censers, of three pounds fifteen ounces; a silver ship for incense; a large silver cross, with its base, weighing sixteen pounds thirteen ounces and a half; a triangular silver lamp; two silver candlesticks, of seven pounds three ounces; other two, of eight pounds thirteen ounces; a silver chalice gilt, of 20¼ ounces; a silver chalice and cross, of 75 ounces; besides the priests robes, and other vestments of gold brocade, crimson velvet embroidered with gold and green damask.—These were all sold, and part of the money applied to the repairs of the church; the rest was added to the funds of the corporation.

In the steeple of St Giles's church are three large bells brought from Holland in 1621; the biggest weighing 2000lb. the second 700, and the third 500. There are also a set of music bells, which play every day between one and two o'clock, or at any time in the case of rejoicings. The principal division is called the *High Church*, and has been lately repaired and new seated. There is a very elegant and finely ornamented seat for his majesty, with a canopy supported by four Corinthian pillars decorated in high taste. This seat is used by the king's commissioner during the time the General Assembly sits. On the right hand is a seat for the lord high constable of Scotland, whose office it is to keep the peace within doors in his majesty's presence; it being the duty of the earl marshal to do the same without. The seats belonging to the lords of council and session are on the right of the lord high constable; and on the left of the throne was a seat for the lord high chancellor of Scotland; but that office being now abolished, the seat is occupied by others. On the left of this sit the barons of exchequer; and, to the left of them, the lord provost, magistrates, and town-council. The pulpit, king's seat, and galleries, are covered with crimson velvet with gold and silk fringes.

The aisle of St Giles's church is fitted up with seats for the general assembly who meet here; and there is a throne for his majesty's commissioner with a canopy of crimson silk damask, having the king's arms embroidered with gold, presented by the late lord Cathcart to his successor in office. In this church is a monument dedicated to the memory of lord Napier, baron of Merchiston, well known as the inventor of logarithms; a second to the earl of Murray, regent of Scotland during the minority of James VI; and a third to the great marquis of Montrose.

4. *The Parliament House*, in the great hall of which the Scottish parliament used to assemble, is a magnificent building. The hall is 123 feet long 42 broad, with a fine arched roof of oak, painted and gilded. In this the lawyers and agents now attend the courts, and single judges sit to determine causes in the first instance, or to prepare them for the whole court, who sit in an inner room formerly appropriated to the privy-council. In a nich of the wall is placed a fine marble statue of president Forbes, erected at the expence of the faculty of advocates. There are also full length portraits of king William III. queen Mary his consort, and queen Anne, all done by Sir Godfrey Kneller; also of George I. John duke of Argyle, and Archibald duke of Argyle, by Mr Aikman of Cairney.

Above stairs are the court of exchequer and treasury chamber, with the different offices belonging to that department; and below is one of the most valuable libraries in Great Britain, belonging to the faculty of advocates. Besides 30,000 printed volumes, here are many scarce and valuable manuscripts, medals, and coins: here is also an entire mummy in its original chest, presented to the faculty (at the expence of 300l.) by the earl of Morton, late president of the royal society. As these rooms are immediately below the hall where the parliament sat, they are subject to a search by the lord high constable of Scotland ever since the gun-powder plot; and this is specified in the gift from the city to the faculty. This library was founded, in the year 1682, by Sir George Mackenzie lord advocate. Among other privileges, it is intitled to a copy of every book entered in Stationer's hall. Before the great door is a noble equestrian statue of Ch. II. the proportions of which are reckoned exceedingly just. Over the entrance are the arms of Scotland, with Mercy and Truth on each side for supporters.

The court of session, the supreme tribunal in Scotland, consists of 15 judges, who sit on a circular bench, clothed in purple robes turned up with crimson velvet. Six of these are lords of the justiciary, and go the circuit

Edinburgh. cuit twice a-year; but, in that capacity, they wear scarlet robes turned up with white sattin.

5. *The Tolbooth* was erected in 1561, not for the purposes merely of a prison, but likewise for the accommodation of the parliament and other courts; but it has since become so very unfit for any of these purposes, that it is now proposed to pull it down and rebuild it in some other place, especially as it is very inconvenient in its present situation on account of its incumbering the street. The provost is captain of the tolbooth, with a goaler under him: and the latter has a monopoly of all the provisions for the prisoners; a circumstance which must certainly be considered as a grievous oppression, those who are least able to purchase them being thus obliged to do so at the highest price. There is a chaplain who has a salary of 30l. a-year.

6. There is a hall in the Writers Court belonging to the clerks to his majesty's signet, where there is also an office for the business of the signet. The office of keeper of the signet is very lucrative, and he is allowed a depute and clerks under him. Before any one enters into this society he must attend the college for two years, and serve five years as an apprentice to one of the society. There is a good library belonging to this hall, which is rapidly increasing, as every one who enters must pay 10l. towards it. He pays also 100l. of apprentice-fee, and 100l. when he enters.

7. *The Exchange* is a large and elegant building, with a court of about 90 feet square in the middle. On the north side are piazzas where people can walk under cover, the other three sides being laid out in shops; but the merchants have never made use of it to meet in, still standing in the street as formerly. The back part of the building is used for the general custom-house of Scotland, where the commissioners meet to transact business. They have above 20 offices for the different departments, to which the access is by a hanging stair 60 feet in height. In looking over the window before he ascends this stair, a stranger is surprised to find himself already 40 feet from the ground, which is owing to the declivity on which the exchange is built. For the customhouse rooms the city receives a rent of 1l. *per* day.

The Trustees Office for the improvement of fisheries and manufactures in Scotland is in the south-west corner of the exchange; the fund under their management being part of the equivalent money given to Scotland at the Union. This is distributed in premiums amongst those who appear to have made any considerable improvements in the arts.

7. *The North Bridge*, which forms the main passage of communication betwixt the Old and New Towns, was founded, as has already been observed, in 1763 by Provost Drummond; but the contract for building it was not signed till August 21st 1765. The architect was Mr William Mylne, who agreed with the town-council of Edinburgh to finish the work for 10,140l. and to uphold it for 10 years. It was also to be finished before Martinmas 1769; but on the 3d of August that year, when the work was nearly completed, the vaults and side-walls on the south fell down, and five people were buried in the ruins. This misfortune was occasioned by the foundation having been laid, not upon the solid earth, but upon the rubbish of the houses which had long before been built on the north side of the high-street, and which had been thrown out into the hollow to the northward. Of this rubbish there were no less than eight feet between the foundation of the bridge and the solid earth. Besides this deficiency in the foundation, an immense load of earth which had been laid over the vaults and arches in order to raise the bridge to a proper level, had no doubt contributed to produce the catastrophe abovementioned.—The bridge was repaired by pulling down some parts of the side-walls, and afterwards rebuilding them; strengthening them in others with chain-bars; removing the quantity of earth laid upon the vaults, and supplying its place with hollow arches, &c. The whole was supported at the south end by very strong buttresses and counterforts on each side; but on the north it has only a single support.—The whole length of the bridge, from the High-street in the Old Town to Prince's-street in the New, is 1125 feet; the total length of the piers and arches is 310 feet. The width of the three great arches is 72 feet each; of the piers, 13½ feet; and of the small arches, each 20 feet. The height of the great arches, from the top of the parapet to the base, is 68 feet; the breadth of the bridge within the wall over the arches is 40 feet, and the breadth at each end 50 feet.—On the southern extremity of this bridge stands the General Post Office for Scotland; a neat plain building, with the proper number of apartments for the business, and a house for the secretary.

The communication betwixt the two towns by means of this bridge, though very complete and convenient for such as lived in certain parts of either, was yet found insufficient for those who inhabited the western districts. Another bridge being therefore necessary, it was proposed to fill up the valley occasionally with the rubbish dug out in making the foundations of houses in the New Town; and so great was the quantity, that this was accomplished so as to be fit for the passage of carriages in little more than four years and an half.

8. *The South Bridge* is directly opposite to the other, so as to make but one street, crossing that called the *High street* almost at right angles. It consists of 19 arches of different sizes: but only one of them is visible, *viz.* the large one over the Cowgate; and even this is small in comparison with those of the North Bridge, being no more than 30 feet wide and 31 feet high. On the south it terminates at the University on one hand, and the Royal Infirmary on the other. The Tron Church, properly called *Christ Church*, stands at the northern extremity, facing the High-street, and in the middle of what is now called *Hunter's-Square*, in memory of the late worthy chief magistrate who planned these improvements, but did not live to see them executed. On the west side of this square the Merchant Company have built a very handsome hall for the occasional meetings of their members. This bridge was erected with a design to give an easy access to the great number of streets and squares on the south side, as well as to the country on that quarter from whence the city is supplied with coals. The street on the top is supposed to be as regular as any in Europe; every house being of the same dimensions, excepting, that between every two of the ordinary construction there is one with a pediment on the top, in order to prevent that

Edinburgh. the ſameneſs of appearance which would otherwiſe take place. So great was the rage for purchaſing ground on each ſide of this bridge for building, that the areas ſold by public auction at 50l. *per* foot in front. By this the community will undoubtedly be conſiderable gainers; and the proprietors hope to indemnify themſelves for their extraordinary expence by the vaſt ſale of goods ſuppoſed to attend the ſhops in that part of the town; though this ſeems ſomewhat more dubious than the former.

9. *The Concert Hall*, called alſo *St Cecilia's Hall*, ſtands in Niddery's-ſtreet; and was built in 1762, after the model of the great opera-theatre in Parma. The plan was drawn by Sir Robert Mylne, architect of Blackfriars bridge. The muſical room is of an oval form, the ceiling being a concave elliptical dome, lighted from the top by a lanthorn. The ſeats are ranged in the form of an amphitheatre; and are capable of containing 500 perſons, beſides leaving a large area in the middle of the room. The orcheſtra is at the upper end, and is terminated by an elegant organ.

The muſical ſociety was firſt inſtituted in the year 1728. Before that time, ſeveral gentlemen had formed a weekly club at a tavern kept by one Steil, a great lover of muſic, and a good ſinger of Scots ſongs. Here the common entertainment conſiſted in playing on the harpſichord and violin the concertos and ſonatos of Handel, juſt then publiſhed. The meeting, however, ſoon becoming numerous, they inſtituted, in the year abovementioned, a ſociety of 70 members, for the purpoſe of holding a weekly concert. The affairs of the ſociety are regulated by a governor, deputy-governor, treaſurer, and five directors, who are annually choſen by the members. The meetings have been continued ever ſince that time on much the ſame footing as at firſt, and the number of members is now increaſed to 200. The weekly concerts are on Friday; the tickets being given gratis by the directors, and attention paid in the firſt place to ſtrangers. Oratorios are occaſionally performed throughout the year; and the principal performers have alſo benefit concerts. The band are excellent in their ſeveral departments; and ſeveral of the members are alſo good performers, and take their part in the orcheſtra. There are always many applications on the occaſion of a vacancy by the death of one of the members or otherwiſe; and ſuch is generally the number of candidates, that it is no eaſy matter to get in.

10. *The Univerſity.* In the year 1581, a grant was obtained from king James VI. for founding a college or univerſity within the city of Edinburgh; and the citizens, aided by various donations from well diſpoſed perſons, purchaſed a ſituation for the intended new college, conſiſting of part of the areas, chambers, and church of the collegiate provoſtry and prebends of the Kirk-a-field, otherwiſe called *Templum et Præfectura Sanctæ Mariæ in campis*, lying on the ſouth ſide of the city. Next year, a charter of confirmation and erection was obtained alſo from king James VI. from which the college to be built did afterwards derive all the privileges of an univerſity.

In 1583, the provoſt, magiſtrates, and council, the patrons of this new inſtitution, prepared the place in the beſt manner they could for the reception of teachers and ſtudents; and in the month of October the ſame year, Robert Rollock, whom they had invited from a profeſſorſhip in St Salvator's College in the univerſity of St Andrew's, began to teach in the new college of Edinburgh. Other profeſſors were ſoon after elected; and in the year 1586, Rollock was appointed principal of the college, and the following year alſo profeſſor of divinity, immediately after he had conferred the degree of M. A. on the ſtudents who had been under his tuition for four years. The offices of principal and profeſſor of divinity remained united till the year 1620.

In the year 1617, king James VI. having viſited Scotland after his acceſſion to the crown of England, commanded the principal and regents of the college of Edinburgh to attend him in Stirling caſtle; and after they had there held a ſolemn philoſophical diſputation in the royal preſence, his majeſty was ſo much ſatisfied with their appearance, that he deſired their college for the future might be called *The College of King James*, which name it ſtill bears in all its diplomas or public deeds.

For ſeveral years the college conſiſted only of a principal, who was alſo profeſſor of divinity, with four regents or profeſſors of philoſophy. Each of theſe regents inſtructed one claſs of ſtudents for four years, in Latin, Greek, ſchool logic, mathematics, ethics, and phyſics, and graduated them at the concluſion of the fourth courſe. A profeſſor of humanity or Latin was afterwards appointed, who prepared the ſtudents for entering under the tuition of the regents; alſo a profeſſor of mathematics, and a profeſſor of Hebrew or Oriental languages. It was not till about the year 1710 that the four regents began to be confined each to a particular profeſſion; ſince which time they have been commonly ſtyled *Profeſſors of Greek, Logic, Moral Philoſophy, and Natural Philoſophy*.—The firſt medical profeſſors inſtituted at Edinburgh, were Sir Robert Sibbald and Doctor Archibald Pitcairn, in the year 1685*. Theſe, however, were only titular profeſſors; and for 30 years afterwards, a ſummer-lecture on the officinal plants, and the diſſection of a human body once in two or three years, completed the whole courſe of medical education at Edinburgh.—In 1720, an attempt was made to teach the different branches of phyſic regularly; which ſucceeded ſo well, that, ever ſince, the reputation of the univerſity as a ſchool for medicine hath been conſtantly increaſing, both in the iſland of Britain, and even among diſtant nations.

* See College of Phyſicians.

The college is endowed with a very fine library, founded in 1580 by Mr Clement Little advocate, who bequeathed it to the town-council. They ordered a houſe to be built for it in the neighbourhood of St Giles's Church, where it was for ſome time kept under the care of the eldeſt miniſter of Edinburgh, but was afterwards removed to the college. This collection is enriched, as well as others of a ſimilar kind by receiving a copy of every book entered in Stationer's hall, according to the ſtatute for the encouragement for authors. Beſides this, the only fund it has is the money paid by all the ſtudents at the univerſity, except thoſe of divinity, upon their being matriculated, and a ſum of 5l. given by each profeſſor at his admiſſion. The amount of theſe ſums is uncertain, but has been eſtimated at about 150l. annually. The ſtudents of

Edinburgh. of divinity, who pay nothing to this library, have one belonging to their own particular department.

Here are shown two skulls, one almost as thin as paper, pretended to be that of the celebrated George Buchanan, and, by way of contrast, another said to have been that of an idiot, and which is excessively thick. Here also are preserved the original protest against the council of Constance for burning John Huss and Jerom of Parague in 1417; the original contract of queen Mary with the dauphin of France, and some valuable coins and medals. There are also several portraits; particularly of Robert Pollock the first principal of the university, king James VI. Lord Napier the inventor of logarithms, John Knox, principal Carstairs, Mr Thomson the author of the Seasons, &c. The museum contains a good collection of natural curiosities, the number of which is daily increasing. The anatomical preparations are worth notice, as are also those belonging to the professor of midwifery.

The celebrity of this college has been greatly owing to the uniform attention of the magistracy in filling up the vacant chairs with men of known abilities in their respective departments. Greatly to their honour, too, they have been no less attentive to the instituting of new professorships from time to time as the public seemed to demand them. In the year 1790, the Senatus Academicus consisted of the following members, arranged according to the different faculties.

Faculty of Theology.

William Robertson, D. D. Principal of the College.
Andrew Hunter, D. D. Professor of Divinity.
Thomas Hardy, D. D. Regius Professor of Church-History.
James Robertson, D. D. Professor of Oriental Languages, and Emeritus Secretary and Librarian.

Faculty of Law.

Robert Dick, Advocate, Professor of Civil Law.
Allan Maconochie, Advocate, Professor of Public Law.
Alexander Fraser Tytler, Advocate, Professor of Universal Civil History, and of Greek and Roman Antiquities.
David Hume, Advocate, Professor of Scots Law.

Faculty of Medicine.

Alexander Monro, M. D. Professor of Medicine, and of Anatomy and Surgery.
James Gregory, M. D. Professor of the Practice of Physic.
Joseph Black, M. D. Professor of Medicine and Chemistry.
Francis Home, M. D. Professor of Medicine and Materia Medica.
Andrew Duncan, M. D. Professor of the Theory of Physic.
Daniel Rutherford, M. D. Professor of Medicine and Botany.
Alexander Hamilton, M. D. Professor of Midwifery.

Faculty of Arts.

George Stewart, LL. D. Emeritus Professor of Humanity.
Adam Fergusson, LL. D. Emeritus Professor of Moral Philosophy, and joint Professor of Mathematics.
Hugh Blair, D. D. Emeritus Professor of Rhetoric and Belles Lettres. Edinburgh.
Andrew Dalziel, A. M. Professor of Greek, and Secretary and Librarian.
John Robison, A. M. Professor of Natural Philosophy.
Dugald Stewart, A. M. Professor of Moral Philosophy.
John Hill, LL. D. Professor of Humanity.
John Bruce, A. M. Joint Professor of Logic.
John Walker, D. D. Regius Professor of Natural History, and Keeper of the Museum.
William Greenfield, A. M. Professor of Rhetoric and Belles Lettres.
John Playfair, A. M. Professor of Mathematics.
Robert Blair, M. D. Regius Professor of Practical Astronomy.
James Finlayson, A. M. Joint Professor of Logic.
Andrew Coventry, M. D. Professor of Agriculture.
Andrew Fife, Principal Janitor and Macer.
William Stewart, under Janitor.

N. B. There are only about 50 bursers in this university, and these do not exceed 12l. *per annum*.

The number of students during the last session of the college, from October 10. 1789 to May 6. 1790, was nearly as follows:

Students of Divinity	-	130
——— Law	-	100
——— Physic	-	440
General Classes	- -	420
	In all	1090

The old buildings being very mean, and unfit for the reception of so many professors and students, and quite unsuitable to the dignity of such a flourishing university, as well as inconsistent with the improved state of the city, the Lord Provost, Magistrates, and Council, set on foot a subscription for erecting a new structure, according to a design of Robert Adam, Esq; architect. Part of the old fabric has in consequence been pulled down, and the new building is already in considerable forwardness. The foundation stone was laid on Monday the 16th of November, with great solemnity, by the Right Hon. Francis Lord Napier, grand master mason of Scotland, in the presence of the Right Hon. the Lord Provost, Magistrates, and Town-Council of the city of Edinburgh, with the Principal, Professors, and Students of the university of Edinburgh, a number of Nobility and Gentry, and the Masters, Officers, and Brethren, of all the lodges of free masons in the city and neighbourhood, who marched in procession from the Parliament-House down the High-Street. After the different masonic ceremonials were performed, two crystal-bottles, cast on purpose at the glass-house of Leith, were deposited in the foundation-stone. In one of these were put different coins of the present reign, each of them being previously enveloped in crystal, in such an ingenious manner, that the legend on the coins could be distinctly read without breaking the crystal. In the other bottle were deposited seven rolls of vellum, containing a short account of the original foundation and present state of the university, together with several other papers, in particular the different newspapers, containing advertisements relative to the college, &c. and a list of the names of the Principal and Professors, also of the present

Edinburgh. present Lord Provost and Magistrates, and Officers of the grand lodge of Scotland. The bottles being carefully sealed up, were covered with a plate of copper wrapt in block tin; and upon the under side of the copper were engraved the arms of the city of Edinburgh and the university; likewise the arms of the Right Hon. Lord Napier, grand master mason of Scotland. Upon the upper side, a Latin inscription, of which the following is a copy:

ANNUENTE DEO OPT. MAX.
REGNANTE GEORGIO III. PRINCIPE
MUNIFICENTISSIMO;
ACADEMIÆ EDINBURGENSIS
ÆDIBUS,
INITIO QUIDEM HUMILIMIS,
ET JAM, POST DUO SECULA, PENE RUINOSIS;
NOVI HUJUS ÆDIFICII,
UBI COMMODITATI SIMUL ET ELEGANTIÆ,
TANTO DOCTRINARUM DOMICILIO
DIGNÆ,
CONSULERETUR,
PRIMUM LAPIDEM POSUIT,
PLAUDENTE INGENTI OMNIUM ORDINUM
FREQUENTIA,
VIR NOBILISSIMUS.
FRANCISCUS DOMINUS NAPIER,
REIPUB. ARCHITECTONICÆ APUD SCOTOS
CURIO MAXIMUS:
XVI. KAL. DECEMB.
ANNO SALUTIS HUMANÆ MDCCLXXXIX.
ÆRÆ ARCHITECTONICÆ IↃↃIↃCCLXXXIX.
CONSULE THOMA ELDER,
ACADEMIÆ PRÆFECTO GULIELMO
ROBERTSON,
ARCHITECTO ROBERTO ADAM.
Q. F. F. Q. S.

The east and west fronts of this pile are to extend 255 feet, and the south and north 358. There are to be houses for the principal and six or seven of the professors. The library is to be a room of 160 feet in length; the museum for natural curiosities is to be of the same extent; and the dimensions of the hall for degrees and public exercises are about 90 feet by 30. There are likewise to be an elegant and most convenient anatomical theatre; a chemical laboratory; and large rooms for instruments and experiments for the professors of mathematics, natural philosophy, and agriculture. The whole when finished, if not the most splendid structure of the sort in Europe, will however be the completest and most commodious; and it will do the utmost honour to the genius of the architect and to the munificence of the public. About L. 16,000 is already subscribed; and there is no doubt that the aid of parliament will be granted to complete the work.

The botanical garden belonging to the university is situated at the distance of about a mile, on the road between Edinburgh and Leith. It consists of about five acres of ground; and is furnished with a great variety of plants, many of them brought from the most distant quarters of the globe. The professor is botanist to the king, and receives a salary of 120l. annually for the support of the garden. A monument, to the memory of the celebrated botanist Linnæus, was erected here by the late Dr Hope, who first planned the garden, and brought it to perfection.

The university of Edinburgh, like the others in this kingdom, sends one member to the General Assembly of the church of Scotland; and the widows of the professors have a right to the funds of those of ministers, the professors being trustees on that fund along with the presbytery of Edinburgh. Edinburgh.

11. *The Royal Infirmary* was first thought of by the college of physicians in 1725. A fishing company happened to be dissolved at that time, the partners contributed some of their stock towards the establishment of the infirmary. A subscription was also set on foot, and application made to the General Assembly to recommend the same throughout their jurisdiction. This was readily complied with, and the assembly passed an act for that purpose; but very little regard was paid to it by the clergy. Notwithstanding this, however, 2000l. being procured, a small house was opened for the reception of the sick poor in August 1729. In 1736, the contributors towards the infirmary were erected into a body corporate by royal statute; and after this the contributions increased very considerably: by which means the managers were enabled to enlarge their scheme from time to time; and at last to undertake the present magnificent structure, the foundation of which was laid in 1738. During 25 years, when this institution was in its infancy, Lord Hopetoun bestowed upon it an annuity of 400l. In 1750, Doctor Archibald Ker bequeathed to this incorporation 200l. a-year in the island of Jamaica. In 1755, the lords of the treasury made a donation to it of 8000l. which had been appointed for the support of invalids. In return for this, the managers of the infirmary constantly keep 60 beds in readiness for the reception of sick soldiers. This year also sick servants began to be admitted into the infirmary, and a ward was fitted up for their reception.

This institution, however, was more indebted to George Drummond, Esq; than to any other person. He was seven times chosen lord provost of Edinburgh; and always directed his attention to the improvement of the city, particularly to that of the royal infirmary. So sensible were the managers of their obligations to him, that, in their hall, they erected a bust of him with this inscription, "George Drummond, to whom this country is indebted for all the benefit which it derives from the Royal Infirmary."—In 1748, the stock of the infirmary amounted to 5000l; in 1755, to 7076l. besides the estate left by Doctor Ker; in 1764, to 23,426l.; and in 1778, to 27,074l.

The royal infirmary is attended by two physicians chosen by the managers, who visit their patients daily in presence of the students. All the members of the college of surgeons are also obliged to attend in rotation, according to seniority. If any surgeon declines attendance, he is not allowed to appoint a depute; but the patients are committed to the care of one of four assistant surgeons, chosen annually by the managers.—From the year 1762 to 1769, there were admitted 6261 patients; which number added to 109 who were in the hospital at the commencement of the year 1762, made, in all, 6370. Of these, 4395 were cured; 358 died: the rest were either relieved, dismissed incurable, for irregularities, or by their own desire, or remained in the hospital.—From 1770 to 1775, the patients annually admitted into the infirmary were, at an average, 1567; of whom 63 died. In 1776, there were admitted 1668,

of

Edinburgh. of whom 57 died; and in 1777, the number admitted was 1593, and of the deaths 52. In the year 1786, there were admitted 1822 patients: Of these 1354 were cured; 166 relieved; 84 died; the rest were either relieved, dismissed incurable, for irregularities, or by their own desire.

The building consists of a body and two wings, each of them three stories high, with an attic story and garrets, and a very elegant front. The body is 210 feet long, and 36 broad in the middle, but at the ends only 24 feet broad. There is a bust of king George II. in a Roman dress, above the great door. The wings are 70 feet long and 24 broad. In the centre is a large stair-case, so wide that sedan chairs may be carried up. In the different wards, 228 patients may be accommodated, each in a different bed. There are cold and hot baths for the patients, and also for the citizens; and to these last the patients are never admitted.

Besides the apartments necessary for the sick, there are others for the officers and servants belonging to the house. There are likewise rooms for the managers, a consulting room for the physicians and surgeons, a waiting-room for the students, and a theatre that will hold upwards of 200 people for performing chirurgical operations. There is a military ward, supported by the interest of the 800l. already mentioned; and in consequence of which a small guard is always kept at the infirmary. The wards for sick servants are supported by collections at the church doors. Besides the attendance of the royal college of surgeons by rotation, as has already been mentioned, there are two physicians belonging to the house, who are elected by the managers, and have a small salary; there is likewise a house-surgeon and apothecary. Students who attend the infirmary pay 3l. 3s. annually, which brings in a revenue of about 500l. towards defraying the expence of the house. Two wards are set apart for the patients whose cases are supposed to be most interesting; and the physicians give lectures upon them.

12. *The Public Dispensary* was founded by Dr Duncan in 1776, for the poor whose diseases are of such a nature as to render their admission into the infirmary either unnecessary or improper. Here the patients receive advice gratis four days in the week; a register is kept of the diseases of each, and of the effects produced by the medicines employed. All patients not improper for dispensary treatment are admitted on the recommendation of the elder or church-warden of the parish where they reside. The physicians officiate and give lectures gratis; so that the apothecary who lodges in the house, and the medicines, are the only expences attending this useful institution. The expence of the whole is defrayed by public contributions, and from a small annual fee paid by the students who attend the lectures. It is under the direction of a president, two vice-presidents, and 20 directors, elected annually from among the contributors. One guinea intitles a contributor to recommend patients and be a governor for two years, and five guineas gives the same privilege for life.

13. *The High School.* The earliest institution of a grammar-school in Edinburgh seems to have been about the year 1519. The whole expence bestowed upon the first building of this kind amounted only to about 40l. Sterling. Another building, which had been erected for the accommodation of the scholars in 1578, continued, notwithstanding the great increase of their number, to be used for that purpose till 1777. The foundation of the present new building was laid on the 24th of June that year by Sir William Forbes, Grand Master of the Free Masons. The total length of this building is 120 feet from south to north; the breadth in the middle 36, at each end 38 feet. The great hall where the boys meet for prayers, is 68 feet by 30. At each end of the hall is a room of 32 feet by 20, intended for libraries. The building is two stories high, the one 18, the other 17, feet in height. The expence of the whole when finished is reckoned at 4000l.

There is a rector and four masters, who teach from 4 to 500 scholars annually. The salaries are trifling, and the fees depend upon the reputation they have obtained for teaching; and as this has been for some years very considerable, the rector's place is supposed to be worth not less than 400l. *per annum*, a master's about half that sum. There is a janitor, whose place is supposed to be worth about 70l. a-year. His business is to take care of the boys on the play-ground; and there is a woman who lives on the spot as under janitor, whose place may be worth about 25l. annually. There is a library, but not large, as each of the boys pays only one shilling annually to its support.

There are four established English schools in Edinburgh; the masters of which receive a small salary upon express condition that they shall not take above five shillings per quarter from any of their scholars. There are likewise many other private schools in Edinburgh for all languages; and, in general, every kind of education is to be had here in great perfection and at a very cheap rate.

14. *The Mint* is kept up by the articles of union, with all the officers belonging to it, though no money is ever struck here. In stands in the Cowgate, a little to the west of the English church; but is in a ruinous state, though still inhabited by the different officers, who have free houses; and the bell-man enjoys his salary by regularly ringing the bell. This place, as well as the abbey of Holyrood-house, is an asylum for debtors.

15. *The English Chapel* stands near the Cowgate port, and was founded on the 3d of April 1771. The foundation-stone was laid by general Oughton, with the following inscription: *Edifici sacr. Ecclesiæ episc. Angliæ, primum posuit lapidem J. Adolphus Oughton, in architectonicæ Scotiæ repub. curio maximus, militum præfectus, regnante Georgio III. tertio Apr. die, A. D.* MDCCLXXI. It is a plain handsome building, neatly fitted up in the inside, and somewhat resembling the church of St Martin's in the Fields, London. It is 90 feet long, 75 broad, and ornamented with an elegant spire of considerable height. It is also furnished with an excellent bell, formerly belonging to the chapel royal at Holyrood-house, which is permitted to be rung for assembling the congregation: an indulgence not granted to the Presbyterians in England. The expence of the building was defrayed by voluntary subscription;

Edinburgh. and, to the honour of the country, people of all perſuaſions contributed to this pious work. It has already coſt 7000l. and will require 1000l. more to finiſh the portico. This church is built in a ſingular manner, viz. from ſouth to north, and the altar-piece ſtands on the eaſt ſide. Three clergymen officiate here, of whom the firſt has 150l. the other two 100l. each. The altar-piece is finely decorated, and there is a good organ.

There is another Epiſcopal chapel, but ſmall, in Black-fryars wynd, which was founded by Baron Smith in the year 1722. There are alſo ſome meetings of the Epiſcopal Church of Scotland, who adhere to their old forms, having ſtill their biſhops and inferior clergy. For ſome time theſe were ſubjected to penal laws, as they refuſed to take the oath to government, or mention the preſent royal family in their public prayers: but of late they have conformed, and had their conduct approved of by his Majeſty; ſo that now every denomination of Chriſtians in Britain pray for the royal family on the throne.

16. *Heriot's Hoſpital* owes its foundation to George Heriot, goldſmith to James VI. who acquired by his buſineſs a large fortune. At his death, he left the magiſtrates of Edinburgh 23,625l. 10s. "for the maintenance, relief, and bringing up of ſo many poor and fatherleſs boys, freemen's ſons of the town of Edinburgh," as the above ſum ſhould be ſufficient for. This hoſpital is finely ſituated on the weſt end of the ſouth ridge, almoſt oppoſite to the caſtle, and is the moſt magnificent building of the kind in Edinburgh. It was founded in July 1628, according to a plan (as is reported) of Inigo Jones; but the work being interrupted by the civil wars, it was not finiſhed till the year 1650. The expence of the building is ſaid to have been upwards of 30,000l. (A): and the hoſpital is now poſſeſſed of an income of about 3000l. a-year; though this cannot be abſolutely aſcertained, as the rents are paid in grain, and of courſe muſt be fluctuating.

It ſtands on a riſing ground to the ſouth-weſt of the city, and is a ſquare of 162 feet without, having a court 94 feet ſquare in the inſide, with piazzas on three of the ſides. There is a ſpire with a clock over the gateway, and each corner of the building is ornamented with turrets; but notwithſtanding the magnificent appearance of the outſide, the inner part is far from being convenient. There is a ſtatue of the founder over the gateway, in the dreſs of the times, and a very good painting of him in the governor's room, with a picture of the late treaſurer Mr Carmichael. There is a chapel 61 feet long and 22 broad, which is now repairing in ſuch a manner as will make it worthy of notice. When Cromwell took poſſeſſion of Edinburgh after the battle of Dunbar, he quartered his ſick and wounded ſoldiers in this hoſpital. It was applied to the ſame purpoſe till the year 1658, when general Monk, at the requeſt of the governors, removed the ſoldiers; and on the 11th of April 1659, it was opened for the reception of boys, 30 of whom were admitted into it. The Auguſt after, they were increaſed to 40; and in 1661, to 52. In 1753 the number was raiſed to 130, and in 1763 to 140; but ſince that time it has decreaſed.—In this hoſpital the boys are inſtructed in reading, writing, arithmetic, and a knowledge of the Latin tongue. With ſuch as chooſe to follow any kind of trade, an apprentice-fee of 30l. is given when they leave the hoſpital; and thoſe who chooſe an academical education, have an annuity of 10l. a-year beſtowed on them for four years. The whole is under the overſight of the treaſnrer, who has under him a houſe-governor, houſe-keeper, and ſchool-maſters. Edinburgh.

17. *Watſon's Hoſpital* has its name from the founder George Watſon, who was at firſt clerk to Sir William Dick, provoſt of Edinburgh in 1676, then accountant of the Bank of Scotland; after that he became receiver of the city's impoſt on ale, treaſurer to the merchant's Maiden Hoſpital, and to the ſociety for propagating Chriſtian knowledge. Dying a batchelor in 1723, he left 12,000l. for the maintenance and education of the children and grand-children of decayed members of the merchant company of Edinburgh. The ſcheme, however, was not put in execution till the year 1738, when the ſum originally left had accumulated to 20,000l. The preſent building was then erected, in which about 60 boys are mantained and educated. It is much leſs magnificent than Heriot's hoſpital, but the building is far from being deſpicable. It ſtands to the ſouthward of the city at a ſmall diſtance from Heriot's hoſpital, and was erected at the expence of 5000l.: its preſent revenue is about 1700l. It is under the management of the maſter, aſſiſtants, and treaſurer of the Merchant Company, four old bailies, the old dean of guild, and the two miniſters of the old church. The boys are genteelly clothed and liberally educated. Such as chooſe an univerſity education are allowed 10l. *per annum* for five years: thoſe who go to trades have 20l. allowed them for their apprentice fee; and at the age of 25 years, if they have behaved properly, and not contracted marriage without conſent of the governors, they receive a bounty of 50l. The boys are under the immediate inſpection of the treaſurer, ſchool-maſter, and houſe-keeper.

18. *The Merchants Maiden Hoſpital* was eſtabliſhed by voluntary contribution about the end of the laſt century, for the maintenance of young girls, daughters of the merchants burgeſſes of Edinburgh. The governors were erected into a body corporate, by act of parliament, in 1707. The annual revenue amounts to 1350l. Seventy girls are maintained in it; who, upon leaving the houſe, receive 3l. 6s. 8d. excepting a

(A) It is to be obſerved, that money then bore 10l. *per cent.* intereſt.—The above ſums are taken from Mr Arnot's Hiſtory of Edinburgh, who ſubjoins the following note. "Where Maitland had collected his moſt erroneous account of George Heriot's effects, we do not know. He makes the ſum received, out of Heriot's effects, by the governors of the hoſpital, to be 43,608l. 11s. 3d. being almoſt the double of what they really got. This blunder has been the cauſe of many unjuſt murmurings againſt the magiſtrates of Edinburgh, and even the means of ſpiriting up law-ſuits againſt them."

Edinburgh. a few who are allowed 8 l. 6s. 8d. out of the funds of the hospital. The profits arising from work done in the house are also divided among the girls, according to their industry.

19. *The Trades Maiden Hospital* was founded in the year 1704 by the incorporations of Edinburgh, for the maintenance of the daughters of decayed members, on a plan similar to that of the merchants hospital. To this, as well as to the former, one Mrs Mary Erskine, a widow gentlewoman, contributed so liberally, that she was by the governors styled *joint foundress* of the hospital. Fifty girls are maintained in the house, who pay of entry-money 1 l. 13s. 4d.; and, when they leave it, receive a bounty of 5 l. 11 s. 1½d. The revenues are estimated at 600 l. a-year.

20. *The Orphan Hospital* was planned in 1732 by Andrew Gairdner merchant, and other inhabitants. It was promoted by the society for propagating Christian knowledge, by other societies, by voluntary subscriptions, and a collection at the church-doors.—In 1733, the managers hired a house, took in 30 orphans, maintained them, gave them instructions in reading and writing, and taught them the weaving business. In 1735, they were erected into a body corporate by the town of Edinburgh: and, in 1742, they obtained a charter of erection from his late majesty, appointing most of the great officers of state in Scotland, and the heads of the different societies in Edinburgh, members of this corporation; with powers to them to hold real property to the amount of 1000 l. a-year. The revenue is inconsiderable; but the institution is supported by the contributions of charitable persons. Into this hospital orphans are received from any part of the kingdom. None are admitted under seven, nor continued in it after 14, years of age. At present about 140 orphans are maintained in it.

The orphan hospital is situated to the east of the north bridge; and is a handsome building, consisting of a body and two wings, with a neat spire, furnished with a clock and two bells. The late worthy Mr Howard admits, that this institution is one of the most useful charities in Europe, and is a pattern for all institutions of the kind. The funds have been considerably increased, and the building greatly improved, through the attention and exertions of Mr Thomas Tod the present treasurer.

21. *The Trinity Hospital.* This was originally founded and amply endowed by king James II.'s queen. At the Reformation, it was stripped of its revenues; but the regent afterwards bestowed them on the provost of Edinburgh, who gave them to the citizens for the use of the poor. In 1585, the town-council purchased from Robert Pont, at that time provost of Trinity college, his interest in these subjects; and the transaction was afterwards ratified by James VI. The hospital was then repaired, and appointed for the reception of poor old burgesses, their wives, and unmarried children, not under 50 years of age. In the year 1700, this hospital maintained 54 persons; but, since that time, the number has decreased.—The revenue consists in a real estate of lands and houses, the gross rent of which are 762l. a-year; and 5500l. lent out in bonds at 4 per cent.

This hospital is situated at the foot of Leith-wynd, and maintains about 50 of both sexes, who are comfortably lodged, each having a room for themselves. They are supplied with roast or boiled meat every day for dinner, have money allowed them for clothes, and likewise a small sum for pocket-money. There is a small library for their amusement, and they have a chaplain to say prayers. There are some out-pensioners who have 6 l. a-year, but these are discouraged by the governors. The funds are under the management of the town-council.

22. *The Charity Workhouse* was erected in 1743 by voluntary contribution. It is a large plain building, on the south side of the city. Here the poor are employed, and are allowed twopence out of every shilling they earn. The expence of this institution is supposed not to be less than 4000 l. annually; as about 700 persons of both sexes, including children, are maintained here, each of whom cannot be reckoned to cost less than 4 l 10 s *per annum;* and there are besides 300 out-pensioners. The only permanent fund for defraying this expence is a tax of two *per cent.* on the valued rents of the city, which may bring in about 600l. annually; and there are other funds which yield about 400 l. The rest is derived from collections at the church doors and voluntary contributions; but as these always fall short of what is requisite, recourse must frequently be had to extraordinary collections. The sum arising from the rents of the city, however, is constantly increasing; but the members of the College of Justice are exempted from the tax.

There are two other charity workhouses in the suburbs, much on the same plan with that now described; one in the Canongate, and the other in St Cuthbert's or West-Kirk parish.

To this account of the charitable establishments in Edinburgh, we shall add that of some others; which, though not calculated to decorate the city by any public building, are perhaps no less deserving of praise than any we have mentioned. The first is that of Captain William Horn; who left 3500l. in trust to the magistrates, the annual profits to be divided on Christmas day to poor out day labourers, who must at that season of the year be destitute of employment; five pounds to be given to those who have large families, and one half to those who have smaller.

Another charity is that of Robert Johnston, L.L.D. of London, who in 1640 left 3000 l. to the poor of this city; 1000 l. to be employed in setting them to work, another 1000l. to clothe the boys in Heriot's Hospital, and the third 1000 l. to bursers at the university.

About the beginning of this century John Strachen left his estate of Craigcrook, now upwards of 300 l. a-year, in trust to the presbytery of Edinburgh, to be by them disposed of in small annual sums to poor old people not under 65 years of age, and to orphans not above 12.

There is besides a society for the support of the industrious poor, another for the indigent sick, and there are also many charity-schools.

Having thus given an account of the most remarkable edifices belonging to Old Edinburgh, we shall now proceed to those of the New Town. This is terminated on the east side by the Calton-hill, round which there is a pleasant walk, and which affords one of the finest prospects that can be imagined, varying

Edinburgh. varying remarkably almost at every step. On this hill is a burying-ground, which contains a fine monument to the memory of David Hume the historian.—On the top is an Observatory, the scheme for building which was first adopted in the year 1736; but the disturbance occasioned by the Porteous mob prevented any thing from being done towards the execution of it at that time. The Earl of Morton afterwards gave 100 l. for the purpose of building an observatory, and appointed Mr M'Laurin professor of mathematics, together with the principal and some professors of the university, trustees for managing the sum. Mr M'Laurin added to the money abovementioned the profits arising from a course of lectures which he read on experimental philosophy; which, with some other small sums, amounted in all to 300 l.: but Mr M'Laurin dying, the design was dropped.—Afterwards the money was put into the hands of two persons who became bankrupt; but a considerable dividend being obtained out of their effects, the principal and interest, about the year 1776, amounted to 400 l. A plan of the building was made out by Mr Craig architect; and the foundation-stone was laid by Mr Stodart, lord provost of Edinburgh, on the 25th of August 1776. About this time, however, Mr Adam architect happening to come to Edinburgh, conceived the idea of giving the whole the appearance of a fortification, for which its situation on the top of the Calton-hill was very much adapted. Accordingly a line was marked out for inclosing the limits of the observatory with a wall constructed with buttresses and embrasures, and having Gothic towers at the angles. Thus the money designed for the work was totally exhausted, and the observatory still remains unfinished; nor is there any appearance of its being soon completed either by voluntary subscription or any other way.

23. Proceeding to the westward, the first remarkable building is the *Theatre*, which stands opposite to the Register Office, in the middle of Shakespeare Square. The building is plain on the outside, but elegantly fitted up within, and is generally open three days in the week, and when full will draw about 150 l. a-night; so that the manager generally finds himself well rewarded when he can procure good actors.

Entertainments of the dramatic kind came very early into fashion in this country. They were at first only representations of religious subjects, and peculiarly designed to advance the interests of religion; the clergy being the composers, and Sunday the principal time of exhibition. In the 16th century, the number of playhouses was so great, that it was complained of as a nuisance, not only in Edinburgh, but throughout the kingdom. They soon degenerated from their original institution; and the plays, instead of being calculated to inspire devotion, became filled with all manner of buffoonery and indecency.—After the Reformation, the Presbyterian clergy complained of these indecencies; and being actuated by a spirit of violent zeal, anathematised every kind of theatrical representation whatever. King James VI. compelled them to pass from their censures against the stage; but in the time of Charles I. when fanaticism was carried to the utmost length at which perhaps it was possible for it to arrive, it cannot be supposed that stage plays would be tolerated.—It seems, however, that amusements of this kind were again introduced at Edinburgh about the year 1684, when the Duke of York kept his court there. His residence at Edinburgh drew off one half of the London company, and plays were acted in Edinburgh for some little time. The misfortunes attending the Duke of York, however, and the establishment of the Presbyterian religion (the genius of which is unfavourable to amusements of this kind), soon put a stop to the progress of the stage, and no theatrical exhibition was heard of in Edinburgh till after the year 1715. The first adventurer was Signora Violante, an Italian, remarkable for feats of strength, tumbling, &c. In this way she first exhibited in a house at the foot of Carrubber's Close, which has since been employed by different sectaries for religious purposes. Meeting with good success, she soon invited a company of comedians from London; and these being also well received, Edinburgh continued for some years to be entertained with the performances of a strolling company, who visited it annually. Becoming at last, however, obnoxious to the clergy, they were in 1727 prohibited by the magistrates from acting within their jurisdiction. But this interdict was suspended by the Court of Session, and the players continued to perform as usual.

Still, however, theatrical entertainments were but rare. The town was visited by itinerant companies only once in two or three years. They performed in the Taylor's Hall in the Cowgate; which, when the house was full, would have drawn (at the rate of 2 s. 6d. for pit and boxes, and 1 s. 6 d. for the gallery) 40 l. or 45 l. a-night. About this time an act of parliament was passed, prohibiting the exhibition of plays, except in a house licensed by the king. Of this the presbytery of Edinburgh immediately laid hold; and at their own expence brought an action on the statute against the players. The cause was by the Court of Session decided against the players; who thereupon applied to parliament for a bill to enable his majesty to licence a theatre in Edinburgh. Against this bill petitions were presented in 1739 to the house of commons by the magistrates and town-council, the principal and professors of the university, and the dean of guild and his council; in consequence of which, the affair was dropped. All this opposition, however, contributed in reality to the success of the players; for the spirit of party being excited, a way of evading the act was easily found out, and the house was frequented more than usual, insomuch that Taylor's Hall was found insufficient to contain the number of spectators.

The comedians now fell out among themselves, and a new playhouse was erected in the Canongate in the year 1746. The consequence of this was, that the old one in Taylor's Hall became entirely deserted, and through bad conduct the managers of the new theatre soon found themselves greatly involved. At last, a riot ensuing through dissensions among the performers, the playhouse was totally demolished.—When the extension of the royalty over the spot where the new town is built was obtained, a clause was likewise added to the bill, enabling his majesty to licence a theatre in Edinburgh. This was obtained, and thus the opposition of the clergy for ever silenced. But notwithstanding this, Edinburgh. this, the high price paid by the managers to the patentee, being no less than 500 guineas annually, prevented them effectually from decorating the house as they would otherwise have done, or even from always retaining good actors in their service; by which means the success of the Edinburgh theatre has not been so great as might have been expected.

Not far from this building, an amphitheatre was opened in 1790, on the road to Leith, for equestrian exhibitions, pantomime entertainments, dancing, and tumbling. The circus is 60 feet diameter; and in the forenoon ladies and gentlemen are taught to ride. The house will hold about 1500 people.

24. *The Register Office*. This work was first suggested by the late Earl of Morton, lord-register of Scotland, with a view to prevent the danger which attended the usual method of keeping the public records. In former times, indeed, these suffered from a variety of accidents. Edward I. carried off or destroyed most of them, in order to prevent any marks of the former independency of the nation from remaining to posterity. Afterwards Cromwell spoiled this nation of its records, most of which were sent to the tower of London. At the time of the Restoration, many of them were sent down again by sea; but one of the vessels was shipwrecked, and the records brought by the other have ever since been left in the greatest confusion.—The Earl of Morton taking this into consideration, obtained from his majesty a grant of 12,000l. out of the forfeited estates, for the purpose of building a register-office, or house for keeping the records, and disposing them in proper order. The foundation was laid on the 27th of June 1774, by Lord Frederic Campbell lord-register, Mr Montgomery of Stanhope lord advocate, and Mr Miller of Barskimming lord justice-clerk; three of the trustees appointed by his majesty for executing the work. The ceremony was performed under a discharge of artillery, in presence of the judges of the courts of session and exchequer, and in the sight of a multitude of spectators. A brass plate was put into the foundation-stone with the following inscription: CONSERVANDIS TABULIS PUBLICIS POSITUM EST, ANNO M.DCC.LXXIV, MUNIFICENTIA OPTIMI ET PIETISSIMI PRINCIPIS GEORGII TERTII. In a glass vase hermetically sealed, which is also placed in the foundation-stone, are deposited specimens of the different coins of his present majesty.

The front of the building directly faces the bridge, extends from east to west 200 feet, and is 40 feet back, from the line of Prince's-street. In the middle of the front is a small projection of three windows in breadth. Here is a pediment, having in its centre the arms of Great Britain, and the whole is supported by four Corinthian pilastres. At each end is a tower projecting beyond the rest of the building, having a Venetian window in front, and a copula on the top. The front is ornamented from end to end with a beautiful Corinthian entablature. In the centre of the building is a dome of wooden work covered with lead. The inside forms a saloon 50 feet diameter and 80 high, lighted at top by a copper window 15 feet in diameter. Round the whole is a hanging gallery of stone, with an iron ballustrade, which affords conveniency for presses in the walls for keeping the records. The whole number of apartments is 97; all of which are vaulted beneath, and warmed with fire places. This building which is the most beautiful of Mr Adams's designs, has been executed in a substantial manner, in about 16 years, at the expence of near 40,000l. and is one of the principal ornaments of the city. A serjeant's guard is placed here from the castle, for the further protection of the records. It is intended to place a statue of his present Majesty in the front of the building, with the lion and unicorn above the centinels boxes. The lord-register has the direction of the whole, and the principal clerks of Session are his deputies. These have a great number of clerks under them for carrying on the business of the Court of Session. The lord-register is a minister of state in this country. He formerly collected the votes of the parliament of Scotland, and still collects those of the peers at the election of 16 to represent them in parliament.

25. On the east side of St Andrew's Square stands the *General Excise Office*, built by the late Sir Laurence Dundas for his own residence, but sold by his son for the above purpose. It is a very handsome building, with a pediment in front ornamented with the king's arms, and supported by four Corinthian pilastres; and, in conjunction with the two corner houses. has a fine effect.

26. *St Andrew's Church* stands on the north side of George's Street. It is of an oval form; and has a very neat spire of 186 feet in height, with a chime of eight bells, the first and only one of the kind in Scotland. It has also a handsome portico in front.

27. Opposite to St Andrew's church is the *Physicians Hall*, designed for the meeting of the faculty, and which has a portico resembling that of the church.

28. Farther to the westward, on the south side, stand the *Assembly-rooms*, which though a heavy looking building on the outside, are nevertheless extremely elegant and commodious within. The largest is 100 feet long and 40 broad, being exceeded in its dimensions by none in the island, the large one at Bath excepted. Weekly assemblies are held here for dancing and card-playing, under the direction of a master of ceremonies; admission-tickets five shillings each.

29 Religious establishments.

It now remains only to speak something of the religious and civil establishments of this metropolis. The highest of the former is the General assembly of the Church of Scotland, who meet here annually in the month of May, in an aisle of the church of St Giles fitted up on purpose for them. The throne is filled by a commissioner from his majesty, but he neither debates nor votes. He calls them together, and dissolves them at the appointed time in the name of the king; but they call and dissolve themselves in the name of the Lord Jesus Christ. This assembly consists of 350 members chosen out of the various presbyteries throughout the kingdom; and the debates are often very interesting and eloquent. This is the supreme ecclesiastical court in Scotland, to which appeals lie from the inferior ones.

The ecclesiastical court next in dignity to the assembly is the Synod of Lothian and Tweddale, who meet in the same place in April and November; and next to them is the Presbytery of Edinburgh. These meet on the last Wednesday of every month, and are trustees on the fund for ministers widows. They have

Edinburgh. a hall in Scott's close, where there is a good picture of Dr Webster by Martin, which was put up at the expence of the trustees, out of gratitude for the trouble he took in planning and fully establishing the fund.

The Society for propagating Christian Knowledge in the Highlands and Islands of Scotland, was established a body Corporate by queen Anne in the year 1709, for the purpose of erecting schools to instruct poor children in the principles of Christianity, as well as in reading and writing. The society have a hall in Warriston's close where their business is transacted. From time to time they have received large contributions, which have always been very properly applied; and for much the same purpose his majesty gives 1000l. annually to the general assembly of the church of Scotland, which is employed by a committee of their number for instructing the poor Highlanders in the principles of the Christian religion.

The Earse church at Edinburgh was built about 20 years ago by subscription for the same laudable purpose. Great numbers of people resort to the metropolis from the Highlands, who understand no other language but their own, and consequently have no opportunity of instruction without it; and a most remarkable proof of the benefit they have received from it is, that though the church is capable of holding 1000 people, yet it is not large enough for those who apply for seats. The minister has 100l. *per annum* arising from the seat-rents, and holds communion with the church of Scotland. The establishment was promoted by William Dickson dyer in Edinburgh.

30 Political constitution. With regard to the political constitution of Edinburgh, the town-council have the direction of all public affairs. The *ordinary* council consists only of 25 persons; but the *council ordinary and extraordinary*, of 33. The whole is composed of merchants and tradesmen, whose respective powers and interests are so interwoven, that a balance is preserved between the two bodies. The members of the town-council are partly elected by the members of the 14 incorporations, and they partly choose their own successors. The election is made in the following manner: First a list or *leet* of six persons is made out by each incorporation; from which number the deacon belonging to that incorporation must be chosen. These lists are then laid before the ordinary council of 25, who "shorten the *leets*," by expunging one half of the names from each; and from the three remaining ones the deacon is to be chosen. When this election is over, the new deacons are presented to the ordinary council, who choose six of them to be members of their body, and the six deacons of last year then walk off. The council of 25 next proceed to the election of three merchant and two trades councellors. The members of council, who now amount to 33 in number, then make out *leets*, from which the lord provost, dean of guild, treasurer, and bailies must be chosen. The candidates for each of these offices are three in number; and the election is made by the 30 members of council already mentioned, joined to the eight *extraordinary* council-deacons.

The lord provost of Edinburgh, who is styled *right honourable*, is high sheriff, coroner, and admiral, within the city and liberties, and the town, harbour, and road of Leith. He has also a jurisdiction in matters of life and death. He is preses of the convention of royal boroughs, colonel of the trained bands, commander of the city-guard and of Edinburgh jail. In the city he has the precedency of all the great officers of state and of the nobility; walking on the right hand of the king or of his majesty's commissioner; and has the privilege of having a sword and mace carried before him. Under him are four magistrates called *bailies*, whose office is much the same with that of aldermen in London. There is also a dean of guild, who has the charge of the public buildings, and without whose warrant no house nor building can be erected within the city. He has a council to consult with, a nominal treasurer, who formerly had the keeping of the town's money, which is now given to the chamberlain. These seven are elected annually; who with the seven of the former year, three merchants and two trades councellors, and 14 deacons or preses of incorporated trades, making in all 33, form the council of the city, and have the sole management and disposal of the city revenues; by which means they have the disposal of places to the amount of 20,000l. annually. Formerly the provost was also an officer in the Scots parliament. The magistrates are sheriffs-depute and justices of the peace; and the town council are also patrons of all the churches in Edinburgh, patrons of the university, and electors of the city's representative in parliament. They have besides a very ample jurisdiction both civil and criminal. They are superiors of the Canongate, Portsburgh, and Leith; and appoint over these certain of their own number, who are called *baron bailies*: but the person who presides over Leith has the title of *admiral*, because he hath there a jurisdiction over maritime affairs. The baron bailies appoint one or two of the inhabitants of their respective districts to be their substitutes, and these are called *resident bailies*. They hold courts in absence of the baron-bailies, for petty offences, and discussing civil causes of little moment.

No city in the world affords greater security to the inhabitants in their persons and properties than Edinburgh. Robberies are here very rare, and a street-murder hardly known in the memory of man; so that a person may walk the streets at any hour of the night in perfect security. This is in a great measure owing to 31 Town guard.
the *town-guard*. This institution originated from the consternation into which the citizens were thrown after the battle at Flowden. At that time, the town-council commanded the inhabitants to assemble in defence of the city, and every fourth man to be on duty each night. This introduced a kind of personal duty for the defence of the town, called *watching and warding*; by which the trading part of the inhabitants were obliged in person to watch alternately, in order to prevent or suppress occasional disturbances. This, however, becoming in time extremely inconvenient, the town-council, in 1648, appointed a body of 60 men to be raised; the captain of which was to have a monthly pay of 11l. 2s. 3d. two lieutenants of 2l. each, two serjeants of 1l. 5s. and the private men of 15s. each. No regular fund was established for defraying this expence; the consequence of which was, that the old method of watching and warding was resumed: but the people on whom this service devolved were now become so relaxed in their discipline, that the magistrates were threatened with having the king's troops

Edinburgh. troops quartered in the city if they did not appoint a sufficient guard. On this 40 men were raised in 1679, and in 1682 the number was increased to 108. After the revolution, the town-council complained of the guard as a grievance, and requested parliament that it might be removed. Their request was immediately granted, and the old method of watching and warding was renewed. This, however, was now so intolerable, that the very next year they applied to parliament for leave to raise 126 men for the defence of the city, and to tax the citizens for their payment. This being granted, the corps was raised which still continues under the name of the *town-guard.* At present the establishment consists of three officers and about 90 men, who mount guard by turns. The officers have a lieutenant's pay; the serjeants, corporals, drummers, and common soldiers, the same with those of the army. Their arms are the same with those of the king's forces; but when called upon to quell mobs, they use Lochaber-taxes, a part of the ancient Scottish armour now in use only among themselves.

32
Militia or trained bands.

The militia or trained band of the city consist of 16 companies of 100 men each. They were in use to turn out every king's birth-day; but only the officers now remain, who are chosen annually. They consist of 16 captains and as many lieutenants; the provost, as has already been mentioned, being the colonel.

The town-guard are paid chiefly by a tax on the trading people; these being the only persons formerly subject to watching and warding. This tax, however, amounts only to 1250l. and as the expence of the guard amounts to 1400l. the magistrates are obliged to defray the additional charge by other means.

33
Number of inhabitants.

The number of inhabitants in the city of Edinburgh is somewhat uncertain, and has been very variously calculated. By a survey made in the year 1775, it appears that the number of families in the city, Canongate, and other suburbs, and the town of Leith, amounted to 13,806. The difficulty therefore is to fix the number of persons in a family. Dr Price fixes this number at $4\frac{1}{10}$; Mr Maitland, at $5\frac{1}{4}$; and Mr Arnot, at 6: so that, according to this last gentleman, the whole number of inhabitants is 82,836; to which he thinks 1400 more may be added for those in the garrison, hospitals, &c. There are in Edinburgh 14 incorporations, capable of choosing their own deacons, viz. The royal college of surgeons; the corporations of goldsmiths, skinners, furriers, hammermen, wrights and masons, taylors, bakers, butchers, shoemakers, weavers, waukers, bonnet-makers, and merchant-company. The revenue of the city, arising partly from duties of different kinds, and partly from landed property, is estimated at about 10,000l. per annum.

34
Plenty of provisions.

The markets of Edinburgh are plentifully supplied with all sorts of provisions. Fresh butcher-meat, as well as fowl and fish, if the weather permit, may be had every day; and no city can be better supplied with garden stuffs. The Edinburgh strawberries particularly are remarkably large and fine. A remarkable instance of the plenty of provisions with which Edinburgh is supplied was observed in the year 1779, when several large fleets, all of them in want of necessaries, arrived in the Forth, to the amount of about 500 sail, and having on board at least 20,000 men; yet the increased consumption of provisions, which certainly ensued upon the arrival of so many strangers, made not the least increase in the rate of the markets, insomuch that several victualling ships sent down by the navy-board returned without opening their hatches. The city-mills are let to the corporation of bakers in Edinburgh; and the bread made in the city is remarkable for its goodness.

Edinburgh ‖ Edom.

Edinburgh is supplied with water brought for some miles in pipes, and lodged in two reservoirs, from whence it is distributed through the city both to public wells and private families. A revenue accrues to the town from the latter, which must undoubtedly increase in proportion as the city extends in magnitude.

There are but few merchants in Edinburgh, most of them residing at the port of Leith; so that the support of the city depends on the consumption of the necessaries as well as the superfluities of life. There are five different sorts of people on whom the shopkeepers, publicans, and different trades depend: 1. The people of the law, who are a very respectable body in the city. 2. The number of young people of both sexes who come to town for their education, many of the parents of whom come along with them. 3. The country gentlemen, gentlemen of the army and navy, and people who have made their fortunes abroad, &c. all of whom come to attend the public diversions, or to spend their time in such a manner as is most agreeable to them. 4. The vast concourse of travellers from all parts. 5. The most of the money drawn for the rents of country gentlemen is circulated among the bankers or other agents.

At Edinburgh there are excellent manufactures of linen and cambrics; there are also manufactures of paper in the neighbourhood, and printing is carried on very extensively. But for some time the capital branch about Edinburgh has been building: which has gone on, and still continues to do so, with such rapidity, that the city has been increased exceedingly in its extent; and it is not uncommon to see a house built in a few months, and even inhabited before the roof is quite finished.

EDITOR, a person of learning, who has the care of an impression of any work, particularly that of an ancient author: thus, Erasmus was a great editor; the Louvain doctors, Scaliger, Petavius, F. Sirmond, bishop Walton, Mr Hearne, Mr Ruddiman, &c. are likewise famous editors.

EDOM, or ESAU, the son of Isaac and brother of Jacob. The name of Edom, which signifies *red*, was given him, either because he sold his birth-right to Jacob for a mess of red pottage, or by reason of the colour of his hair and complexion. Idumea derives its name from Edom, and is often called in scripture the land of Edom. See the next article.

EDOM, or IDUMÆA (anc. geog.), a district of Arabia Petræa; a great part also of the south of Judæa was called Idumæa, because occupied by the Idumæans, upon the Jewish captivity, quite to Hebron. But the proper Edom or Idumæa appears not to have been very extensive, from the march of the Israelites, in which they compassed it on the south eastwards, till they

they came to the country of the Moabites. Within this compaſs lies mount Hor, where Aaron died; marching from which the Iſraelites fought with king Arad the Canaanite, who came down the wilderneſs againſt them (Moſes). And this is the extent of the *Idumæa Propria*, lying to the ſouth of the Dead Sea; but in Solomon's time extending to the Red Sea (1 Kings ix. 26.)

EDMUND I. and II. See *(Hiſtory of)* ENGLAND.

1 Definition.

EDUCATION may be defined, that ſeries of means by which the human underſtanding is gradually enlightened, and the diſpoſitions of the human heart are formed and called forth between earlieſt infancy and the period when we conſider ourſelves as qualified to take a part in active life, and, ceaſing to direct our views ſolely to the acquiſition of new knowledge or the formation of new habits, are content to act upon the principles which we have already acquired.

2 Particulars comprehended under the definition.

This comprehends the circumſtances of the child in regard to local ſituation, and the manner in which the neceſſaries and conveniences of life are ſupplied to him; the degree of care and tenderneſs with which he is nurſed in infancy; the examples ſet before him by parents, preceptors, and companions; the degree of reſtraint or licentiouſneſs to which he is accuſtomed; the various bodily exerciſes, languages, arts, and ſciences, which are taught him, and the method and order in which they are communicated; the moral and religious principles which are inſtilled into his mind; and even the ſtate of health which he enjoys during that period of life.

3 Various modes of education have prevailed.

In different periods of ſociety, in different climates, and under different forms of government, various inſtitutions have naturally prevailed in the education of youth; and even in every different family, the children are educated in a different manner, according to the difference in the ſituation, diſpoſitions, and abilities, of the parents. The education of youth being an object of the higheſt importance, has not only engaged the anxious care of parents, but has likewiſe often attracted the notice of the legiſlator and the philoſopher.

4 Plan.

What our readers have therefore a right to expect from us on this article is, 1ſt, That we give an account of ſome of the moſt remarkable inſtitutions for the education of youth which have been legally eſtabliſhed or have accidentally prevailed among various nations and in various periods of ſociety. 2dly, That we alſo give ſome account of the moſt judicious and the moſt fanciful plans which have been propoſed by thoſe authors who have written on the ſubject of education. And, laſtly, that we venture to preſent them with the reſult of our own obſervations and recollections on this important head.

5 Education in a ſavage ſtate.

In the infancy of ſociety, very little attention can be paid to the education of youth. Before men have riſen above a ſavage ſtate, they are almoſt entirely the creatures of appetite and inſtinct. The impulſe of appetite hurries them to propagate their ſpecies. The power of inſtinctive affection is often, though not always, ſo ſtrong as to compel them to preſerve and nurſe the fruit of their embraces. But even when their wants are not ſo urgent, nor their hearts ſo deſtitute of feeling, as to prompt them to abandon their new-born infants to the ferocity of wild beaſts or the ſeverity of the elements, yet ſtill their uncomfortable and precarious ſituation, their ignorance of the laws of nature, their deficiency of moral and religious principles, and their want of dexterity or ſkill in any of the arts of life, all theſe together muſt render them unable to regulate the education of their children with much attention or ſagacity. They may relate to them the wild inconſiſtent tales in which all their notions concerning ſuperior beings and all their knowledge of the circumſtances and tranſactions of their anceſtors are contained; they may teach them to bend the bow, to point their arrows, to hollow the trunk of a tree into a canoe, and to trace the almoſt imperceptible path of an enemy or a wild beaſt over dreary mountains or through intricate foreſts: but they cannot impreſs their minds with juſt ideas concerning their ſocial relations, or concerning their obligations to a Supreme Being, the framer and upholder of nature: they teach them not to repreſs their irregular appetites, nor to reſtrain the ſallies of paſſion when they exceed juſt bounds or are improperly directed; nor can they inform their underſtandings with very accurate or extenſive views of the phenomena of nature. Beſides, they know not how far implicit obedience to his parent's commands is to be required of the boy or youth, nor how far he ought to be left to the guidance of his own reaſon or humour. Among ſavages the influence of parental authority ſoon expires, nor is the parent ſolicitous to maintain it. As the eagle expels his young from his lofty neſt as ſoon as they become able to ſupport themſelves in the air; ſo the ſavage generally ceaſes to care for his child, or aſſume any power over him, as ſoon as he becomes capable of procuring the means neceſſary for his own ſubſiſtence. Savages being ſcarce connected by any ſocial ties, being unacquainted with the reſtraint of civil laws, and being unable to contribute in any great degree to the maintenance or protection of one another; each individual among them, as ſoon as he attains that degree of ſtrength and dexterity which may enable him to procure the neceſſaries of life, ſtands ſingle and alone, independent on others, and ſcorning to ſubmit to their commands. The parent, conſcious of his inability to confer any important benefits on his child, after he has advanced even a very ſhort way towards manhood, no longer endeavours to controul his actions; and the child, proud of his independence, ſcarce ſubmits to aſk his parent's advice. And even before reaching this period of independence, ſo few are the benefits which parents can beſtow (being confined to ſupplying the neceſſaries of life, and communicating the knowledge of a very few of the rudeſt ſimpleſt arts), that children regard them with little deference, nor do *they* always inſiſt on implicit ſubmiſſion. Want of natural affection, and conſciouſneſs of ſuperior ſtrength, often prompt the parent to abuſe the weakneſs of his child. Yet though ſmall the ſkill with which the ſavage can cultivate the underſtanding or form the diſpoſition of his child, though few the arts which he can teach him, and though not very reſpectful or ſubmiſſive the obedience or deference which he requires; yet is there one quality of mind which the ſavage is more careful to inſpire than thoſe parents who are directed in educating their children by all the lights of civilized ſociety. That quality is indeed abſolutely neceſſary to fit the ſavage for his ſituation; without it, the day on which he ceaſed

ceased to enjoy the protection of his parents would most probably be the last day of his life: That quality is Fortitude. We may perhaps think, that the hardships to which the young savage is from the period of his birth unavoidably exposed, might be enough to inspire him with fortitude; but, as if these were insufficient, other means are applied to inspire him with what the Stoics have regarded as the first of virtues. He is compelled to submit to many hardships unnecessary, but from a view to this. Children are there called to emulate each other in bearing the severest torments. Charlevoix relates, that he has seen a boy and girl bind their arms together, place a burning coal between them, and try who could longest endure without shrinking the pain to which they thus exposed themselves.

6
The savage indebted chiefly to nature and circumstances for his education.

Still, however, the young savage owes his education rather to nature and to the circumstances in which he is placed, and the accidents which befal him, than to the kindness or prudence of his parents. Nature has endowed him with certain powers of understanding, sentiments, sensations, and bodily organs; he has been placed in certain circumstances, and is exposed to a certain train of events; and by these means chiefly, not by the watchful industry of instructors, does he become such as he appears when he has reached the years of maturity.

7
Education in an improved state of society.

But man was not designed by his wise and beneficent Creator to remain long in a savage state; the principles of his nature incline him to social life. Reason, distinguishing the superior advantages to be enjoyed in society, concurs with the social principle in his breast, in prompting him to seek the company and conversation of others of the human race. When men enter into society, they always unite their powers and talents, in a certain degree, for the common advantage of the social body. In consequence of this, laws come in time to be instituted; new arts are invented; progress is made in the knowledge of nature; moral duties are better understood and defined; juster ideas are gradually acquired of all our social relations; friendship, love, filial, parental, and conjugal affection, all are heightened and refined. All these advantages do not instantly result from men's entering into a social state; the improvement of the human mind, and the civilization of society, are gradual and progressive: But as it is natural for men to unite in a social state, so it is no less natural for society to be gradually improved and civilized till it attain an high degree of perfection and refinement.

8
Attention to the education of youth a natural consequence of civilization.

When men have attained to such knowledge and improvement as to be intitled to a more honourable appellation than that of savages, one part of their improvements generally consists in their becoming more judicious and attentive in directing the education of their youth. They have now acquired ideas of dependence and subordination; they have arts to teach and knowledge to communicate; they have moral principles to instil; and have formed notions of their relation and obligations to superior powers, which they are desirous that their children should also entertain. Their affection to their offspring is now also more tender and constant. We observe at present, in that state of society in which we live, that the poor who can scarce earn for themselves and their children the necessaries of life, are generally less susceptible of parental affection, in all its anxious tenderness, than the rich, or those whom Providence hath placed in easy circumstances; and we may make use of this fact in reasoning concerning the different degrees of the same affection felt by the savage and the member of a civilized society. The savage may be considered as the poor man, who with difficulty procures the necessaries of life even for himself; the other, as the man in affluent circumstances, who is more at leisure to listen to the voice of tender and generous affection.

In this improved state of society, the education of youth is viewed as an object of higher importance. The child is dearer to his parent; and the parent is now more capable of cultivating the understanding and rectifying the dispositions of his child. His knowledge of nature, and his dexterity in the arts of life, give him more authority over a child than what the savage can possess. Obedience is now enforced, and a system of education is adopted; by means of which the parent attempts to form his child for acting a part in social life. Perhaps the legislature interferes; the education of the youth is regarded as highly worthy of public concern; it is considered that the foolish fondness or the unnatural caprice of parents may, in the rising generation, blast the hopes of the state.

9
Public establishments for education among the ancients.

In reviewing ancient history, we find that this actually took place in several of the most celebrated governments of antiquity. The Persians, the Cretans, and the Lacedemonians, were all of them too anxious to form their youth for discharging the duties of citizens to entrust the education of the children solely to the parents. Public establishments were formed among those nations, and a series of institutions enacted, for carrying on and regulating the education of their youths: Not such as the European universities, in which literary knowledge is the sole object of pursuit, the student is maintained solely at his parent's expence, and attends only if his parents think proper to send him; but of a very different nature, and on a much more enlarged plan.

10
Among the ancient Persians.

The Persians, according to the elegant and accurate account delivered by Xenophon in the beginning of his Cyropædia, divided the whole body of their citizens into four orders; the boys, the youth, the full-grown men, and those who were advanced beyond that period of life during which military service was required. For each of these orders, particular halls were appropriated. Each of them was subjected to the inspection of twelve rulers. The adults and the superannuated were required to employ themselves in the performance of particular duties, suitable to their age, their abilities, and their experience; while the boys and the youth were engaged in such a course of education as seemed likely to render them worthy and useful citizens.

The boys were not employed, in their places of instruction, in acquiring literary accomplishments; for to such the Persians were strangers. They went thither to learn justice, temperance, modesty; to shoot the bow, and to lanch the javelin. The virtues and the bodily exercises were what the Persians laboured to teach their children. These were the direct, and not subordinate, purposes of their system of education. The masters used to spend the greatest part of the day in

Education.

dispensing justice to their scholars; who carried before them actions for thefts, robberies, frauds, and other such grounds of complaint against one another.—Such were the means by which the Persians endeavoured to instil, even in early youth, a regard for the laws of natural equity, and for the institutions of their country. Till the age of 16 or 17, the boys were busied in acquiring those parts of education. At that period they ceased to be considered as boys, and were raised to the order of the youths. After they entered this order, the same views were still attended to in the carrying on of their education. They were still enured to bodily labour. They were to attend the magistrates, and to be always ready to execute their commands. They were led out frequently to the chace; and on such expeditions they were always headed by the king, as in time of war. Here they were taught to expose themselves fearlessly to danger; to suffer, without repining or complaint, hunger, thirst, and fatigue; and to content themselves with the coarsest, simplest fare, for relieving the necessities of nature. In short, whether at home or out on some hunting expedition, they were constantly employed in acquiring new skill and dexterity in military exercises, new vigour of mind and body, and confirmed habits of temperance, fortitude, abstinence, patience, patriotism, and noble integrity. After spending ten years in this manner, their course of education was completed; they were admitted into the class of the adults, and were esteemed qualified for public offices. It must not escape our notice, that the citizens were not compelled to send their children to pass through this course of education in the public halls; but none except such as passed through this course of educatiou were capable of civil power, or admitted to participate in public offices or public honours.

Such are the outlines of that system of education which Xenophon represents as publicly established among the Persians. Were we able to preserve in a translation all the manly and graceful simplicity of that enchanting author, we would have offered to the perusal of our readers the passage in which he has described it; but conscious of being inadequate to that task, we have presumed only to extract the information which it contains.

11
Remarks on Xenophon's account of Persian education.

Perhaps, however, this system of education did not subsist precisely as the eloquent disciple of Socrates describes it among that rude and simple people. On other occasions he has commemorated such instances of their barbarity, as would tempt us to think them incapable of so much order and so much wisdom. Perhaps, as the discoverers of the new world have sometimes conferred on the inhabitants of that hemisphere, in the accounts of them with which they entertained their friends in Europe, amazing degrees of moral and political wisdom, of skill and dexterity in the arts, of industry and valour, which those uncivilized children of nature were afterwards found not to possess; so the Athenian philosopher has also ascribed to the Persians prudence and attention in regulating the education of their youth beyond what people in so rude a state can possibly exert.

But if we examine into the principles on which this system of education proceeds, without concerning ourselves whether it once actually prevailed among the Persians, or is the production of the fine imagination of Xenophon, we will find it peculiarly suitable for a nation just emerging from the rudeness and ignorance of barbarity to a knowledge of social and civil relations, and of the duties connected with such relations. They have sacrificed their independence to obtain the comfort and security of a social state. They now glory in the appellation of citizens, and are desirous to discharge the duties incumbent on a citizen. They must inform their children in the nature of their social relations, and impress them with habits of discharging their social duties; otherwise the society will soon be dissolved, and their posterity will fall back into the same wild miserable state from which they have emerged. But perhaps the circumstances, or abilities, or dispositions of individuals, render them unequal to this weighty task. It becomes therefore naturally an object of public care. The whole social body find it necessary to deliberate on the most proper means for discharging it aright. A plan of education is then formed; the great object of which is, to fit the youth for discharging the duties of citizens. Arts and sciences are hitherto almost wholly unknown: and all that can be communicated to the youth is only a skill in such exercises as are necessary for their procuring subsistence, or defending themselves against human enemies, or beasts of prey; and habits of performing those duties, the neglect of which must be fatal to the society or the individual.

Such is the system of education which we have surveyed as established among the Persians; and perhaps we may now be less suspicious than before of Xenophon's veracity. It appears natural for a people who have reached that degreee of civilization in which they are described, and have not yet advanced farther, to institute such an establishment. Some such establishment also appears necessary to prevent the society from falling back into their former barbarity. It will prevent their virtue and valour from decaying, though it may perhaps at the same time prevent them from making any very rapid progress in civilization and refinement. Yet the industry, the valour, the integrity, and the patriotism which it inspires, must necessarily produce some favourable change in their circumstances; and that change in their circumstances will be followed by a change in their system of education.

12
Among the Cretans.

The Cretans, too, the wisdom of whose laws is so much celebrated in the records of antiquity, had a public establishment for the education of their youth. Minos, whom they revered as their great legislator, was also the founder of that establishment. Its tendency was similar to that of the course of education pursued among the Persians,—to form the soldier and the citizen. We cannot present our readers with a very particular or accurate account of it; but such as we have been able to procure from the best authorities we think it our duty to lay before them.

The Cretans were divided into three classes; the boys, the youth, and the adults. Between seven and seventeen years of age, the boy was employed in learning to shoot the bow, and in acquiring the knowledge of his duties as a man and a citizen, by listening to the conversation of the old men in the public halls and observing their conduct. At the age of seven, he was conducted to the public halls to enter on this course

Education. course of education. He was taught to expose himself boldly to danger and fatigue; to aspire after skill and dexterity in the use of arms and in the gymnastic exercises; to repeat the laws and hymns in honour of the gods. At the age of seventeen he was enrolled among the youth. Here his education was still continued on the same plan. He was to exercise himself among his equals in hunting, wrestling, and the military exercises; and while thus engaged, his spirits were roused and animated by strains of martial music played on such instruments as were then in use among the inhabitants of Crete. One part of the education of the Cretan youth, in which they were particularly desirous to excel, was the Pyrrhic dance; which was the invention of a Cretan, and consisted of various military evolutions performed to the sound of instruments.

Such were the principles and arts in which the Cretan legislature directed the youth to be instructed. This course of education could not be directed or superintended by the parent. It was public, and carried on with a view to fit the boy for discharging the duties of a citizen when he should attain to manhood.

13 Remarks on the Cretan education.

It is easy to see, that such a system of education must have been instituted in the infancy of society, before many arts had been invented, or the distinctions of rank had arisen; at a time when men subsisted in a considerable degree by hunting, and when the intercourse of nations was on such a footing, that war, instead of being occasional, was the great business of life. Such a system of life would then naturally take place even though no sage legislator had arisen to regulate and enforce it.

14 Among the Lacedemonians.

Lycurgus, the celebrated lawgiver of Lacedemon, thought it necessary to direct the education of youth in a particular manner, in order to prepare them for paying a strict obedience to his laws. He regarded children as belonging more properly to the state than to their parents, and wished that patriotism should be still more carefully cherished in their breasts than filial affection. The spirit of his system of education was pretty similar to that of those which we have just viewed as subsisting among the Persians and the Cretans.

As soon as a boy was born, he was submitted to the inspection of the elders of that tribe to which his parents belonged. If he was well shaped, strong, and vigorous, they directed him to be brought up, and assigned a certain portion of land for his maintenance. If he was deformed, weak, and sickly, they condemned him to be exposed, as not being likely ever to become an useful citizen. If the boy appeared worthy of being brought up, he was entrusted to the care of his parents till he attained the age of seven years; but his parents were strictly charged not to spoil either his mind or his bodily constitution by foolish tenderness. Probably, too, the state of their manners was at that time such as not to render the injunction peculiarly necessary.

At the age of seven, however, he was introduced to a public class, consisting of all the boys of the same age. Their education was committed to masters appointed by the state; and what was chiefly inculcated on them in the course of it, was submissive obedience and respect to their superiors; quickness and brevity in their conversation, and replies to such questions as were put to them; dexterity and address in performing what was commanded them, and firmness and patience in bearing every pain or hardship to which they might be exposed. One of the means used to form them to habits of activity and address, was to permit, nay, to direct them to commit little acts of theft; which, if they performed them so dexterously as to avoid detection, they might afterwards boast of as noble exploits: but if detected in such enterprises, the aukward artless boy was exposed both to punishment and disgrace. To avoid the punishment and disgrace incurred by being detected in an act of theft, the Spartan boy would often suffer with unshrinking fortitude the severest tortures. It is related of one of them, that rather than be discovered with a young fox under his cloak, which he had stolen, he suffered the little animal to tear open his bowels. Not content with beholding the children suffer by submitting voluntarily to such hardships, the Spartans also endeavoured to form them to fortitude, by whipping them on their religious festivals, sometimes with such severity that they expired under the lash. The Lacedemonian youth were also taught such bodily exercises, and the use of such warlike weapons, as were necessary to render them expert and skilful soldiers.

15 Remarks.

They, too, as well as the Cretans and Persians, among whom we have seen that somewhat similar modes of education prevailed, were to be citizens and soldiers; not husbandmen, mechanics, artists, merchants, &c. Therefore the mode of education established among them was simple and uniform. Its aim was, to make them acquainted with the nature of their social duties, and to form them to such vigour of body and such firmness of mind as might render them fit for the station in which they were to be placed, and adequate to the part which they were to act. This establishment for education was perfectly consistent with the other parts of that legislature which was instituted by Lycurgus. Youth educated among the Lacedemonians could hardly fail to become worthy members of that singular republic. Let us not, however, regard the Spartans as *singularly* inhumane in their treatment of youth. Let us reascend, in imagination, to that period in the progress of society from rudeness to refinement, to which they had attained when Lycurgus arose among them. What were then their circumstances, their arts and manners, their moral principles, and military discipline? Not very different from those which the laws of Lycurgus rendered so long stationary among them. He, no doubt, rectified some abuses, and introduced greater order and equality. But man is not to be so easily metamorphosed into a new form. As you cannot, at once, raise an acorn to a venerable oak; so neither will you be able to change the savage, at once, into the citizen. All the art or wisdom of Lycurgus, even though assisted by all the influence of the prophetic Apollo, could never have established his laws among his countrymen, had not their character and circumstances previously disposed them to receive them. But, grant this, and you must, of consequence, allow, that what to us may appear cruel and inhumane, must have affected their feelings in a different manner. The change introduced in the treatment of youth by the establishment

Education. ment of this system of education was probably recommended by its being more humane than what before prevailed. Corrupted as are our manners, and effeminate our modes of education; yet we would not perhaps act wisely in laying them aside, to adopt in their stead those of ancient Sparta. But the Spartan education was peculiarly well fitted to form citizens for the republic of Lycurgus; it was happily adapted to that state of society in which it was introduced. And, if we should enquire by what means Lycurgus was enabled to fix the arts, the manners, and in short the civilization of his country, for so long a period in a stationary state; we would perhaps find reason to ascribe that effect, to the public establishment which he instituted for the education of youth; to his confining the Spartan citizens to the profession of arms, and assigning all servile offices to the Helots; and to his prohibiting the use of gold and silver. Among these however his establishment for education occupies the chief place. Never was any state adorned with more patriotic citizens than those of Sparta. With them every private affection seemed to be swallowed up by the *amor patriæ:* the love of their country was at least their ruling passion. Pœdaretes being rejected when he offered himself a candidate for a seat among the council of three hundred, returned home, rejoicing that there were in Sparta no fewer than three hundred whom his countrymen found reason to regard as better citizens than himself. This was not a seeming joy, assumed to conceal the pain which he suffered from the disappointment; it was heartfelt and sincere. Such were the effects of their system of education.

16 Education among the other nations of antiquity.

When we turn our eyes from the Persians, the Cretans, and the Spartans, to the other nations of antiquity; we no where behold so regular a system of public education. Among the Athenians and the Romans, the laws did not descend to regulate in so particular a manner the management of the youth. These nations gradually emerged from a state of the rudest barbarity, to that polished, enlightened, and civilized state which rendered them the glory and the wonder of the heathen world: but in no part of their progress from the one state to the other do we find any such establishment subsisting among them. So various, however, are the circumstances which form and diversify the character of nations, that we cannot reasonably conclude, because no such establishments existed among the Athenians and Romans, that therefore their existence was unnatural among those nations who possessed them. But though the education of youth was managed in a different manner among these and most other nations in the ancient world, than by public establishments, which detached children from the care of their parents; yet still it was every where regarded as an object of the highest importance. As the manners of mankind gradually improved to a state of refinement; as the invention of arts, and the discovery of science gradually introduced opulence and luxury; connubial, parental, and filial affection gradually acquired greater strength and tenderness. Of consequence, children experienced more of their parent's care; and that care was directed to form them for acting a becoming part in life. According to the circumstances of each nation, the arts which they cultivated, and the form of government under which they lived; the knowledge which they sought to communicate to their children, and the habits which they endeavoured to impress upon them, were different from those of other nations: And again, according to the different circumstances, tempers, abilities, and dispositions of parents, even the children of each family were brought up in a manner different from that in which those of other families were managed. The Athenians, the Romans, the Carthaginians, conducted each of them the education of their youth in a different manner, because they had each different objects in view. But having considered the most singular establishments for education which prevailed in the ancient world, it seems unnecessary for us to descend to a particular account of the manner which every nation, or fantastic individual, thought proper to pursue in bringing up their youth. It will probably be more useful and entertaining to our readers, if we next present them with a view of some of the most judicious or fanciful plans of education which have been proposed by the writers on that subject.

17 Quinctilian.

One of the most respectable writers on education among the ancients, is the celebrated Quinctilian. He taught rhetoric in Rome during the reign of Domitian and under several of the other emperors. When he retired from the exercise of his employment as a teacher of rhetoric, he spent his leisure in the composition of a treatise, not merely on rhetoric, but on the most proper means for educating a boy so as to render him both an eloquent orator and a good man.

In that valuable treatise, he enters into a minute detail of all that appears to him most likely to conduce to those important ends.

As soon as the boy enters the world, he would have the greatest care to be used in selecting those who are to be placed about him. Let his nurse have no impediment of speech. It will be happy for him, if his parents be persons of sense and learning. Let his tutor, at least, possess these qualifications. As soon as he attains the distinct use of his organs of speech, let him be initiated in the first elements of literature. For as he is capable of distinguishing and remembering at a very early age; so his faculties cannot possibly be employed in a more advantageous manner. And even at this early period of life, let maxims of prudence and the first principles of morals be inculcated upon his mind by the books which are put into his hands, and even by the lines which he copies in learning the art of writing. The Greek language was to the Romans in the days of Quinctilian, what the Latin and Greek and French are to us at present, an acquisition held indispensably necessary to those who aspired to a liberal education; and Quinctilian judges it proper that the boy should begin his application to letters with the Greek language in preference to his mother tongue.

This judicious writer next examines a question which has been often agitated, Whether a domestic or a public education is liable to the fewest inconveniences, and likely to be attended with the greatest advantages? And he is of opinion, that in a domestic education the boy is in danger of being corrupted by injudicious fondness and evil example; is not roused by the spur of emulation; and is deprived of proper opportunities for acquiring a just idea of his own powers, or that ac-

Education. activity and dexterity which he will afterwards find so necessary when he comes to act a part in life: While in a public education, which was preferred by some of the most renowned nations of antiquity, the morals are not greatly exposed to corruption, emulation is roused, friendships are formed, all the powers of the mind are called forth to act with new vigour, and the youth is prepared for performing his part on the great theatre of the world. Quinctilian, therefore, wishes that parents would place their children in public seminaries of education.

When a boy is committed to a master's care, the master's attention must be first directed to discover his dispositions and the extent of his capacity. Of his capacity he will form a favourable judgment, not from his sprightliness, nor even from his quickness of apprehension; but from his modesty, docility, and virtuous dispositions. If the boy possess these last qualifications, the master will rejoice in him, as likely to give him satisfaction and do him honour. According to his temper and dispositions, let the boy be treated with mildness or severity; but never let severity extend to blows. Let the boy be allured and led, by the most artful and insinuating treatment, to do his duty; there will then be no occasion to punish him for neglecting it.

As Quinctilian's professed object was, not merely to give general directions for forming the heart and cultivating the understanding, but to form a particular character in life, the scholar and the orator; he finds it necessary to enter into minute details concerning the manner in which the boy is to be instructed in speaking, writing, grammar, and composition; of which it does not appear necessary for us to take particular notice in this place. Music and geometry, he thinks, ought to make a part of the young orator's studies; as being useful to render him accurate in reasoning, and capable of relishing the beauties of the poets. He is also of opinion, that the boy should not be confined to one branch of study, without being allowed to attempt others till he have made himself master of that. Let several parts of literature engage his attention by turns: let him dedicate a considerable portion of his time to them. He may thus acquire habits of industrious application which will remain with him through life.

With the tender attention of a good man, this sensible and elegant writer still accompanies his pupil through the course of his studies; anxiously insists that he be placed under a master distinguished for purity of morals, and for no mean abilities in his profession; directs his memory to be stored with the noblest passages of the poets, orators, and historians; and carefully discusses and refutes those opinions which represent genius as above industry. The remaining part of his work being employed on the principles of rhetoric, without containing any thing on the subject of education in general it is not necessary that we should here present an analysis of it to our readers. But since Quinctilian was so distinguished, not only as a rhetorician, but as an instructor of youth, and displays so much good sense and so solid a judgment, formed on long experience, in whatever he advances on the subject of education; we could not without extreme negligence, omit taking notice of him under this article, and affording our readers an opportunity of being instructed by listening to his sentiments on this head.

18 Milton's treatise on education.

The name of John Milton is so universally revered, that his sentiments on any subject must be interesting. His life was dedicated to study: During a part of it, he was employed in the task of instructing youth; and among his other works we find a treatise on education. He had himself been educated according to that plan which has long been established in the English universities; but with that mode of education he was not satisfied. The object of his directions is chiefly to form the scholar. He considered himself as qualified to exhibit a model of "a better education, in extent and comprehension far more large, and yet of time far shorter, and of attainment far more certain, than any that had yet been in practice." The following is the substance of his treatise.

As the end of learning is to cultivate our understandings, and to rectify our dispositions; therefore the design of our applying to the study of languages cannot be merely that we may commit to memory the words of which they consist, or that we may acquire a knowledge of their analogy and structure; but that we may enrich our minds with the treasures of wisdom which they contain. But in the present modes of education this design does not appear to be kept in view. The learner of Latin is burdened with rules, and themes, and verses, and orations; but no care is taken to make him master of the valuable knowledge which the classics contain. And when he advances a little farther, he is driven into the thorny paths of logic and metaphysics. So, when his studies are completed, and he is considered as having received a liberal education, he is almost as destitute of real knowledge as when he first entered a school.

But to render learning truly beneficial, instead of the school and university education which youth at present receive; let the place of both school and university be supplied by an academy, in which they may acquire all that is taught at either, except law and physic. Let the academy afford accommodation for 150 persons; 20 of whom may be servants and attendants. As many academies as are necessary may be afterwards erected on the model of this one. Let the youth who are introduced into this academy begin their studies with learning the principal rules of grammar from some good elementary book. In their pronunciation of Latin, let them be taught to follow the pronunciation of the Italians; as that of the English is indistinct, and unsuitable to the genius of the language. Next, read to them some entertaining book on education; such as, the three first books of Quinctilian in Latin, and Cebes, Plutarch, or some other of the Socratic discourses, in Greek; and be careful to seize every opportunity of inspiring them, by seasonable lectures and explanations, with love for learning, admiration of great and virtuous characters, and a disposition to cheerful obedience. At the same time, but at a different hour of the day, let them be instructed in the rules of arithmetic and the elements of geometry. Between supper and bed-time instruct them in the principles of religion and the sacred history. From the writers on education let your pupils pass to the authors on agriculture, to Cato, Varro, and Columella. Before

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fore half theſe authors be read, they cannot but be pretty well qualified to read moſt of the proſe authors in the Latin language; and they may now, with great propriety, learn the uſe of the globes, and make themſelves acquainted with the ancient and modern maps. Let them, about the ſame time, begin the ſtudy of the Greek tongue, and proceed in it as in the Latin: they will not fail to overcome, in a ſhort time, all the difficulties of grammar; after which they will have acceſs to all the treaſures of natural knowledge to be found in Ariſtotle and Theophraſtus. In the ſame manner they may make themſelves acquainted with Vitruvius, Seneca, Mela, Celſus, Pliny, and Solinus. And having thus paſſed through the principles of arithmetic, geometry, aſtronomy, and geography, with a general compact of phyſics; let them next turn their attention to mathematics, in which they may begin with the practical branch of trigonometry, which will ſerve as an introduction to fortification, architecture, and navigation. To teach them the knowledge of nature, and inſtruct them in the arts of life, let them have the aſſiſtance and inſtructions, not merely of maſters who are acquainted only with books, but of men whoſe ſkill has been obtained by actual practice, even of artiſts and mechanics. Next, let the poets obtain their attention; and they will now read them with eaſe and pleaſure. From the poets let your pupils proceed to the moraliſts; and, after acquainting themſelves with them, they may be allowed the entertainment of ſome of the beſt Greek, Latin, and Italian, dramatic compoſitions. From theſe let them proceed to politics: let them here ſtudy the law of Moſes, the admirable remains of the ancient lawgivers of Greece, the Roman tables, edicts, and pandects, concluding with the inſtitutions of their mother country. Now let them be more particularly inſtructed in the principles of theology; for by this time they may have acquired the Hebrew language, together with the Chaldee and the Syriac dialect, and may therefore read the ſcriptures in their original language. When their minds are thus furniſhed, they will be able to enter into the ſpirit of the nobleſt hiſtorians and poets. To get by heart, and repeat in a proper manner, paſſages from the writings of ſome of theſe, will have the happieſt effects in elevating their genius. Let this ſtately edifice be crowned with logic and rhetoric. Far different would be the effects of ſuch a courſe of education, from thoſe produced by any which is at preſent purſued. We ſhould then ſee abler writers, more eloquent ſpeakers, and wiſer ſtateſmen. Similar to this, probably, was the courſe taught in the famous ſchools of Pythagoras, Plato, Iſocrates, and Ariſtotle. This would unite the advantages of an Athenian and a Spartan education: for our pupils ſhould be taught the exerciſes of wreſtling and fencing, and the whole military diſcipline.

19 Remarks.

Such are the ideas of the admirable Milton on the ſubject of education. An enthuſiaſtic admirer of the ſciences, arts, and inſtitutions of Greece and Rome; from his religious and political principles, no friend to the univerſities; it was natural for a man of his learning and ingenuity, in an age of innovation, and influenced by ſuch prejudices, to form ſuch a project as that which we have ſurveyed. He ſeems not to have reflected, that it is neceſſary for children to be long occupied in obtaining a familiar acquaintance with words, before they can gain from books any knowledge of things; overlooking this circumſtance, and perceiving plainly that the mode of education which then prevailed confined the attention of youth almoſt wholly to words, he could not but regard the ſcheme which he propoſed as likely to produce very happy effects. His obſervation, that the appearances of external nature are among the firſt objects which attract the attention of youth, which he communicates by directing his pupils to peruſe the writers on agriculture and natural hiſtory as near the beginning of their ſtudies as poſſible; if not altogether juſt, yet muſt be allowed to be nearly ſo. Perhaps human actions and paſſions, and the ſeries of events which happen around us, are, by the time at which we begin our application to learning, the objects which moſt frequently and ſtrongly engage our attention: But the appearances of external nature are at leaſt the next object of our regard.

20 Locke's Treatiſe on education.

Mr Locke, to whoſe abilities and noble deſire to be uſeful to the world, his country is ſo much indebted, has written, among other things, on the education of youth. He was capable of thinking for himſelf; but more deſirous of rendering himſelf uſeful, than of being admired for ſingularity. He is, therefore, an author to whom we ought to liſten, at leaſt, with reſpectful attention. If Quinctilian and Milton had been employed as teachers of youth, Mr Locke had been converſant with the world, had inquired into the principles of human nature, and had no doubt endeavoured to examine without prejudice the effects of thoſe modes of education of which he diſapproves. When we conſider, that, to render himſelf uſeful to the riſing generation, he could deſcend from the heights of ſcience to tranſlate the fables of Æſop, and to perform other humble taſks in literature, which a philoſopher of leſs benevolence and virtue would have diſdained; we cannot but look with veneration and gratitude on ſo exalted a character. In his Treatiſe on Education, the two great objects which Mr Locke keeps in view are, 1ſt, To preſerve and ſtrengthen the bodily conſtitution; 2dly, To inform the underſtanding with uſeful knowledge, and to cheriſh good diſpoſitions in the heart.

21 Bodily conſtitution.

In his directions on the firſt of theſe heads, he ſeems extremely anxious to prevent parents and others in whoſe hands children are placed, from injuring them by ill-directed tenderneſs. Plain fare, ſimple and light cloathing, abſtinence from phyſic and from ſtrong liquors, he earneſtly recommends as the moſt judicious means for preſerving and confirming the health of the child. In all his gratification let the ſtricteſt moderation be obſerved. If you permit him to indulge pretty freely in ſleep, at leaſt cauſe him to get up at an early hour in the morning. In one thing, however, few parents will be willing to comply with Mr Locke's advice. He not only directs that the child's feet be frequently bathed in cold water; but even expreſſes a wiſh, that his ſhoes were always kept in ſuch a condition as to admit water freely. This he thinks likely to fortify the conſtitution of the body in ſuch a manner, as to render him leſs liable, in the courſe of life, to ſuch diſeaſes as ariſe from any unuſual expoſure to wetneſs or cold, than others whoſe

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31 Cultivation of the powers of the mind.

When he turns his attention to the cultivating of the understanding, and the forming of the dispositions, Mr Locke still deservedly claims the regard of the parent and the preceptor. With a virtuous indignation he reprobates that negligence and folly by which we generally corrupt the heart and spoil the temper of children, even in the period of infancy; so as to render them incorrigible when they advance farther in life. Their appetites are pampered, all their desires are gratified; and if we are at any time disposed to refuse what they ask, they have an all-powerful engine to compel our compliance with their wishes. They assail us with tears; and we then yield to their requests, however hurtful to themselves or inconvenient to us. We often studiously instruct them in vicious tricks, and call forth their evil passions. At so early an age, their rage or cunning can scarcely injure us; and we reflect not that habits of peevishness and deceit must be peculiarly hurtful to themselves.

But though all the foolish desires of children ought not to be gratified, and though we should carefully avoid leading them into any bad habit; yet it is not necessary nor prudent to treat them with harshness or severity. Let them be formed to obedience from their earliest years: let them be accustomed to submit implicitly to the direction of those on whom they depend. But beware of souring their temper and depressing their spirits by harshness: and on the other hand, remember, that it is no less improper to give the boy a habit of neglecting his duty except when he is allured to it by the hopes of reward. As he advances towards manhood, and attains the use of reason; you may admit him to greater familiarity, and allow him to follow his own inclinations more than at an earlier period: and if, instead of indulging all his freaks in childhood, you have carefully accustomed him to obedience and submission, without enforcing these by improper means, he will now be able to regulate his conduct with some degree of prudence.

But while caution is to be used in bestowing rewards and inflicting punishments; still rewards and punishments are indispensably necessary in the management of the child. Inspire your boy with a sense of shame, and with a generous thirst for praise. Caress and honour him when he does well; treat him with neglect when he acts amiss. This conduct will produce much better effects than if you were at one time to chide and beat him; at another, to reward him with a profusion of sweetmeats and playthings.

Think not that children are to be taught propriety of conduct by loading their memory with rules, directing them how to act on every particular occasion. Burden them not with rules, but impress them with habits.

Be not desirous of forming them at too early an age, to all that politeness and propriety of manners which you wish to distinguish them when they become men. Let them be taught an easy, graceful carriage of body; but give yourself no concern, though they now and then blunder against the punctilios of good-breeding; time will correct their aukwardness.

With regard to that important question, whether children ought to be sent to a public school, or are likely to be better trained up in a domestic education? so impossible is it for one master to extend his attention to a number of boys, and so likely is the contagion of vice to be caught among the crowd of a public school, that a private seems more favourable than a public education to virtue, and scarce less favourable to learning.

When you resolve to give your son a domestic educacation, be careful to regulate that domestic education in a judicious manner. Keep him at a distance from evil example: choose the most favourable seasons for communicating instruction; strictly enforce obedience; but never by blows, except in case of obstinacy which you find otherwise incurable. If his engagements in life prevent the parent from superintending and directing his son's education personally, let him commit him to the care of a virtuous and judicious tutor. Let the tutor be rather a man of experience in the world than of profound learning; for it is more necessary that the pupil be formed for conducting himself with prudence in the world, and be fortified against these temptations to which he will be exposed when he enters upon active life, than that his head be stuffed with Latin and logic.

Here Mr Locke, notwithstanding that his own mind was stored with the treasures of Grecian and Roman literature, takes occasion to declare himself pretty freely against that application to ancient learning, which was then indispensably required in the education of youth. He considers languages and philosophy as rather having a tendency to render the youth unfit for acting a prudent and becoming part in life, than forming for it: and he therefore insists that these should be but in a subordinate degree the objects of his attention.

Let the tutor encourage the child under his care to a certain degree of familiarity; let the pupil be accustomed to give his opinion on matters relative to himself; let him be taught justice, by finding injustice to others prejudicial to himself; let him be taught liberality, by finding it advantageous; let him be rendered superior to teazing his parents or tutor with complaints, by finding his complaints unfavourably received. That you may teach him to restrain every foolish or irregular desire, be sure never to indulge his wishes, save when you find the indulgence proper for him, and convenient for yourself. Curiosity, however,

ever, is a principle which ought to be industriously roused in the breast of the child, and cherished there by meeting always the readiest gratification. However you may oppose the boy's inclinations in other things, yet refuse him not a proper portion of recreation: let him indulge in play, while he continues to play with keenness and activity; but suffer him not to loiter about in listless indolence. To restrain your child from fool-hardy courage, point out to him the dangers to which it exposes him: to raise him above timorous cowardice, and inspire him with manly fortitude; accustom him from the earliest period of life to an acquaintance with such things as he is most likely to be afraid of: subject him now and then to pain, and expose him to danger; but let such trials be judiciously conducted.

Idleness or curiosity sometimes leads children to cruelty in their treatment of such animals as are placed within their power. Dogs, cats, birds, and butterflies, often suffer from their inhumanity. But when they seem inclined to such cruelty, let them be carefully watched, and let every means be used to awake their hearts to generous sensibility. Allow them to keep tame birds, dogs, &c. only on condition of their using them with tenderness. Perhaps this unhappy disposition to cruelty is occasioned, or at least fostered, by people's laughing when they behold the impotent efforts of children to do mischief; and often going so far as even to encourage them in maltreating those creatures which are within their reach. We entertain them, too, with stories of fighting and battles; and represent characters distinguished for atrocious acts of inhumanity as great and illustrious. But let such practice be carefully refrained from, if you wish to inspire your child with generous and humane sentiments. Teach him gentleness and tenderness, not only to brute animals, but also to servants and companions.

Curiosity is to be roused and cherished in the breast of the child: but by what means? Answer his inquiries readily: though his questions be put in aukward language, let not that hinder you from attending to the objects of them. Curiosity is natural to the human mind; and if you repress not the curiosity of the child, he will often be moved by its impulse to the pursuit of knowledge. Let him find his eagerness in the pursuit of knowledge, a source of applause and esteem. Avoid the folly of those who sport with the credulity of children, by answering their questions in a ludicrous or deceitful manner.

You must, however, not only listen with obliging attention to his questions, and strive to gratify his curiosity; but even whenever he attempts to reason on such subjects as are offered to his observation, be careful to encourage him: praise him if he reasons with any degree of plausibility; even if he blunders, beware of ridiculing or laughing at him. With regard to the boy's play-things: while you indulge him freely in innocent diversions, give him such play-things as may be necessary in the amusements in which he engages, provided they be such as he cannot make himself; but it will be still better for him to exercise his dexterity and ingenuity in making them himself.

After throwing out these things concerning the general principles on which education should be carried on, Mr Locke next proceeds to those particular parts of knowledge in which he thinks every young gentleman ought to be instructed. In virtue, wisdom, breeding, and learning, he comprehends all that is necessary to enable his pupil to act a respectable part in life.

In forming the boy to virtue, the first thing to be done, is to inform him of the relation subsisting between human creatures and a supreme independent Being, their creator, preserver, and governor; and to teach him, that obedience and worship are due to that Being. But when you inform the child of the existence of an invisible Being, beware of impressing his mind with any notions concerning spirits or goblins, which may render him incapable of bearing darkness or solitude. In infancy our minds are, by the indiscretion of those about us, generally impressed with such prejudices concerning a thousand frightful forms, ever ready to assail or haunt us under the shade of night, that we become incapable of manly fortitude during the course of life: the soldier who will boldly face death in the field of battle, shall perhaps tremble and take to flight at the rustling of a few leaves, or the grunting of a hog in the dark. But were the imaginations of children not crazed with wild stories concerning spirits and hobgoblins, darkness would be no more alarming to them than light. After informing the child of the existence of a Deity, and teaching him to pray to him; next labour to impress his mind with a veneration for truth, and habituate him to a strict adherence to it on every occasion. Endeavour also to render him gentle and good-natured.

The best means you can use to teach him wisdom or prudence in conducting himself in the ordinary business and intercourse of life, is to teach him to despise the mean shifts of cunning. The rest must be learned by actual experience in life.

The decencies of life, comprehended under the word Good Breeding, form no inconsiderable part of a good education. In teaching these, two things are to be attended to: Inspire the youth with a disposition to please and oblige all with whom he is conversant; next, teach him how to express that disposition in a becoming manner. Let boisterous roughness, haughty contempt of others, censoriousness, impertinent raillery, and a spirit of contradiction, be banished from his temper and behaviour. At the same time, beware of leading him to regard the mere forms of intercourse as a matter of the highest importance. Remember that genuine good-breeding is only an easy and graceful way of expressing good sense and benevolence in his conversation and deportment.

Mr Locke, when he comes to give his opinion concerning those parts of learning which are proper to be taught a young gentleman, and the manner in which they ought to be communicated, advises to initiate the child in the art of reading, without letting him know that he is engaged about a matter of any importance, or learning an accomplishment which you are solicitous that he should acquire. Present it to him in the form of an amusement, or teach him to consider it as an high honour to be permitted to learn his alphabet; otherwise he will turn from it with disgust. When by insinuating arts you have allured him to apply to reading, put into his hands such books as are plain, entertaining, and instructive. Insist not on his reading over the bible: instead of gaining any advantage from an indiscriminate minute perusal of it at this period of life, he is likely to acquire the most confused notions of religion, and an indifference for the sacred volume during the rest of life; yet it may be highly proper to cause him to peruse some of its beautiful historical passages, and to familiarize him with its elegant and simple moral precepts. After learning to read his mother-tongue, the boy's attention ought to be next directed to the art of writing. The easiest way to teach him that art, is to get a plate engraved, after the model of any hand which you think most proper for his imitation. With this plate get a number of copies cast with red ink; the letters of these the learner may trace with his pen filled with black ink: and he will thus in a short time, and without much trouble to you or himself, acquire a decent hand. As drawing is useful on many occasions in life; if the boy be not naturally incapable of acquiring it, he may with great propriety dedicate some part of his time and attention to that art.

When the scholar has attained a tolerable degree of skill in writing, and in reading and speaking his native language, he must next begin an acquaintance with other languages. Among these, the first object of his study will naturally be the Latin. Yet let none waste their time in attempting to acquire a knowledge of Latin, but such as are designed for some of the learned professions, or for the life of a gentleman without a profession. To these last it may be useful; to others it is wholly unserviceable. But in learning the Latin tongue, a much happier method than burdening and perplexing him with rules of grammar, would be to make him speak it with a tutor who were sufficiently master of it for that purpose. Thus might he spend that time which is usually occupied in acquiring this language, in learning some other necessary branches of education. But if you cannot conveniently have the boy taught the language by the way of conversation, let the introductory books be accompanied with an English version, which he may have easy recourse to for the explanation of the Latin. Never perplex him with grammatical difficulties. Reflect that, at his age, it is impossible to enter into the spirit of those things. Render every thing as easy and pleasing as possible; for the attention will not fail to wander, even though you labour not to render the task disagreeable. Skill in grammar may be useful; but it is to those whose lives are to be dedicated to the study of the dead languages: that knowledge which the gentleman and the man of the world may have occasion to derive from the treasures contained in the ancient languages, may be acquired without a painful study of prosody or syntax. As the learning of any language is merely learning words; if possible, let it be accompanied with the acquisition of some real knowledge of things; such as the nature of plants, animals, &c. their growth and propagation. But if you cannot or will not give your boy a private education, and are still resolved to send him to school, to be whipped through the usual course of Greek and Latin; at least act with so much good sense and humanity, as to insist that he be not burdened and tormented with the composition of Latin themes and verses. Neither let his memory be oppressed with whole pages and chapters from the classics. Such ridiculous exercises have no tendency, whatever prejudice may urge to the contrary, to improve him either in the knowledge of languages or of nature.

Mr Locke seems to wish that the French language, which in his days had attained to higher refinement and a more regular analogy than any of the other modern languages of Europe;—he seems to wish that the French were learned along with the Latin: and he wishes the study of these languages to be accompanied with the study of arithmetic, geography, history, and chronology. Let these branches of knowledge be communicated to the learner in one of the two languages; and he will thus acquire the language with greater facility. He next points out the advantages of the branches of knowledge which he recommends as proper to be learned together with the languages; but on that head he says nothing singular. One method which he recommends for facilitating the study of language is, to put into the youth's hands, as soon as he has acquired a tolerable knowledge of chronology, some of the most entertaining Latin historians: the interesting nature of the events which they relate will not fail to command his attention, in spite of the difficulty which he must find in making out their meaning. The Bible and Tully's Offices will be his best guides in the study of ethics. The law of nature and nations, as well as the civil and political institutions of his country, will form to him an important object, which he ought to study with the most careful attention. Rhetoric and logic, though generally regarded as objects of great importance in a liberal education, can neither of them contribute much, with all their rules and terms, to render him an acute reasoner or an eloquent speaker; and it is therefore unnecessary for him to honour them with very particular attention. Tully and Chillingworth will be more beneficial in teaching him to reason and to persuade, than all the treatises on rhetoric and logic which he can possibly peruse, or all the lectures on those arts which he can gain opportunities to hear. In every art and every science, practice and experience are infinitely better than rules. Natural philosophy, as contributing to inspire the breast with warmer sentiments of devotion, and serving also to many useful purposes in life, ought to make a part in the young gentleman's studies. But the humble experimental writers on that subject are to be put into his hands in preference to the lofty builders of systems. As for Greek, our pupil is not to be a professed scholar, but a gentleman and a man of the world; and therefore it does not appear necessary that Greek should make a part in the system of his education. But in none of these studies will the pupil ever attain any proficiency, unless he be accustomed to method and regularity in the prosecution of them. In languages, let him gradually ascend from what is simplest to what is most difficult: in history, let him follow the order of time; in philosophy, that of nature.

Dancing, as contributing to ease and gracefulness of carriage, ought to make a part in our young gentleman's education. Fencing and riding being fashionable, cannot well be denied him. As he is likely, in the course of life, to have some leisure hours on his hands, and to be sometimes disposed to active recreation, let him learn some mechanical trade, with the

Education. exercise of which he may agreeably fill up some of those hours. If he is to possess any property, let him not be unskilled in the management of accounts. Travel, instead of being useful, appears more likely to be hurtful to the understanding and morals of the traveller, unless deferred to a later period than that at which young men are usually sent out to complete their education by traversing through foreign countries.

Here Mr Locke concludes his work with observing, that he does not offer it to the world as a full or comprehensive treatise on the subject of education; but merely as the outlines of what occured to him as most proper to be observed in breeding up a young gentleman not intended for any learned profession or mechanical employment, but for acting a respectable part in life at the head of a competent hereditary fortune.

23 Remarks.

In considering the sentiments of this respectable philosopher on the subject of education, we perceive, that as he was, on the one hand, superior to those prejudices which render us incapable of distinguishing the defects or absurdities of any custom or institution which has long prevailed; so, on the other hand, he was free from that silly vanity which disposes those who are subject to its influence to affect novelty and singularity of sentiment on every subject which they consider. Though a member of one of the universities, he hesitates not to declare himself against a very laborious attention to classical learning; and his reasoning is, through the whole of his treatise, rather plain and solid than subtle or refined.

Yet, however we respect the soundness of his understanding or the benevolence of his intentions, we cannot avoid observing, that his opinions are not always such as experience justifies. He had no doubt taken notice of some instances in which the too great anxiety of parents about the preservation of their children's health was the very means of rendering their constitution feeble and tender through the course of life; and from that circumstance might be led to propose those expedients which he mentions for preserving the health and strengthening the constitution of children. But a little more observation or inquiry would have easily convinced him, that some of his expedients, instead of strengthening the child's constitution, would in all probability shorten his days.

He had perhaps seen some of the heroes of classical literature, who were familiar with Demosthenes and Cicero, and had Homer and Virgil at their fingers ends,—he had seen some of those gentlemen so overloaded with their cargo of Greek and Latin as to be unfit for the ordinary business and intercourse of life; and such instances might tempt him to forget the advantages which he himself and a long series of philosophers, patriots, and statesmen, with whose names the annals of his country are adorned, had derived from a regular classical education. But as we are afterwards to deliver our own sentiments on this subject, we will not here extend our observations on Mr Locke to a greater length.

24. Rosseau.

An author more distinguished than Mr. Locke, for tenderness of sentiment, singularity, eloquence, and whim, has presented the public with a work on the subject of education, in which he, with unexampled boldness, inveighs against all the established modes, as well as reprobates whatever had been advanced by former writers on the subject; and, at the same time, delineates a plan of education which he would persuade us is infinitely superior to those which he explodes. This writer is the amiable and pathetic Rosseau: And tho' he be often vain, paradoxical, and whimsical; yet the charm of genius and sentiment which adorns his writings will at least engage our attention while he unfolds his opinions.

25 Imprudent management of children in infancy.

He sets out with observing, that our business in the bringing up of children should be, to second and to call forth nature; and that, instead of this, we almost always oppose her intentions and operations. As soon as the child sees the light, he is wrapped in swathing bands. His limbs are thus restrained from that free motion which is necessary to their growth and vigour: and even the internal parts of his frame are rendered incapable of their proper functions. Mothers are too proud or indolent, or too fond of gaiety and dissipation, to submit to the task of nursing their own children. The poor infants are committed to some hireling nurse, who not being attached to them by natural affection, treats them with negligence or inhumanity. But is that mother capable of any delicacy of sentiment, who can permit another to suckle her child, and to share with her, or perhaps wholly supplant her, in the filial affection of the child?

Again, when parents undertake the care of their infant children, they often injure them by mistaken tenderness. They pamper them with delicate meats, cover them with warm clothes, and anxiously keep them at a distance from all that has the appearance of danger: not attending to the economy of nature, who subjects us in infancy to a long train of epidemical distempers, and exposes us during the same period to innumerable dangers; the design of which doubtless is, to teach us a prudent concern for our own safety, and to strengthen and confirm our constitutions.

A child no sooner enters into life, than it begins to cry; and during a great part of infancy continues frequently to shed tears. We either attempt to soothe it into good nature, or seek to silence it by harsher means; and it is thus we infuse into its infant mind those evil passions which we afterwards presume to impute to nature.

As the mother generally disdains to nurse her own child, so the father is seldom at leisure to take any share in the management of his education: he is put into the hands of a tutor. But that tutor whose time and attention can be purchased for money is unworthy of the charge. Either be yourself your son's preceptor, or gain a friend whose friendship to you shall be his sole motive to undertake the task.

26 Management of Emilius during infancy

After a few preliminary observations to the above purport, our author introduces his Emilius; in whose education he delineates that plan which he prefers. The preceptor whom he would assign Emilius must be young; and must dedicate his attention to Emilius alone, from the time when his pupil enters the world till he attain the full age of manhood. Emilius, to receive the full benefit of his preceptor's system of education, and to afford full scope to it, must possess a genius of the middle class; no prodigy of parts, nor singularly dull; he must have been born to affluent circumstances and an elevated rank in life. His preceptor is invested with the rights, and takes upon him the obligations, of both father and mother. Emilius is, when put into

Education. into the hands of his preceptor, a well-ſhaped vigorous, and healthy child. The firſt care of the preceptor is to provide him with a nurſe, who, as he is new-born, muſt be newly delivered: it is of ſtill higher importance that ſhe be clean, healthy, virtuous, and of mild diſpoſitions. While ſuckling her charge, ſhe ſhall feed plentifully, chiefly on a vegetable diet. The child muſt be frequently bathed, in cold water if poſſible; if you begin with warm, however, uſe it by degrees colder and colder, till at length he is able to bear it entirely cold. He is not to be wrapped in ſwaddling-clothes or rollers, or bound with ſtay-bands; but put in good warm blankets and in a roomy cradle: Let him ſtretch and move his limbs at freedom, and crawl about on hands and knees at his pleaſure. The greateſt care muſt now be taken to prevent the child from contracting any habits whatever: Suffer him not to uſe one arm more than another, or to eat or ſleep at ſtated hours. Prepare him for the enjoyment of liberty, by preſerving to him the exerciſe of his natural abilities, unfettered by any artificial habits.

As ſoon as the child begins to diſtinguiſh objects, let his education begin. Some objects are naturally agreeable, others frightful. Accuſtom him to look upon any object that may come in his way without being affrighted. Children are at firſt ignorant of local relations, and learn to diſtinguiſh them only by experience; and while Emilius is yet an infant, incapable of ſpeaking or walking, he may be aſſiſted in acquiring the knowledge of theſe.

In his feeble helpleſs condition, the child muſt feel many wants and much uneaſineſs; tears are the language which nature has given him to make known his diſtreſſes and wants. When the child cries, it would be much more prudent and humane to examine what he ſuffers or ſtands in need of, than, as is uſually done, to rock or ſing him aſleep; or, when theſe means ſucceed not, to threaten or uſe him brutally.

In managing children, as nature has endowed them with no ſuperfluous powers, we ought not to confine them from the free uſe of thoſe which they are able to exert. It is our duty to ſupply their deficiency both of mental and bodily powers; but while we are ready to adminiſter on every occaſion to their real wants, we muſt beware of gratifying their caprice or unreaſonable humours. In order to diſtinguiſh between their natural and fantaſtic wants, we muſt ſtudy the language and ſigns by which they expreſs their wiſhes and emotions. Though crying be the means which nature has given infants to enable them to procure relief or aſſiſtance, yet when they cry they are not always in need of either. They often cry from obſtinacy or habits of peeviſhneſs. But if, inſtead of attempting to ſoothe them by diverting their attention to other objects, we would on ſuch occaſions entirely neglect them, they would ſoon ceaſe to indulge in ſuch fits of crying.

When children begin to ſpeak, we are uſually anxious about their language and articulation, and are every moment correcting their blunders. But inſtead of hoping to teach them purity or correctneſs of ſpeech by ſuch means as theſe, let us be careful to ſpeak eaſily and correctly before them, and allow them to expreſs themſelves in the beſt manner they can. By ſuch means we will be much more likely to obtain our wiſhes in this matter. When they ſpeak, let us not liſten with ſuch ſolicitude as to relieve them from the neceſſity of uſing an open diſtinct articulation.

When the child attains the power of expreſſing himſelf in artificial language, he may then be conſidered as having reached the ſecond period of infancy. He needs not now to make known his wants by tears, and ſhould therefore be diſcouraged from the uſe of them. Let his tears be entirely neglected. He now begins to run about, and you are anxious to prevent him from hurting himſelf; but your anxiety can only render him peeviſh or timid. Remove him from any very alarming danger, and then ſuffer him to run about at his pleaſure. He will now and then bleed, and hurt himſelf; but he will become bold, lively, and cheerful.

27 Subjection to authority.

In regulating the conduct of your child, let him know that he is dependant; but require not of him an implicit ſubmiſſion to your will. Let his unreaſonable deſires be oppoſed only by his natural inability to gratify them, or by the inconveniences attending the gratification. When he aſks what is neceſſary or reaſonable, let him inſtantly obtain it; when he aſks what is unreaſonable or improper, lend a deaf ear to all his intreaties and demands. Beware of teaching him to eſtabliſh his authority over you by means of the forms of politeneſs. A child will ſcarce take the trouble to addreſs you with *If you pleaſe*, unleſs he has been made to regard theſe as a ſet of magic ſyllables, by the uſe of which he may ſubject every perſon to his will. His *If you pleaſe*, then means *I pleaſe; pray*, with him, ſtands for *do*. Though you put in his mouth the words of humility, his tone and air are thoſe of authority that *will* be obeyed.

Sacrifice not the preſent happineſs of your child for the ſake of any diſtant advantage.

Be not too anxious to guard him againſt natural evil. The liberty which he enjoys while he is now and then permitted to expoſe himſelf to blows, or cold, or wetneſs, is more than a ſufficient compenſation for all that he thus ſuffers.

28 Ideas of moral obligation.

Seek not to impreſs him with ideas of *duty* or *obligation*. Till children reach the years of diſcretion, they are incapable of any notions of the diſtinctions of morality. Avoid therefore even the uſe of the terms by which theſe are expreſſed in their hearing. While they continue to be affected only by ſenſible objects, ſeek not to extend their ideas beyond the ſphere of ſenſation. Try all the powers of language, uſe the plaineſt and moſt familiar methods you can contrive; you ſhall ſtill be unable to give the boy at this age any juſt ideas of the diſtinction between right and wrong. He may readily conceive, that for one ſet of actions you will puniſh him, and that by another he will obtain your approbation; but farther than this his ideas of *right* and *wrong*, of *virtue* and *vice*, cannot yet be carried.

The powers of the human mind are gradually unfolded. At firſt, the infant is capable only of perception; by and by, his inſtincts and paſſions begin to exert their force; at length, as he advances towards manhood, reaſon begins to act, and he becomes able to feel the beauty of virtue and the deformity of vice.

But though you ſeek not to regulate his conduct by by notions of *duty*, yet let him feel the yoke of necessity. Let him know, that as he is weaker than you, he must not, therefore, expect that you should be subject to his will; and that, as he has neither skill nor strength to control the laws of nature, and make every object around him bend to his pleasure, he cannot hope to obtain the gratification of all his wishes. Thus you teach him virtue before he knows what virtue is; and call forth his reason without misleading or perverting it. Let him feel his impotence; but forbid him not to think, that if he had power there would be no reason why he might not at pleasure even turn the world upside down.

Hitherto you have given your pupil no verbal instructions, nor must you attempt to instruct him by any other means than experience; let all his knowledge be literally of his own acquisition.

Let not the parent who has observed the conduct of children brought up in the usual way be afraid that, if his child should be treated like our pupil, he would become stupid and vicious. Nature sends not human beings into the world with a predisposition to vice: we sow the seeds of it in the infant heart; and by our absurd modes of treatment, we also enfeeble and pervert the powers of the understanding.

But from the hour of his birth till he attain the age of twelve, the education of Emilius shall be purely negative. Could we but bring him up healthy and robust, and entirely ignorant, till that period, the eyes of his understanding would then be open to every lesson: free from the influence of habit and prejudice, his passions would not then oppose us; and we might render him the wisest and most virtuous of men. If we can but lose time, if we can but advance without receiving any impressions whatever, our gains are unspeakable. Nature gives the powers of every mind some particular direction: but that particular bias, impressed by the hand of nature, cannot be distinguished before the period we have mentioned; and if you counteract nature, instead of seconding her views, the consequences cannot but be highly unfavourable both to the heart and the understanding of your pupil.

Perhaps, in the midst of society, it may be difficult to bring up our pupil without giving him some idea of the relations between man and man, and of the morality of human actions. Let that, however, be deferred as long as possible.

Were Emilius to witness a scene of anger, and to ask the cause of the appearances which he beheld, he should be told that the persons were affected with a fit of sudden illness. We might thus perhaps prevent the unhappy effects of such an example.

The first moral notions which should be communicated to the child are those of property. To communicate the ideas of property to our pupil, we will direct him to take possession of something; for instance, of a piece of ground belonging to some other person, and in a state of cultivation. Let him cultivate this spot of ground anew, sow it with seeds, and look eagerly forward to the time of harvest in the hopes of reaping the fruit of his labors. In the mean time, let the proprietor of the ground take notice of what is done, destroy your pupil's rising crop, and complain of the injustice done him. While the boy laments his loss and the disappointment of his hopes, in all the bitterness of grief, let the proprietor of the ground still insist on the injury done him, and complain of what he suffers by the purpose for which he himself had cultivated and sown the ground being frustrated. Our pupil, now sensible of the reasonableness of the other's claims, will desist from his lamentations, and only beg to have some other spot assigned him which he may cultivate at his pleasure without offending any person. This he will justly consider as his own property, to the productions of which raised by his own labour he has an exclusive right, and in the occupying of which none ought to molest him. In some such manner as this may the nature of property, the idea of which easily refers in this instance to the first occupier, and afterwards the exchange of property, be explained to him.

Another instance of the manner in which the pupil is now to be managed may not be improper in this place. He is possibly so rude and boisterous as to spoil or break whatever is within his reach. Be not angry with him, however, if he breaks the utensils which he has constant need of; be in no haste to supply him with others in their room: let other things be removed out of his way: if he break the windows of his apartment, let him be exposed night and day to the cold; complain not of the inconvenience yourself, but order matters so that he may feel it. After some time, let them be mended up; and if he break them again, change your method. Tell him calmly, "These windows are mine; I took care to have them put there; and I will prevent their being again broken, by confining you in a dark room." Let all his endeavours to avoid this prove ineffectual. Let him be actually confined, and be liberated only on proposing and agreeing to the condition of breaking no more windows. When he proposes this condition, be ready to listen to him; observe that it is well thought on, and that it is a pity he did not think of it sooner. Consider this engagement between you as sacred; treat him as before, and you cannot fail to attain the end in view.

The moral world now opens to us: But no sooner are we able to distinguish between right and wrong, than we become desirous to conceal those instances in which we act wrong. Lying is therefore a vice of which your pupil is now apt to be guilty: you cannot always prevent, but you can punish; but let the punishments which you inflict appear to the child only the natural consequences of his conduct. If he is in any instance convicted of a lie, let his assertions no longer gain credit. By this means, sooner than by precepts, or any other species of punishments, will you be able to reclaim him from the habit of lying.

The methods generally taken to render children virtuous are preposterous and foolish. To render them generous and charitable, we give them money, and bid them bestow it in alms, while we ourselves give nothing; but the parent or master, and not the child, should bestow the alms. Example might produce the wished for effect. Besides, children are strangers to the value of money. A gingerbread cake is more to them than an hundred guineas. Though you teach them to give away money, till you persuade them to part readily with those things which they value most, you do not inspire them with generosity. Would you make them liberal

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by ſhowing them that the moſt liberal is always beſt provided for? this is to teach covetouſneſs, not liberality. Example is the only means by which you can, at this period, hope to teach your pupil any of the virtues.

The only leſſon of morality that can with any propriety be inculcated on children, is to injure no perſon. Even the poſitive precept of doing good, muſt be conſidered as ſubordinate to this negative one of doing no harm. The moſt virtuous and the moſt exalted of characters, is the man who does the leaſt harm to his fellow-creatures.

In a public education, it will be neceſſary to attempt the communication of moral inſtruction at an earlier period than in a private one. In a private education, it will always be beſt to allow the moral powers of children to ripen as much as poſſible before you endeavour to inform and direct them by precepts.

There is an equality among geniuſes; and fond mothers and fathers may be diſpoſed to plead for exceptions in favour of ſuch of their children as they view with a partial eye. "This boy's mind is more capacious, his powers are riper, than thoſe of others." But however great the ſeeming diſparity of geniuſes may be, it is at bottom but inconſiderable. Let the age of children be therefore regarded as a common meaſure by which their treatment is to be regulated.

However quick and tenacious the memories of children may ſeem, they can derive little advantage from the exertions of memory till ſuch time as judgment begins to act. All the knowledge that they acquire in the courſe of the uſual ſyſtem of education, is merely the knowledge of words. The languages, geography, chronology, in ſhort all that they are taught, and called to diſplay ſo oſtentatiouſly at this period of life, ſerve no other purpoſe than to fill their minds with words.

29 History, how far proper to be put into the hands of boys.

Hiſtory is eſteemed a proper thing to be put into the hands of children. But except you wiſh to confine their attention to the external and phyſical actions, it is almoſt nothing they can acquire by the peruſal of it. And if diveſted of the moral diſtinctions of actions, of the workings of the paſſions, and the complication of intereſts, what is there to render hiſtory entertaining? We may indeed eaſily teach them to repeat the words *kings, emperors, wars, conqueſts, revolutions, laws*: but of the things which you uſe theſe words to denote, you will find they are hitherto incapable of forming any clear ideas.

But the mere knowledge of words is not ſcience; make your pupil acquainted with things, and he will not fail to acquire their names. Emilius muſt never be ſet to get any compoſition by heart, not even fables: be careful to place before him thoſe ſcenes and objects, the images of which it may be uſeful for him to have impreſſed on his memory; but by no other means ſeek to aſſiſt him to improve that faculty.

Emilius ſhall not even learn to read till he attain the age of twelve: for, before that period, it can be of no benefit to him; and the labour would only make him unhappy during that period of life which is naturally the golden part of our days. But when he has attained the proper age, matters ſhall be ſo ordered, that he ſhall find his ignorance of letters an inconvenience. A card ſhall be ſent him, which being unable to read, he will apply to ſome of thoſe about him. They may be unwilling to oblige him, or otherwiſe engaged. If, at length, it is read to him, that may be when it is now too late to take advantage of ſome agreeable invitation which it contained. This may be two or three times repeated. At length he becomes eager to learn to read; and accompliſhes that almoſt without aſſiſtance.

The principle on which we proceed, is to leave the pupil almoſt wholly under his own direction, ſeemingly at leaſt; to lead him to acquire new accompliſhments, ſolely from the deſire of increaſing his powers, and extending his influence; and humbly to follow nature, not to force her.

As we are deſirous of cultivating his underſtanding, the means which we employ for that purpoſe is, to cultivate thoſe abilities on which it depends; he is always active and in motion. Let us firſt make him a man in point of health and vigour, and he will ſoon become a man in underſtanding.

By our conſtant attention to the welfare of children, we render it unneceſſary for them to attend to it themſelves. What occaſion has your ſon or pupil to obſerve whether the aſpect of the ſky threaten rain, when he knows that you will take care to have him ſheltered from a ſhower? or to regulate the length of his excurſions, when he is ſure that you will not ſuffer him to loſe his dinner?

While matters are ſo ordered that Emilius thinks himſelf ſubject only to his own will, though all his motions are regulated according to your pleaſure; inſtead of becoming fantaſtic and capricious, he inſenſibly acquires the habit of keeping utility in view in all his actions.

The firſt objects which engage the attention of children are the appearance of the material world around them: our firſt ſtudy is a kind of experimental philoſophy; our inſtruments and inſtructors are our hands, our feet, and our eyes. By exerciſing theſe bodily organs, the boy will acquire more real knowledge even in the period of childhood, than if we ſhould dedicate nine-tenths of his time to books, from the age of ſix to ſixty. All who have examined, with any ſagacity, the characters, circumſtances, and manners of the ancients, have agreed in attributing to their gymnaſtic exerciſes that ſuperior ſtrength of body and mind which renders them the objects of admiration to the moderns.

Our pupil's clothes cannot be too light and eaſy. If tight and cloſe, they fetter and confine his joints and limbs, and likewiſe obſtruct the circulation of the blood; if accuſtomed to warm clothing, he will ſoon become incapable of bearing cold.

30 Expoſure and exerciſe.

In every thing let him be habituated to what is plain and hardy. Let his bed be coarſe and hard, his clothes plain, his fare ſimple. Infants muſt be freely indulged in ſleep; but as Emilius is now advanced beyond infancy, he muſt be accuſtomed at times to go to bed late and get up early, to be ſometimes haſtily waked from ſleep; and thus to prepare himſelf for what he may afterwards have occaſion to ſubmit to in the courſe of life.

As this period is in a particular manner that of exerciſe, and Emilius is encouraged to take as much exerciſe as he chooſes; we muſt endeavour to prompt,

our

Education. but without seeming to direct him to such as are most proper. Swimming, though not generally attended to, is yet one of the first which a boy ought to learn. It may, in many occasions in life, be of the greatest advantage, by enabling us to save our own life or the life of others. Emilius shall be taught to swim; he shall be taught whatever can really enlarge the sphere of his power: "could I teach him to fly in the air, I would make him an eagle; if to bear the fire, a salamander."

To exercise the senses is not merely to make use of them; it is to learn to judge by them. Call not your pupil to exert all his strength on every occasion; but let him learn to judge of the truth of the information which he receives from one sense, by having recourse to the evidence of another.

It is not impossible to improve the senses to an higher degree of perfection than that which they usually attain. Blind men generally possess the sense of touch in a more exquisite degree, than we who have also eyes to guide and inform us. But they acquire this superior delicacy and acuteness of sensation, only by their finding it necessary to have more frequent recourse to the information of that sense. Here is then a wide field for improvement and agreeable exercise to our pupil.

What a variety of useful diversions might he be led to entertain himself with in the course of the night. The hours of darkness are generally hours of terror, not only to men, but also to the brute animals. Even reason, knowledge, and courage, are not always sufficient to render us superior to the terror which darkness inspires.

31 Darkness and ghosts.

This timidity is usually attributed to the tales of ghosts and goblins with which we are frightened in infancy. But it originates from another cause; our ignorance of what is passing around us, and our inability to distinguish objects during that period of darkness. The passion of fear was implanted by nature in the human breast, in order that it might serve to put us on our guard against danger. But in consequence of our being subject to the influence of that passion, when we are ignorant of what surrounds us, imagination calls up dangers on all hands. And such is the cause from which our terror in darkness naturally arises.

But the only way to free our pupil from this tyranny of imagination, is to oppose to it the power of habit. A bricklayer or tyler is never giddy on looking down from the roofs of houses. Neither will our pupil be alarmed by the terrors of darkness, if he be accustomed to go frequently abroad under night. It is easy to contrive a number of little amusements, the agreeableness of which may, for a time, overcome our pupil's aversion for darkness; and thus may a habit be at length impressed.

Let us give yet another instance of the means by which children may be led to do what we wish, without our imposing any restraint on their will. Suppose Emilius is lazy and inactive, and we wish to make him learn to run. When walking out with the young sluggard after dinner, I would sometimes put a couple of his favourite cakes in my pocket; of these each of us should eat one in the course of our walk. After some time I would show him I had put a third cake in my pocket. This he would not fail to ask after finishing his own: no, says I, I can eat it myself, or we will divide it; or stay, we had better let these two little boys there run a race for it. Accordingly I propose the race to the boys; who readily accept the conditions, and one of them carries off the prize. After seeing this several times repeated, Emilius begins to think himself qualified to obtain the third cake as well as any of the little boys, and to look upon running as an accomplishment of some consequence. He seeks an opportunity of being permitted to enter the lists. He runs; and after being two or three times outstripped, is at length successful, and in a short time attains an undoubted superiority.

32 Drawing.

As children naturally imitate almost whatever they behold, they are often disposed to attempt drawing. In this our pupil might be indulged, not merely for the sake of the art, but to give him a steady hand and a good eye. But he should draw from nature, not from other drawings or from prints. Were he to draw the likeness of a horse, he should look at the animal: if to attempt a representation of a house, he should view the house itself. In this method he will, no doubt, scratch for a long time without producing any likeness: but he will acquire what we proposed as the ends of his attempting to draw; namely, steadiness of hand and justness of sight, by this method, sooner than by any others.

33 Geometry.

Geometry, when taught in the usual way, is certainly above the capacity of children; they cannot go along with us in our reasonings: Yet they are not totally incapable of acquiring even this difficult science; if, when they are prosecuting their amusements, you lead them insensibly to observe the properties of the circle, the triangle, and the square, and place them now and then in circumstances when they may have occasion to apply their knowledge of these to real uses in life.

A child has been taught the various relations between the outlines, surfaces, and contents of bodies, by having cakes set before him, cut in all manner of regular solids; by which means he was led to master the whole science of Archimedes, by studying which form contained the greatest quantity.

There is a period between infancy and the age of puberty at which the growth and improvement of our faculties exceed the increase of our desires. About 12 or 13, when the appetite for the sex has not yet begun to make itself felt, when unnatural wants are yet unknown, no false appetites yet acquired; at that period, though weak as a man, as a child the youth is strong.

This interval, when the individual is able to effect more than is necessary for the gratification of his wishes, contains the most precious moments of his life, which ought to be anxiously filled up in an useful manner. This is the best time for employment, for instruction, for study.

Now, let us begin to consider what is useful; for, hitherto, we have only inquired what was necessary. In entering on our studies, we will make no account of any but such as instinct directs us to pursue: those which the pedants and the pretended philosopher are im-

impelled to pursue solely from the desire of attracting the admiration of mankind, are unworthy of our notice.

The earth which we inhabit, and the sun by whose beams we are enlightened, are the first objects which claim our attention. We will therefore direct the attention of our pupil to the phenomena of nature. We will lead him to the knowledge of geography, not by maps, spheres, and globes: we will lead Emilius out on some beautiful evening to behold the setting sun. Here we take particular notice of such objects as mark the place of his going down. Next morning we visit the spot to contemplate the rising of the glorious luminary. After contemplating for some time the successive appearances which the scene before us assumes, and making Emilius observe the hills and the other surrounding objects, I stand silent a few moments, affecting to be occupied in deep meditation: At last I address him thus: "I am thinking, that, when the sun set last night, it went down yonder; whereas this morning, you see he is risen on the opposite side of the plain here before us. What can be the meaning of this?" I say nothing more at this time, but rather endeavour to direct his attention to other objects.

This is our first lesson in cosmography.

Our last observation was made about Midsummer; we will next view the rising sun on some fine morning in the middle of winter. This second observation will be made on the very same spot which we chose for the former. When Emilius and I perceive the sun now emerging above the horizon, we are struck at the change of the place of his rising.—By such lessons as these may the pupil be gradually taught a real, not a seeming, acquaintance with the relative motions of the sun and the planets and with geography.

34
Objects during the second period of childhood

During the first period of childhood, the great object of our system of education was to spend our time as idly as possibly, in order that we might avoid employing it to an ill purpose: but our views are now changed with our pupil's progress in life; and we have scarce enough of time for the accomplishment of our necessary pursuits. We therefore proceed as quickly as possible in making ourselves acquainted with the nature of the bodies around us, and the laws by which their motions and appearances are regulated. We keep to this study at present, as being necessary for the most important purposes in life, and as being the most suitable to the present state of our pupil's powers. We still begin with the most common and obvious phenomena of nature, regarding them as mere facts; and, advancing from these, we come to generalize by degrees.

As soon as we are so far advanced as to be able to give our pupil an idea of what is meant by the word *useful*, we have attained a considerable influence over his future conduct. On every occasion after this a frequent question between us will be, Of what use is that? This will be the instrument by means of which I shall now be able to render him absolutely submissive to my wishes. However, I will allow him to make use of it in his turn, and will be careful not to require of him to do or learn any thing the utility of which he cannot comprehend.

55
Robinson Crusoe

Books only teach people to talk about what they do not understand. Emilius shall have as little recourse as possible to books for instruction. Yet if we can find a book in which all the natural wants of man are displayed in a manner suitable to the understanding of a child, and in which the means of satisfying those wants are gradually displayed with the same ease and simplicity; such a book will be worthy of his most attentive study. There is such a book to be found; but it is neither Aristotle, nor Pliny, nor Buffon; it is Robinson Crusoe. Emilius shall have the adventures of Robinson put into his hands; he shall imitate his example; even affect his dress; and, like Robinson, learn to provide for himself without the aid of others.

Another employment of Emilius at this period shall be, to visit the shops of various artisans; and when he enters a shop, he will never come out without lending a hand to the work, and understanding the nature and the reason of what he sees going forward.

Still, however, we are careful to afford not a hint concerning those social relations the nature of which he is not yet able to comprehend.

The value and importance of the various arts are ordinarily estimated, not according to their real utility, but by a very injudicious mode of estimation: Those which contribute in a particular manner to the gratification of the fantastic wishes of the rich, are preferred to those which supply the indispensable necessaries of life. But Emilius shall be taught to view them in a different light. Robinson Crosoe shall teach him to value the stock of a petty ironmonger above that of the most magnificent toy-shop in Europe. Let us establish it as a maxim, that we are to lead our pupil to form just notions of things for himself, not to dictate to him ours. He will estimate the works both of nature and art by their relation to his own convenience; and will therefore regard them as more precious than gold—a shoemaker or a mason, as a man of more importance than the most celebrated jeweller in Europe.

The intercourse of the arts consists in the reciprocal exchange of industry; that of commerce, in the exchange of commodities; and that of money, in the exchange of bills and cash. To make our pupil comprehend the nature of these, we have now only to generalize and extend to a variety of examples those ideas of the nature of property, and of the exchange of property, which we formerly communicated to him. The nature of money, as bearing only a conventional value, which it derives from the agreement of men to use it as a sign for facilitating commerce, may be now explained to Emilius, and will be easily comprehended by him. But go no farther: seek not yet to explain to the child in what manner money has given rise to the numerous chimeras of prejudice and caprice; nor how countries which abound most in gold and silver, come to be the most destitute of real wealth.

Still our views are directed to bring up our pupil in such a manner that he may be qualified to occupy any place in the order of society into which even the caprice of fortune can throw him. Let us make him a man; not a slave, a lord, or a monarch. How much superior the character of a king of Syracuse turned

Education. schoolmast·r at Corinth, of a king of Macedon become a notary at Rome, to an unhappy Tarquin incapable of supporting himself in a state of independence when expelled from his kingdom!

36 The propriety of making a youngman, nwhatever phere of ife, learn a rade.

Whatever be our situation in the world, we can contribute nothing but our personal abilities to society. To exert them is therefore the indispensable duty of every one who enjoys the advantage of a social state; and to cultivate them in our pupil to the best purpose, ought to be the great aim of every course of education. Emilius has already made himself familiar with all the labours of husbandry; I can therefore bid him cultivate the land which he inherits from his father. But if it should be lost, what shall be his resource? He shall learn a trade, that he may be provided against such an accident. And he shall not be a politician, a painter, a musician, or an architect; to gain employment for his talents in any of these arts, would cost him no less trouble than to regain his lost estate. He shall learn some simple mechanical art: he will then need only to step into the first shop he sees open, to perform his day's labour, and receive his wages.

It may be here proper to take notice of a mistake into which people generally fall in determining the trade or profession in which they are to place their children. Some accident disposes the child to declare himself for a particular employment: the parent regards that as the employment to which his talents are fitted by the design of nature; and permits him to embrace it without inquiring whether another would have been more suitable or advantageous. But because I am pleased with my occupation, I am not on that account necessarily qualified for it. Inclinations do not confer abilities. It requires more careful and accurate observation than is generally imagined, to distinguish the particular taste and genius with which nature has endowed the mind of a child. We view him carelessly, and of consequence we are apt to mistake casual inclination for original disposition.

But Emilius needs not now to hesitate about the occupation which he is to choose. It is to be some mechanical employment. All the distinction we have now to make is, to prefer one that is cleanly and not likely to be injurious to his health. We shall make choice of that of a joiner. We cannot dedicate all our time to that trade; but at least for two days in the week we will employ ourselves in learning our trade. We will have no workshop erected for our convenience, nor will we have a joiner to wait on us in order to give us the necessary instructions; but for the two days in every week which we dedicate to the purpose of learning a trade, we will go to our master's workshop; we will rise before him in the morning; work according to his orders; eat at his table; and, after doing ourselves the honour of supping with his family, return to our own hard mattresses at night. We shall be treated only according to the merit of our performances. Our master shall find fault with our work when clumsily or negligently done, and be pleased with it only when well executed.

37 New ideas suggested to Emilius by his application to a trade.

While my pupil has been accustomed to bodily exercise and manual labour, his education has been hitherto conducted in such a manner as to give him insensibly a taste for reflection and meditation. Before he has been long a workman, therefore, he will begin to become more sensible of that inequality of ranks which takes place in the order of society. He will therefore take notice of his own dependence, and of my apparent wealth, and will be desirous to know why I contribute not my personal exertions to society. I put off the question with telling him, that I bestow my superfluous wealth upon him and the poor; and will take to make a bench or table every week, that I may not be quite useless to the public.

38 Progress that Emilius has made before the age of puberty.

And now when about to enter the most critical period of life, when just on the brink of that age at which the heart and blood begin to feel the impulse of a new appetite, what progress has our pupil made? what knowledge has he acquired? All his science is merely physical. Hitherto he has scarce acquired any ideas of moral relations; but the essential relations between men and things he has attentively studied. He knows the general qualities of certain bodies; but upon those qualities he has not attempted to reason. He has an idea of abstract space, by means of geometrical figures; of abstract quantity, by means of algebraical signs. He has no desire to find out the essence of things; their relations alone interest him. He values nothing external but from its relation to himself. The general consent of mankind, or the caprice of custom, have not yet given any thing a value in his eyes; utility alone is his measure of estimation. He is laborious, temperate, patient, resolute, and bold. His imagination never exaggerates danger. He scarce knows as yet what death is; but should it approach him, he is prepared to submit to necessity. He is virtuous in every thing relative merely to himself. He is prepared to become a virtuous member of society as soon as he shall be made acquainted with the nature of his social relations. He is free from vice and error as far as is possible for human nature. He considers himself as unconnected with others; requires nothing from any person, and thinks none has a right to require any thing of him. Sure a youth arrived thus at his fifteenth year has not mispent the period of his infancy.

39 New measures to be adopted in his education at that age.

But now our pupil has reached the most critical period of life. He now feels the influence of the passion for the sex: and as soon as we become subject to the influence of that passion, we are no longer unsocial beings. The want of a mistress soon produces the want of a friend.

As hitherto we have been careful not to force or anticipate nature, so even now our attention must be directed to divert the impulses of that dangerous appetite which now begins to make itself felt. To confine the growing passions within proper limits, let it be our care to defer as long as possible the time at which they begin to display themselves. For this purpose, let us cautiously guard our words and actions in the presence of our pupil. Let us be careful to give him no premature instructions.

To excite and cherish that sensibility of mind which now first begins to show itself, to extend the care of the youth beyond himself, and to interest him in the welfare of his fellow creatures; let us be careful to put such objects in his way as have a tendency to call forth and refine his feelings. It is not possible for the human heart to sympathise with those who are happier than ourselves; our sympathy is moved only by the sight of misery. We pity in others only those distresses, Education. ses to which we ourselves are liable; and our pity for the misfortunes of others is measured, not by the quantity of the evil, but by the supposed sensibility of the sufferer. Let these observations serve to direct us in what manner we are to form the minds of children to humanity and compassion.

In prosecution of our design, to retard rather than accelerate the growth of the passions, let us, when that critical period which we have so much feared comes on, seclude him as much as possible from the intercourse of society, where so many objects appear to inflame the appetites. Let us be circumspect in the choice of his companions, his employment, his pleasures. Let all our care be directed to nourish his sensibility without inflaming his desires. As his moral powers now begin to unfold themselves; in cultivating them, let us proceed not by way of lecture, or by directing his attention to books, but still by leading him to acquire experience. At length the period will arrive for communicating to him some religious instruction. When he knows the nature of his relations to society, he may be informed of his relation to and dependence upon the Deity.

[The creed of the Savoyard curate, containing those sentiments concerning religious matters which Rousseau seems to propose as the most proper to be inculcated on his pupil, comes next in the order of the work; but it does not appear to be so closely connected with the subject of his education as to render it proper for us to give a view of it in this place. The sentiments which he there advances, the reasonings which he urges, are evidently hostile to revealed religion; and the power of his eloquence has adorned slight and superficial arguments with such a charm, that even the sternest believer, if not absolutely destitute of taste and feeling, must read them with delight.]

And now, notwithstanding all my arts, I can no longer keep back that moment which I have endeavoured to defer to as late a period as possible. As soon as I perceive that it has certainly arrived, I no longer treat Emilius as my pupil or disciple, but as my friend. His affections are now expanded beyond himself; his moral powers have begun to exert themselves, and have received some cultivation; he also is become capable of religious sentiments, and instructed in the nature of his relation to a supreme Being. Besides, it is now requisite, if we consider the period to which nature has conducted him, that he should no longer be treated as a simple child. Hitherto ignorance has been his guardian, but now he must be restrained by his own good sense.

Now is the time for me to give him in my accounts; to show him in what manner his time and mine have been employed; to acquaint him with his station and mine, with our obligations to each other, his moral relations, the engagements he has entered into with regard to others, the degree of improvement which he has attained, the difficulties he will hereafter meet with, and the means by which he may surmount them: —in a word, to point out to him his critical situation, and the new perils which surround him; and to lay before him all the solid reasons which should engage him to watch with the utmost attention over his conduct, and to be cautious of indulging his youthful desires.

Books, solitude, idleness, a sedentary and effeminate life, the company of women and young people, are what he must carefully avoid at this age. He has learned a trade, he is not unskilled in agriculture; these may be means, but not our only means, for preserving him from the impulse of sensual desire. He is now too familiar with these: he can exercise them without taking the trouble to reflect; and while his hands are busy, his head may be engaged about something quite different from that in which he is employed. He must have some new exercise which may at once fix his attention and cause him to exert his bodily powers. We can find none more suitable for this purpose than hunting. Now, therefore, Emilius shall eagerly join in the chace; and though I do not wish him to acquire that cruelty of disposition and ferocity of temper which usually distinguish those who dedicate their lives to that barbarous diversion, yet at present it may have the happiest effects in suspending the influence of the most dangerous of passions.

40 Means employed to preserve the purity of his manners.

When I have now conducted my pupil so far; have informed him of what I have done for him, and of the difficulty of his situation; and have resigned my authority into his hands; he is so sensible of the dangers to which he is exposed, and of the tender solicitude with which I have watched over him, that he still wishes to continue under my direction. With some feigned difficulty I again resume the reins. My authority is now established. I may command obedience; but I endeavor to guard against the necessity of using it in this manner.

To preserve him from indulging in licentious pleasures, I let him know that nature has designed us for living in a state of marriage, and invite him to go in search of a female companion. I will describe to him the woman whom he is to consider as worthy of his attachment in the most flattering colours. I will array her in such charms, that his heart shall be hers before he has once seen her. I will even name her: her name shall be Sophia. His attachment to this imaginary fair one will preserve him from all the allurements of unlawful love. Besides, I take care to inspire him with such reverence for himself, that, notwithstanding all the fury of his desires, he will not condescend to pursue the enjoyments of debauchery. And though I may now sometimes entrust him to his own care, and not seek to confine him always under my eye; yet still I will be cautious to watch over his conduct with careful circumspection.

But as Emilius is to be shortly introduced to his Sophia, it may perhaps be proper for us to enquire into her character, and in what manner she has been brought up.

41 Distinctive characters of the two sexes.

There is a natural difference between the two sexes. The difference in the structure of their bodies shows them to be destined by nature for different purposes in life, and must necessarily occasion a distinction between their characters. It is vain to ask which of them merits the pre-eminence: each of them is peculiarly fitted to answer the views of nature. Woman is naturally weak and timid, man strong and courageous; the one is a dependent, the other a protector. As the guardian of her virtue, and a restraint on her desires, woman is armed with native modesty. Reason is the guide and governor of man. When a man and a wo-

 man

 man are united by conjugal vows, a violation of thoſe vows is evidently more criminal in the woman than in the man. The wife ought to be anſwerable for the genuineneſs of the offspring with which ſhe has been entruſted by nature. It is no doubt barbarous and wicked for the huſband to defraud his wife of the only reward which ſhe can receive from the ſevere duties of her ſex: but the guilt of the faithleſs wife is ſtill more attrocious; and the conſequences of her infidelity are ſtill more unhappy.

But if nature has eſtabliſhed an original diſtinction between the characters of the two ſexes; has formed them for different purpoſes, and aſſigned them different duties; it muſt follow, that the education of the one ſex ought to be conducted in a manner different from that of the other. The abilities common to the two ſexes are not equally divided between them; but if that ſhare which nature has diſtributed to woman be ſcantier than what ſhe has beſtowed on man, yet the deficiency is more than compenſated by the qualities peculiar to the female. When the woman confines herſelf to aſſert her proper rights, ſhe has always the advantage over man; when ſhe would uſurp thoſe of the other ſex, the advantage is then invariably againſt her.

But we require not that woman ſhould be brought up in ignorance. Let us conſider the delicacy of her ſex and the duties which ſhe is deſtined to perform; and to theſe we may accommodate the education which we beſtow upon her. While boys like whatever is attended with motion and noiſe, girls are fond of ſuch decorations as pleaſe the eye. Dolls are the favourite plaything of the ſex in their infant years. This is an original taſte, of the exiſtence of which we have the plaineſt evidence. All therefore that we ought to do is, to trace and bring it under proper regulation. Allow the girl to decorate her baby in whatever manner ſhe pleaſes; while employed about that, ſhe will acquire ſuch ſkill and dexterity in thoſe arts which are peculiar to her ſex, that with ſcarce any difficulty ſhe will acquire needle-work, embroidery, and the art of working lace. Her improvements may even be extended as far as deſigning, an art ſomewhat connected with taſte in dreſs; but there is no reaſon that their ſkill in this art ſhould be carried farther than to the drawing of foliage, fruits, flowers, drapery, and ſuch parts of the art as bear ſome relation to dreſs. Always aſſign reaſons for the employment which you give to young girls, but be ſure you keep them conſtantly buſy. They ought to be accuſtomed to laborious induſtry, as well as to bear the abridgment of their liberty. Uſe every art to prevent their work from becoming diſagreeable to them. For that purpoſe, let the mother be careful to make herſelf agreeable. A girl who loves her mother or her aunt, will work cheerfully by them all day; while ſhe to whom her mother is not dearer than all the world beſides, ſeldom turns out well. Never ſuffer girls, even at their diverſions, to be entirely free from reſtraint, nor allow them to run from one amuſement to another. If you now and then detect your daughter uſing a little artifice to excuſe herſelf from obedience, reflect that artifice is, in a certain degree, natural to the fair ſex; and as every natural inclination, when not abuſed, is upright and good, why ſhould it not be cultivated? In order to give girls proper notions of dreſs, let them be taught to conſider ſplendor and elegance of dreſs as deſigned only to conceal the natural defects of the perſon; and to regard it as the nobleſt triumph, the higheſt praiſe, of beauty, to ſhine with unborrowed luſtre in the ſimpleſt attire. Forbid not young women to acquire thoſe arts which have a tendency to render them agreeable. Why refuſe them the indulgence of learning to dance, to ſing, and to ſtudy ſuch other accompliſhments as afterwards enable them to entertain their huſbands? Girls are more diſpoſed to prattle, and at an earlier age, than boys. We may now and then find it neceſſary to reſtrain their volubility. But the proper queſtion to them on ſuch occaſions is not, as to boys, *Of what uſe is this?* but *What effects will this produce?* At this early period, when they are yet ſtrangers to the diſtinction between good and evil, and therefore unable to form a juſt judgment concerning any perſon's conduct, we ought to reſtrain them carefully from ſaying what may be diſagreeable to thoſe with whom they converſe.

Girls are no leſs incapable than boys of forming diſtinct notions of religion at an early age. Yet, and even for that very reaſon, religious inſtruction ſhould be communicated to them much ſooner than to the youth of the other ſex. Were we to wait the period when their mental faculties arrive at maturity, we might perhaps loſe the happieſt time, from our inability to make a right diſtinction. Since a woman's conduct is ſubject to public opinion, her belief ought therefore to depend, not on reaſon, but on authority. Every girl ought to follow the religion of her mother, every married woman that of her huſband. They cannot derive a rule of faith from their own inquiry. Let us therefore ſeek, not ſo much to inſtruct them in the reaſons of our belief, as to give them clear diſtinct notions of thoſe articles which we require them to believe. Be more careful to inſtruct her in thoſe doctrines which have a connection with morality, than in thoſe myſterious articles which we are required to believe, though we cannot comprehend them.

Such are the principles on which the education of Emilius's unknown miſtreſs has been conducted.

[Notwithſtanding the merit of that part of this treatiſe in which the author entertains us with the courtſhip between his Emilius and Sophia, it does not appear to be ſo intimately connected with the ſubject of education as to render it proper for us to preſent our readers with a view of it. We therefore paſs over the courtſhip, to give a view of our author's ſentiments concerning the advantages to be derived from travelling, and the manner in which it ought to be directed.]

42 Emilius attached to a miſtreſs.

When Emilius has formed a firm attachment to Sophia, and by his aſſiduities has been ſo fortunate as to gain her affections, his great wiſh now is, to be united with her in the bonds of marriage. But as he is ſtill young, is but imperfectly acquainted with the nature of thoſe duties incumbent on him as a member of a particular ſociety, and is even ignorant of the nature of laws and government, I muſt ſeparate him from his Sophia, and carry him to gain a knowledge of theſe things, and of the character and circumſtances of mankind, in various countries, and under various forms of civil government, by travelling. Much has been ſaid 43 Travel.

con-

Education. concerning the propriety of sending young people to travel, in order to complete their education. The multiplicity of books is unfavourable to real knowledge. We read with avidity, and think that by reading we render ourselves prodigiously wise. But we impose on ourselves: the knowledge which we acquire from books is a false species of knowledge, that can never render us truly wise.

To obtain real knowledge, you must observe nature with your own eyes, and study mankind. But to gain this knowledge by travelling, it is not necessary that we should traverse the universe. Whoever has seen ten Frenchmen, has beheld them all; and whoever has surveyed and compared the circumstances and manners of ten different nations, may be said to know mankind.

To pretend that no advantages may be derived from travelling, because some of those who travel return home without having gained much real improvement, would be highly unreasonable. Young people who have had a bad education, and are sent on their travels without any person to direct or superintend their conduct, cannot be expected to improve by visiting foreign countries. But they whom nature has adorned with virtuous dispositions, who have been so happy as to receive a good education, and go abroad with a real design of improvement, cannot but return with an increase of virtue and wisdom. In this manner shall Emilius conduct his travels. To induce him to improve in the most attentive manner that time which he should spend in travelling, I would let him know, that as he had now attained an age at which it might be proper for him to form some determination with regard to the plan of his future life, he ought therefore to look abroad into the world, to view the various orders in society, to examine the various circumstances of mankind, under different forms of government, and in different parts of the globe; and to choose his country, his station, and his profession. With these views should Emilius set out on his travels; and with these views, in the course of our travels, we should inquire into the origin of society and government, into the nature of those principles by means of which men are united in a social state, into the various circumstances which have given rise to so many different forms of government, and into the necessary relation between government and manners. Our stay in the great towns should be but short: for as in them corruption of manners has risen to a great height, and dissipation reigns, a long stay in any great town might be fatal to the virtuous dispositions of Emilius. Yet his attachment to Sophia would be alone sufficient to save him from the dangers to which his virtue is exposed. A young man must either be in love, or be a debauchee. Instances may be pointed out in which virtue has been preserved without the aid of love; but to such instances I can give little credit.

44
Return from his travels, and marriage.

Emilius, however, may now return to his Sophia. His understanding is now much more enlightened than when he set out on his travels. He is now acquainted with several forms of government, their advantages and defects, with the characters of several different nations, and with the effects which difference in circumstances may be expected to produce on the characters of nations. He has even been so fortunate as to get acquainted with some persons of merit in each of the countries which he has visited. With these advantages gained, and with affection unchanged and unabated, he returns to his Sophia. After having made him acquainted with the languages, the natural history, the government, the arts, customs, and manners, of so many countries, Emilius eagerly informs me that the period which we had destined for our travels is now expired. I ask, What are then his purposes for life? He replies, that he is satisfied with the circumstances in which nature has placed him, and with my endeavours to render him independent on fortune, and wishes only for his Sophia to be happy. After giving him a few advices for the regulation of his conduct in life, I conduct him to his Sophia, and behold him united with her in marriage. I behold him happy; with affectionate gratitude he blesses me as the author of his happiness; and I thus receive the reward of all the pains with which I have conducted his education.

45
Remarks.

Such are the outlines of the system of education proposed by this singular and original genius. For originality of thought, affecting sentiment, enchanting description, and bold vehement eloquence, this book is one of the noblest pieces of composition, not only in the French language, but even in the whole compass of ancient and modern literature. The irregularity of his method, however, renders it a very difficult task to give an abridged view of his work. He conducts his pupil, indeed, from infancy to manhood: But instead of being barely a system of education, his work is besides a treasure of moral and philosophical knowledge. He has chosen a path, and follows it from the bottom to the summit of the hill: yet whenever a flower appears on the right or left hand, he eagerly steps aside to pluck it; and sometimes, when he has once stepped aside, a new object catches his eye and seduces him still farther. Still, however, he returns. His observations are in many places loosely thrown together, and many things are introduced, the want of which would by no means have injured either the unity or the regularity of his work. If we attempt to review the principles on which he proceeds in reprobating the prevalent modes of education, and pointing out a new course, his primary and leading one seems to be, that we ought to watch and second the designs of nature, without anticipating her. As the tree blossoms, the flowers blow, and the fruit ripens each at a certain period; so there is a time fixed in the order of nature for the sensitive, another for the intellectual, and another for the moral powers of man to display themselves. We in vain attempt to teach children to reason concerning truth and falsehood, concerning right and wrong, before the proper period arrive: We only confound their notions of things, and load their memories with words without meaning; and thus prevent both their reasoning and moral powers from attaining that strength and acuteness of which they are naturally capable. He attempts to trace the progress of nature, and to mark in what manner she gradually raises the human mind to the full use of all its faculties. Upon the observations which he has made in tracing the gradual progress of the powers of the human mind towards maturity, his system is founded.

As it is impossible to communicate to the blind any just ideas of colours, or to the deaf of sounds; so it must be acknowledged, that we cannot possibly communicate

municate to children ideas which they have not faculties to comprehend. If they are, for a certain period of life, merely sensitive animals, it must be folly to treat them during that period as rational and moral beings. But is it a truth that they are, during any part of life, guided solely by instinct, and capable only of sensation? Or, how long is the duration of that period? Has nature unkindly left them to be, till the age of twelve, the prey of appetite and passion? So far are the facts of which we have had occasion to take notice, concerning the history of infancy and childhood, from leading to such a conclusion, that to us it appears undeniable that children begin to reason very soon after their entrance into life. When the material world first opens on their senses, they are ignorant of the qualities and relations of surrounding objects: they know not, for instance, whether the candle which they look at be near or at a distance; whether the fire with which they are agreeably warmed may also affect them with a painful sensation. But they remain not long in this state of absolute ignorance. They soon appear to have acquired some ideas of the qualities and relative situation of bodies. They cannot, however, acquire such ideas, without exerting reasoning powers in a certain degree. Appearances must be compared, and inferences drawn, before knowledge can be gained. It is not sensation alone which informs us of the relative distances of bodies; nor can sensation alone teach us, that the same effects which we have formerly observed will be again produced by the same cause.

But if children appear capable of reasoning at a very early period, they appear also to be at a very early period subject to the influence of the passions: they are angry or pleased, merry or sad, friends or enemies, even while they hang at the breast; instead of being selfish, they are naturally liberal and social. And if we observe them with a candid attention, we will find that the passions do not display themselves sooner than the moral sense. As nature has wisely ordered, that we should not see, and hear, and feel, without being able to compare and draw inferences from our preceptions; so it is a no less certain and evident law of nature, that the passions no sooner begin to agitate the human breast, than we become able to distinguish the beauty and the deformity of virtue and vice. The child is not only capable of gratitude and attachment to the person who treats him with kindness; he is also capable of distinguishing between gratitude and ingratitude, and of viewing each with proper sentiments. He cries when you refuse to gratify his desires; but he boldly insists that he is injured when you use him cruelly or unjustly. It is indeed impossible to attend to the conduct of children during infancy, without being convinced that they are, even then, capable of moral distinctions. So little are they acquainted with artificial language, that we and they do not then well understand each other. But view their actions; consider those signs by which nature has taught them to express themselves. Our limbs, our features, and our senses, are not gradually and by piecemeal bestowed as we advance towards maturity; the infant body comes not into the world mutilated or defective; why then, in point of mental abilities, should we be for a while brutes, without becoming rational and moral beings till the fulness of time be accomplished? All the differences between the phenomena of manhood and those of infancy and childhood may be accounted for, if we only reflect, that when children come into the world, they are totally unacquainted with all the objects around them; with the appearances of nature, and the institutions of society; that they are sent into the world in a feeble state, in order that the helplessness occasioned by their ignorance may attract the notice and gain the assistance of those who are able to help them; and that they attain not full strength in the powers either of mind or body, nor a sufficient acquaintance with nature, with artificial language, and with the arts and institutions of society, till they arrive at manhood.

Even Rousseau, notwithstanding the art with which he lays down his system, cannot avoid acknowledging indirectly, on several occasions, that our social dispositions, our rational and our moral powers, display themselves at an earlier period than that at which he wishes us to begin the cultivation of them.

But though the great outlines of his system be merely theory, unsupported by facts, nay plainly contradictory to facts; yet his observations on the impropriety or absurdity of the prevalent modes of education are almost always just, and many of the particular directions which he gives for the conducting of education are very judicious. He is often fanciful, and often deviates from the common road, only to show that he is able to walk in a separate path. Yet why should he be opposed with so much virulence, or branded with so many reproachful epithets? His views are liberal and extensive: his heart seems to have glowed with benevolence: his book contains much observation of human actions; displays an intimate acquaintance with the motives which sway the human heart; and if not a perfect system for education, is yet superior to what any other writers had before done upon the subject. It is surely true, that we ourselves often call forth evil passions in the breasts of children, and impress them with bad habits: it is no less true that we put books in their hands, and load their memory with words, when we ought rather to direct their attention to things, to the phenomena of nature, and the simplest arts of life. The form in which he has chosen to communicate his sentiments on the subject of education renders the perusal of it more pleasing, and his precepts more plain, than they would otherwise have been: it is nearly that dramatic form with which we are so much delighted in some of the noblest compositions of the ancients.

After viewing the public establishments for education which existed in some of the most renowned states of antiquity; and after listening to the sentiments of the experienced Quintilian, the learned Milton, the judicious Locke, and the bold fanciful Rousseau, on this interesting subject; it may now be proper to lay before the reader our own sentiments concerning the education of youth under a few distinct heads.

Indeed, if we were disposed to give abridgments of all the books which have been written on the subject of education, or even to hint at all the various modes which have been recommended by teachers or theorists, we might swell this article to an amazing size: nay, were we only to take notice of the many elegant and sensible writers who have of late endeavoured to call the attention of the public to this subject, we might extend it to an immoderate length. A Kames, a Priestley, Education. ley, a Knox, a Madame de Sillery, and a Berquin, might well attract and fix our attention, But as, among ſuch a crowd of writers, every thing advanced by each cannot be original; and even of thoſe things which are original only a certain, and that perhaps even a moderate, proportion, can be juſt and judicious; and as they often either borrow from one another, or at leaſt agree in a very friendly manner, though in ſome things they profeſs a determined hoſtility; therefore we ſhall content ourſelves with having taken notice of four of the moſt reſpectable writers on the ſubject.

In preſenting to our readers the reſult of our own obſervations and reflections, we ſhall throw our thoughts nearly under the following heads. The management of children from their birth till they attain the age of five or ſix; from that period till the age of puberty; private and public education; religion and morals; the languages; natural philoſophy; the education of people of rank and fortune; education of perſons deſigned for a mercantile employment, and for the other humbler occupations in active life not particularly connected with literature; education of the female ſex; foreign travel; knowledge of the world; and entrance into active life. We do not pretend to be able to include under theſe heads every thing worthy of notice in the ſubject of education: but under theſe we will be able to comprehend almoſt every thing of importance that has occurred to us on the ſubject.

I. *On the Management of Infants from the Time of their Birth till they attain the Age of five or ſix.*

The young of no other animal comes into the world in ſo helpleſs a ſtate, or continues ſo long to need aſſiſtance, as that of the human ſpecies. The calf, the lamb, and the kid, are vigorous and lively at the inſtant of their birth; require only, for a very ſhort period, nouriſhment and protection from their reſpective dams; and ſoon attain ſuch degrees of ſtrength and activity as to become intirely independent. The infancy of the oviparous animals is not of longer continuance: And, indeed, whatever department of the animal world we may chooſe to ſurvey, we ſtill find that no ſpecies is ſubject to the ſame ſevere laws as man during the firſt period of life.

Yet the character and the views of man are ſo very different from thoſe of the other animals, that a more careful attention to theſe may perhaps induce us to regard this ſeeming ſeverity rather as an inſtance of the peculiar kindneſs of the Author of nature. From every obſervation which has been hitherto made on the powers and operations of the inferior animals, we are led to conſider them as guided and actuated chiefly, if not ſolely, by inſtinct, appetite, and ſenſation: their views extend not beyond the preſent moment; nor do they acquire new knowledge or prudence as they advance in life. But the character of the human race is much more exalted. We have alſo powers and organs of ſenſation, inſtincts and appetites; but theſe are the moſt ignoble parts of our nature: our rational faculties and moral powers elevate us above the brutes, and advance us to an alliance with ſuperior beings. Theſe rational faculties and moral powers render us capable of ſocial life, of artificial language, of art, of ſcience, and of religion. Now, were one of the ſpecies to come into the world full grown, poſſeſſed of that bodily ſtrength and vigour which diſtinguiſhes manhood, his ignorance would ſtill render him inadequate to the duties of life; nay, would even render him unable to procure means for his ſubſiſtence: while his manly appearance would deprive him of the compaſſion and benevolent aſſiſtance of others; and his ſtrength and vigour would alſo render him leſs docile and obedient than is neceſſary, in order that he may receive inſtruction in the duties and arts of life. Again, were the period of infancy as ſhort to the human ſpecies as to the other animals; were we to be no longer ſubjected to a parents authority, or protected by his care, than the bird or the quadruped; we ſhould be expoſed to the dangers and difficulties of the world before we had acquired ſufficient knowledge or prudence to conduct us through them, before we had gained any acquaintance with the ordinary phenomena of nature, or were able to uſe the language or practiſe the arts of men in a ſocial ſtate.

46 Man compared to other animals, in reſpect to the helpleſſneſs of infancy.

Since, then, it is by the benevolence of nature that we are feeble and helpleſs at our entrance into life, and that our progreſs towards maturity is ſlow and gradual; ſince nature has deſtined us to be for a conſiderable time under the care and authority of our parents; and ſince the manner in which we are managed during that early part of life has ſo important an influence on our future character and conduct: it is therefore incumbent on parents to direct that tenderneſs, which they naturally feel for their offſpring, in ſuch a manner as to ſecond the views of nature.

When children come into the world, inſtinct directs them to receive nouriſhment from the breaſt, and to claim attention to their pains and wants by crying. We attend to their ſigns, and ſtrive to render them as eaſy as we can. They are waſhed, clothed with ſuch garments as we think moſt ſuitable, and ſuckled either by their mother or by ſome other woman who is conſidered as proper for the purpoſe. The abſurd mode of ſwaddling up infants in ſuch a manner as to confine them almoſt from all motion, and leave ſcarce a limb at liberty, which has been ſo often exclaimed againſt and repreſented as highly injurious to the ſymmetry and vigour of the human frame, is now almoſt entirely laid aſide; and therefore we need not raiſe our voice againſt it. Still, however, there are certainly too many pins and bandages uſed in the dreſs of infants: theſe are unfavourable to the circulation of the blood, impede the growth, and often occaſion thoſe tears and that peeviſhneſs which we raſhly attribute to the natural ill-humour of the poor creatures. Their dreſs ought to be looſe and cool, ſo as to preſs hard on no joint, no vein nor muſcle; and to leave every limb at liberty. If too heavy and cloſe, it may occaſion too copious a perſpiration, and at the ſame time confine the matter perſpired on the ſurface of the ſkin; than which nothing can be more prejudicial to the health of the child. It may alſo, however, be too thin and cool: for as moderate warmth is neceſſary to the vegetation of plants; ſo it is no leſs neceſſary for promoting the growth of animals: and, therefore, though the dreſs of infants ought to be looſe and eaſy, yet ſtill it ſhould be moderately warm.

47 Dreſs of infants.

48 Nurſes.

It is common for mothers in affluent or even in comfortable circumſtances, to forego the pleaſure of nurſing their own children, that they may avoid the fatigues with which it is attended. This practice has long prevailed in various ages and among various nations:

48 Nurſes.

tions: it has been often reprobated with all the warmth of passion, and all the vehemence of eloquence, as dishonourable, inhuman, contradictory to the designs of nature, and destructive of natural affection: yet still it prevails; fathers and mothers are still equally deaf to the voice of nature and the declamations of philosophers. Indeed, in a luxurious age, such a a practice may be naturally expected to prevail. In such an age, they who are possessed of opulence generally persuade themselves, that, to be happy, is to spend their time wholly amid diversions and amusements, without descending to useful industry, or troubling themselves about the ordinary duties of life. Influenced by such notions, they think it proper for them to manage their family affairs, and to nurse and educate their children, by proxy; nay, to do for themselves nothing that another can perform for them. It is vain to make a furious opposition to these absurd notions; the false views of happiness, the pride and the indolence produced by luxury, will still be too powerful for us. We must not hope to persuade the mother, that to receive the caresses, to behold the smiles, and to mark the bodily and mental powers of her child in their gradual progress towards maturity, would be more than a sufficient compensation for all the fatigues which she would undergo in nursing and watching over him in his infant years. We need not mention, that the mutual affection between a mother and her child, which is partly the effect of instinct, depends also, in no inconsiderable degree, on the child's spending the period of infancy in its mother's arms; and that when she substitutes another in her place, the child naturally transfers its affection to the person who performs to it the duties of a mother. We need not urge these, nor the various other reasons which seem to recommend to every mother the province of suckling her own children, and watching over their infant years; for we will either not be heard, or be listened to with contempt. Yet we may venture to suggest, that if the infant must be committed to a stranger, some degree of prudence may be employed in selecting the person to whom he is to be entrusted. Her health, her temper, and her manner of speaking, must be attended to. A number of other qualifications are also to be required in a nurse; but it is rather the business of the physician to give directions with regard to these. If her habit of body be any way unhealthy, the constitution of the infant that sucks her milk cannot but be injured: if her temper be rough or peevish, the helpless child subjected to her power will be often harshly treated; its spirit will be broken, and its temper soured: if her pronunciation be inarticulate or too rapid, the child may acquire a bad habit when it first begins to exert its vocal organs, which will not be easily corrected.

49
Influence of treatment in infancy on the abilities and dispositions

In the milder seasons of the year, infants ought to be frequently carried abroad. Not only in the open air favourable to health, but the freshness, the beauty, the variety, and the lively colours of the scenes of nature, have the happiest effects on the temper, and have even a tendency to enliven and invigorate the powers of the mind. At this period, the faculties of the understanding and the dispositions of the heart generally acquire that particular bias, and those distinguishing features, which characterize the individual during the future part of his life, as quick or dull, mild or passionate; and which, though they be generally attributed to the original conformation of the mind by the hand of nature, yet are owing rather to the circumstances in which we are placed, and the manner in which we are treated, during the first part of life.

When children begin to walk, our fondness disposes us to adopt many expedients to assist them. But these seem to be improper. It is enough for us to watch over them so as to guard them from any danger which they might otherwise incur by their first attempts to move about. Those who advise us not to be too anxious to preserve children from those slight hurts to which they are exposed from their disposition to activity, before they have acquired sufficient strength or caution, certainly give a judicious piece of advice which ought to be listened to. By being too attentive to them, we teach them to be careless of themselves; by seeming to regard every little accident which befals them as a most dreadful calamity, we inspire them with timidity, and prevent them from acquiring manly fortitude. When children begin to lisp out a few words or syllables, the pleasure which we feel at hearing them aim at the use of our language, disposes us to listen to them with such attention as to relieve them from the necessity of learning an open distinct articulation. Thus we teach them to express themselves in a rapid, indistinct, and hesitating manner, which we often find it difficult, sometimes even impossible to correct, when they are farther advanced. Would we teach them a plain distinct articulation, we ought not only to speak plainly and distinctly in their presence, but also to disregard their questions and requests, if not expressed with all the openness and distinctness of pronunciation of which they are capable.

Man is naturally an imitative animal. Scarce any of our natural dispositions is displayed at an earlier period than our disposition to imitation. Children's first amusements are dramatic performances, imitative of the arts and actions of men. This is one proof among others, that even in infancy our reasoning faculties begin to display themselves; for we cannot agree with some philosophers, that children are actuated and guided solely by instinct in their attempts at imitation.

However that be, the happiest use might be made of this principle which discovers itself so early in the infant mind. Whatever you wish the child to acquire, do in his presence in such a manner as to tempt him to imitate you. Thus, without souring his mind by restraint during this gay innocent period of life, you may begin even now to cultivate his natutral powers. Were it impossible at this time to communicate any instruction to the boy, without banishing that sprightly gaiety which naturally distinguishes this happy age, it would be best to think only how he might lose his time in the least disadvantageous manner. But this is far from being necessary. Even now the little creature is disposed to imitation, is capable of emulation, and feels a desire to please those whose kindness has gained his affection. Even now his sentiments and conduct may be influenced by rewards when prudently bestowed, and by punishments when judiciously inflicted. Why then should we hesitate to govern him by by the same principles, by which the laws of God and society assert their influence on our own sentiments and conduct? Indeed, the imprudent manner in which children are too generally managed at this early period, would almost tempt us to think it impossible to instruct them, as yet, without injuring both their abilities and dispositions. But this is owing solely to the carelessness, stupidity, or capricious conduct of those under whose care they are placed.

50 Obedience whether, and when to be exacted.

Is implicit obedience to be exacted of children? and at what period of life should we begin to enforce it? As children appear to be capable both of reasoning and of moral distinctions at a very early age; and as they are so weak, so inexperienced, so ignorant of the powers of surrounding bodies, and of the language, institutions, and arts of men, as to be incapable of supporting or conducting themselves without direction or assistance; it seems therefore proper that they be required even to submit to authority. To the necessity of nature both they and we must on many occasions submit. But if the will of a parent or tutor be always found scarce less unalterable than the necessity of nature, it will always meet with the same respectful submissive resignation. It may not perhaps be always proper to explain to children the reasons for which we require their obedience: because, as the range of their ideas is much less extensive than ours; as they do not well understand our language, or comprehend our modes of reasoning; and as they are now and then under the influence of passion and caprice, as well as people who are farther advanced in life; we are therefore likely to fail in making them comprehend our reasons, or in convincing them that they are well-grounded. And as it is proper to exact obedience of children; so we should begin to require it as soon as they become capable of any considerable degree of activity. Yet we must not confine them like slaves, without allowing them to speak, to look, or to move, but as we give the word. By such treatment we could expect only to render them peevish and capricious. It will be enough, at first, if we let them know that obedience is to be exacted; and if we restrain them only where, if left at liberty, they would be exposed to imminent danger.

If then, at so early a time of life as before the age of five or six, it is possible to render children obedient, and to communicate to them instruction; what arts, or what learning, ought we to teach them at that period? To give a proper answer to this question, is no easy matter. It seems at first difficult to determine, whether we ought yet to initiate them in letters. But as their apprehension is now quick, and their memory pretty tenacious, there cannot be a more favourable time for this very purpose. As soon as they are capable of a distinct articulation, and seem to possess any power of attention, we may with the greatest propriety begin to teach them the alphabet. The most artful, alluring methods may be adopted to render the horn-book agreeable; or we may use the voice of authority, and command attention for a few minutes; but no harshness, no severity, and scarce any restraint. At the same time, it will be proper to allow the little creatures to run much about in the open air, to exercise their limbs, and to cultivate those social dispositions which already begin to appear, by playing with their equals.

Such are the thoughts which have suggested themselves to us concerning the management of children in mere infancy. What an amiable little creature would the boy or girl be, who were brought up in a manner not inconsistent with the spirit of these few hints? Behold him healthy and vigorous, mild, sprightly, and cheerful: He is submissive and docile, yet not dull or timid; he appears capable of love, of pity, and of gratitude. His mind is hitherto, however, almost wholly uninformed; he is acquainted but with a few of the objects around him; and knows but little of the language, manners, and institutions of men: but he feels the impulse of an ardent curiosity, and all the powers of his mind are alive and active.

II. *On the Management of Children between the Age of five or six and the Age of puberty.*

At this period it may be proper, not only to exact obedience, and to call the child's attention for a few minutes now and then to those things of which the knowledge is likely to be afterwards useful to him; but we may now venture to require of him a regular steady application, during a certain portion of his time, to such things as we wish him to learn. Before this time it would have been wrong to confine his attention to any particular task. The attempt could have produced no other effect than to destroy his natural gaiety and cheerfulness, to blunt the native quickness of his powers of apprehension, and to render hateful that which you wished him to acquire. Now, however, the case is somewhat different: The child is not yet sensible of the advantages which he may derive from learning to read, for instance; or even though he were able to foresee all the advantages which he will obtain by skill in the art of reading through the course of life, yet it is the character of human nature, at every stage of life, to be so much influenced by present objects in preference to future views, that the sense of its utility alone would not be sufficient to induce him to apply to it. Even at the age of 12, of 20, of 50; nay, in extreme old age, when reason is become very perspicacious, and the passions are mortified; still we are unable to regulate our conduct solely by views of utility. Nothing could be more absurd, therefore, than to permit the child to spend his time in foolish tricks, or in idleness, till views of utility should prompt him to spend it in a different manner. No; let us begin early to habituate him to application and to the industrious exertion of his powers. By endowing him with powers of activity and apprehension, and rendering him capable of pursuing with a steady eye those objects which attract his desires, nature plainly points out to us in what manner we ought to cultivate his earlier years. Besides, we can command his obedience, we can awaken his curiosity, we can rouse his emulation, we can gain his affection, we can call forth his natural disposition to imitation, and we can influence his mind by the hope of reward and the fear of punishment. When we have so many means of establishing our authority over the mind of the boy without tyranny or usurpation; it cannot surely be difficult, if we are capable of any moderation and prudence, to cultivate his powers by making him begin at this period to give regular application to something that may afterwards be useful.

Education.

51 A knowledge of words and of things muſt be learnt at the ſame time.

And if the boy muſt now begin to dedicate ſome portion of his time regularly to a certain taſk, what taſk will be moſt ſuitable? Even that to which children are uſually required to apply; continue teaching him to read. Be not afraid that his abilities will ſuffer from an attention to books at ſo early an age. Say not that it is folly to teach him words before he have gained a knowledge of things. It is neceſſary, it is the deſign of nature, that he ſhould be employed in acquiring a knowledge of things, and gaining an acquaintance with the vocal and written ſigns by which we denote them, at the ſame time. Theſe are intimately connected; the one leads to the other. When you view any object, you attempt to give it a name, or ſeek to learn the name by which men have agreed to diſtinguiſh it; in the ſame manner, when the names of ſubſtances or of qualities are communicated to us, we are deſirous of knowing what they ſignify. At the ſame time, ſo imperfect is the knowledge of nature which children can acquire from their own unaſſiſted obſervation, that they muſt have frequent recourſe to our aſſiſtance before they can form any diſtinct notions of thoſe objects and ſcenes which they behold. Indeed language cannot be taught, without teaching that it is merely a ſyſtem of ſigns, and explaining what each particular ſign is deſigned to ſignify. If, therefore, language is not only neceſſary for facilitating the mutual intercourſe of men, but is even uſeful for enabling us to obtain ſome knowledge of external nature, and if the knowledge of language has a natural tendency to advance our knowledge of things; to acquaint ourſelves with it muſt therefore be regarded as an object of the higheſt importance: it muſt alſo be regarded as one of the firſt objects to which we ought to direct the attention of children. But the very ſame reaſons which prove the propriety of making children acquainted with thoſe artificial vocal ſigns which we uſe to expreſs our ideas of things, prove alſo the propriety of teaching them thoſe other ſigns by which we expreſs theſe in writing. It is poſſible indeed, nay it frequently happens, that we attempt to inſtruct children in language in ſo improper a manner as to confound their notions of things, and to prevent their intellectual powers from making that improvement of which they are naturally capable: but it is alſo poſſible to initiate them in the art of reading, and in the knowledge of language, with better auſpices and happier effects. The knowledge of language may be conſidered as the key by which we obtain acceſs to all the ſtores of natural and moral knowledge.

52 Confinement, how far proper.

Though we now agree to confine our pupil to a certain taſk, and have determined that his firſt taſk ſhall be to learn to read; yet we do not mean to require that he be confined to this taſk during the greateſt part of the day, or that his attention be ſeriouſly directed to no other object. To ſubject him to too ſevere reſtraint would produce the moſt unfavourable effects on his genius, his temper, and his diſpoſitions. It is in conſequence of the injudicious management of children, while they are ſometimes ſuffered to run riot, and at other times cruelly confined like priſoners or ſlaves; it is in conſequence of this, that we behold ſo many inſtances of peeviſhneſs, caprice, and invincible averſion to all ſerious application at this period of life. But were a due medium obſerved, were reſtraint duly tempered with liberty and indulgence, nothing would be more eaſy than to diſpoſe children to cheerful obedience, and to communicate to them inſtruction at this age. That part of their time which they are left to enjoy at liberty, they naturally dedicate to their little ſports. The favourite ſports of boys are generally active; thoſe of girls, ſedentary. Of each we may take advantage, to prepare them for the future employments of life. However, neither are the amuſements of boys invariably active, nor thoſe of girls always ſedentary; for, as yet, the manners and diſpoſitions of the two ſexes are diſtinguiſhed rather by habit or accident than by nature. The diſpoſition to activity which characterizes children, is no leſs favourable to health than to their improvement in knowledge and prudence; their active ſports have a tendency to promote their growth and add new vigour to their limbs. Perhaps, even at this time, children might be enticed to learn the elements of natural philoſophy and natural hiſtory amid their amuſements and ſports. Birds, butterflies, dogs, and other animals, are now favourite objects of their care; their curioſity is powerfully rouſed by the appearance of any ſtrange object; and many of the ſimpleſt experiments of natural philoſophy are ſo pleaſing, that they cannot fail to attract the attention even of thoſe who are leaſt under the influence of curioſity. Yet it would be improper to inſiſt on their attention to theſe things as a taſk: if we can make them regard them as amuſements, it will be well; if not, we muſt defer them to ſome happier ſeaſon. They might alſo, by proper management, be led to acquire ſome ſkill in the arts. They build mimic houſes, and fill them with ſuitable furniture; they conſtruct little boats, and ſail them; they will fence in little gardens, and cultivate them; and we even ſee them imitate all the labours of the huſbandman. Such is the pleaſure which man naturally feels in exerting his powers, and in acting with deſign. Let us encourage this diſpoſition. Theſe are the moſt ſuitable amuſements in which they can engage.

53 What books moſt proper.

As the boy's attention to literary objects is ſtill ſuppoſed to be continued, he will ſoon be able to read with ſome correctneſs and facility. It becomes an object of importance, and of no ſmall difficulty, to determine what books are to be put into his hands, and in what manner his literary education is to be conducted. After the child is made acquainted with the names and powers of the letters, with their combination into ſyllables, and with the combination of theſe again into words, ſo that he can read with tolerable facility; it will be proper that the pieces of reading which are put into his hands be ſuch as are deſcriptive of the actions of men, of the ſcenes of external nature, and of the forms and characters of animals. With theſe he is already in ſome degree acquainted: theſe are the objects of his daily attention; beyond them the range of his ideas does not yet extend; and therefore other ſubjects will be likely to render his taſk diſagreeable to him. Beſides, our preſent object is to teach him words: in order to teach him words, we muſt let him know their ſignification; but till he have acquired a very conſiderable knowledge of language, till he have gained a rich fund of ſimple ideas, it will be impoſſible for him to read or to hear with underſtanding on any other ſubject but theſe. And let us not as yet be particularly

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54 Writing. As ſoon as the pupil can read and ſpell with tolerable facility, and has acquired ſufficient ſtrength of arm and fingers to hold a pen, it may be proper to initiate him in the art of writing. If this art is not made diſagreeable by the manner in which his application to it is required, he will learn it without difficulty. Childrens natural diſpoſition to imitate, particularly whatever depends on manual operation, renders this art peculiarly eaſy and pleaſing to them when they are not harſhly forced to apply to it, nor ſuffered to get into a habit of performing their taſk with haſte and negligence.

55 Reſtraint. It requires indeed the moſt cautious prudence, the niceſt delicacy, and the moſt artful addreſs, to prevail with children to give a cheerful and attentive application to any appointed taſk. If you are too ſtern and rigid in enforcing application, you may ſeemingly obtain your object: the child ſits motionleſs, and fixes his eye on his book or copy; but his attention you cannot command; his mind is beyond your reach, and can elude your tyranny, it wanders from the preſent objects, and flies with pleaſure to thoſe ſcenes and objects in which it has found delight. Thus you are diſappointed of your purpoſe; and, beſides, inſpire the child with ſuch averſion both to you and to thoſe objects to which you wiſh him to apply, that perhaps at no future period will he view learning otherwiſe than with diſguſt.

56 Gentleneſs. Again, gentleneſs, and the arts of inſinuation, will not always be ſucceſsful. If you permit the child to apply juſt when he pleaſes; if you liſten readily to all his pretences and excuſes; in ſhort, if you ſeem to conſider learning as a matter not of the higheſt importance, and treat him with kindneſs while he pays but little attention and makes but ſlow progreſs; the conſequences of your behaving to him in this manner will be ſcarce leſs favourable than thoſe which attend imprudent and unreaſonable ſeverity. It is, however, ſcarce poſſible to give particular directions how to treat children ſo as to allure them to learning, and at the ſame time to command their ſerious attention. But the prudent and affectionate parent and the judicious tutor will not be always unſucceſsful; ſince there are ſo many circumſtances in the condition of children, and ſo many principles in their nature, which ſubject them to our will.

57 Arithmetic. The principles of arithmetic ought to make a part in the boy's education as ſoon as his reaſoning powers appear to have attained ſuch ſtrength and quickneſs that he will be able to comprehend them. Arithmetic affords more exerciſe to the reaſoning powers of the mind than any other of thoſe branches of learning to which we apply in our earlier years: and if the child's attention be directed to it at a proper period, if he be allowed to proceed ſlowly, and if care be taken to make him comprehend fully the principles upon which each particular operation proceeds, it will contribute much to increaſe the ſtrength and the acuteneſs of the powers of his underſtanding.

Where the learned languages are regarded as an object worthy of attention, the boy is generally initiated in them about this time, or perhaps earlier. We have reſerved to a ſeparate head the arguments which occur to us for and againſt the practice of inſtructing children in the dead languages; and ſhall therefore only obſerve in this place, that the ſtudy of them ought not to engroſs the learner's attention ſo entirely as to exclude other parts of education.

58 Practical mathematics. From arithmetic our pupil may proceed to the practical branches of the mathematics: And in all of theſe, as well as in every other branch of learning, what you teach him will be beſt remembered and moſt thoroughly underſtood, if you afford him a few opportunities of applying his leſſons to real uſe in life. Geometry and geography are two moſt important branches of education; but are often taught in ſuch a manner, that no real benefit is derived from the knowledge of them. The means which Rouſſeau propoſes for initiating young people in theſe and in ſeveral other of the arts and ſciences are excellent; and if judiciouſly applied, could hardly fail of ſucceſs.

While boys are engaged in theſe and in the languages, they may alſo attend to and cultivate the bodily exerciſes; ſuch as dancing, fencing, and horſemanſhip. Each of theſe exerciſes is almoſt abſolutely neceſſary for one who is deſigned to have intercourſe with the world; and beſides, they have a tendency to render the powers of the body active and vigorous, and even to add new courage and firmneſs to the mind.

59 Firſt exerciſes in compoſition. When our pupil has acquired ſome knowledge of his own and of the learned languages, has gained ſome ſkill in the principles of arithmetic and of practical mathematics, and has received ſome inſtruction in the principles of morality and religion, or even before this time, it will be proper to begin him to the practice of compoſition. Themes, verſions, and letters, the firſt exerciſes in compoſition which the boy is uſually required to perform, none of them ſeems happily calculated for leading him to increaſe his knowledge, or to acquire the power of expreſſing himſelf with eaſe and elegance. Without enlarging on the impropriety or abſurdity of theſe exerciſes, we will venture to propoſe ſomething different, which we cannot help thinking would conduce more effectually to the end in view. It has been already obſerved, that the curioſity of children is amazingly eager and active, and that every new object powerfully attracts their regard: but they cannot view any object without taking notice of its moſt obvious qualities; any animal, for inſtance, without taking notice of its ſhape, its colour, its ſeeming mildneſs or ferocity; and they are generally pretty ready to give an account of any thing extraordinary which they have obſerved. How eaſy then would it be to require them to write down an account of any new object expoſed to their obſervation?

tion? The task would not be difficult; and every new piece of composition which they presented to us would add such to their knowledge of nature. We might even require such specimens of their accuracy of observation and skill in language, at times when they enjoyed no opportunities of beholding new or surprising objects; a tree, a flower, a field, a house, an animal, any other simple objects, should be the subject of their exercise. After some time, we might require them to describe something more various and complex. They might give an account of several objects placed in a relative situation; as, a stream, and the vale through which it flows; or, a bird, and the manner in which it constructs its nest; or, of one object successively assuming various appearances, as the bud, the flower, the apple. Human actions are daily exposed to their observation, and powerfully attract their attention. By and by, therefore, their task should be to describe some action which had lately passed in their presence. We need not pursue this hint farther; but, if we mistake not, by these means young people might sooner, and much more certainly, be taught to express themselves with ease and correctness in writing, than by any of the exercises which they are at present caused to perform with a view to that. Besides, they would at the same time acquire much more real knowledge. The study of words would then be rendered truly subservient to their acquiring a knowledge of things.

We cannot descend to every particular of that series of education in which we wish the boy to be engaged from that period when he first becomes capable of serious application till he reach the age of puberty. It is not necessary that we should, after having given abstracts of what has been offered to the world by so many respectable writers on the subject.

The few hints which we have thrown out will be sufficient to show, in general, in what manner we wish the youth's education to be conducted during this period. Let the parent and the tutor bear in mind, that much depends on their example, with regard to the dispositions and manners of the youth; and let them carefully strive to form him to gentleness, to firmness, to patient industry, and to vigorous courage: let them, if possible, keep him at a distance from that contagion with which the evil example of worthless servants and play-fellows will be likely to infect him. Now is the time for sowing the seeds of piety and virtue: if carefully sown now, they will scarce fail to grow up, and bear fruit in future life.

III. *From Puberty to Manhood.*

This age is every way a very important period in human life. Whether we consider the change which now takes place in the bodily constitution, or the passion which now first begins to agitate the breast, still we must regard this as a critical season to the youth. The business of those to whose care he is still entrusted, is to watch over him so as to prevent the passion for the sex from hurrying him to shameful and vicious indulgence, and from seducing him to habits of frivolity and indolence; to prevent him from becoming either the shameless rake, or the trifling coxcomb. Though so furious is the impulse of that appetite which now fires the bosom and shoots through the veins of the youth, that to restrain him from the excesses to which it leads can be no easy task; yet if his education has been hitherto conducted with prudence, if he is fond of manly exercises, active, sober, and temperate, and still influenced by modesty and the sense of shame; even this may through the blessing of heaven be accomplished. It is impossible to give better directions than those of Rousseau for this purpose. Let the young man know his situation; set before him in a striking light the virtue which he may practise by restraining appetite, and the frightful fatal vices into which he may be hurried. But trust not to precept, nor to any views which you can lay before him, either of the disgracefulness and the pernicious consequences of vice, or of the dignity and the happy fruits of virtue. Something more must be done. Watch over him with the attention of an Argus; engage him in the most active and fatiguing sports. Carefully keep him at a distance from all such company, and such books, as may suggest to his mind ideas of love, and of the gratification at which it aims. But still all your precautions will not counteract the designs of nature; nor do you wish to oppose her designs. The youth under your care must feel the impulse of desire, and become susceptible of love. Let him then fix his affections on some virtuous young woman. His attachment to her will raise him above debauchery, and teach him to despise brutal pleasures: it will operate as a motive to dispose him to apply to such arts, and to pursue such branches of knowledge, as may be necessary for his farther establishment in the world. The good sense of Rousseau on this head renders it less necessary for us to enlarge on it: especially as we are to treat of some articles separately which regard the management of youth at this period.

IV. *Religion and Morals.*

60 At what age the principles of religion may be taught.

In pointing out the general plan of education which appears to us the most proper to be pursued in order to form a virtuous and respectable member of society, we took but slight notice of the important objects of religion and morals. At what period, and in what manner, ought the principles of religion and morality to be instilled into the youthful mind? It has been before observed, that children are capable of reasoning and of moral distinctions even at a very early age. But they cannot then comprehend our reasonings, nor enter into our moral distinctions; because they are strangers to our language, and to the artificial manner in which we arrange our ideas when we express them in conversation or in writing. It follows, then, that as soon as they are sufficiently acquainted with our language, it must be proper to communicate to them the principles and precepts of morality and religion. Long before this time, they are diligent and accurate observers of human actions. For a short period it is merely the external act which they attend to and observe: soon, however, they penetrate farther; conscious themselves of reflection and volition, they regard us also as thinking beings; conscious of benevolent and of unfriendly dispositions, they regard us as acting with design, and as influenced by passion: naturally imitative animals, they are disposed in their conduct to follow the example which we set before them. By our example we may teach them piety and virtue long before it can be proper to offer them religious or moral instruction in a formal manner.

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We cannot presume to determine at what particular period children ought to be first informed of their relations to God and to society, and of the duties incumbent on them in consequence of those relations. That period will be different to different children, according to the pains which have been taken, and the means which have been employed, in cultivating their natural powers. Perhaps even where the most judicious maxims of education have been adopted, and have been pursued with the happiest effects, it cannot be sooner than the age of eight or nine. But even before this period much may be done. Show the child your reverence for religion and virtue; talk in his presence, and in the plainest, simplest terms, though not directly to him, of the existence of God the creator, the preserver, and the governor of the world; speak of the constant dependance of every creature on the gracious care of that Being; mention with ardour the gratitude and obedience which we owe to him as our great parent and best benefactor: next, speak of the mutual relations of society; of the duties of children and parents, of masters and servants, of man to man. At length, when his mind is prepared by such discourses which have passed in his presence without being addressed to him, you may begin to explain to him in a direct manner the leading doctrines of religion. He will now be able to comprehend you, when you address him on that important subject: the truths which you communicate will make a powerful impression on his mind; an impression which neither the corruption and dissipation of the world, nor the force of appetite and passion, will ever be able to efface.

61 Habit.

Some writers on this subjected have asserted, that youth are incapable of any just ideas of religion till they attain a much more advanced age; and have insisted, that, for this reason, no attempts should be made to communicate to them the articles of our creed in their earlier years. This doctrine, both from its novelty and from its pernicious tendency, has provoked the keenest opposition. It has, however, been opposed rather with keenness than with acuteness or skill. Its opponents seem to have generally allowed that children are incapable of reasoning and of moral distinctions; but they have ascribed wonderful effects to habit. Enrich the memories of children, say they, with the maxims of morality, and with the doctrines of religion; teach them prayers, and call them to engage in all the ordinances of religion. What though they comprehend not the meaning of what they learn? What though they understand not for what purpose you bid them repeat their prayers, nor why you confine them on the Lord's day from their ordinary amusements? Their powers will at length ripen, and they will then see in what they have been employed, and derive the highest advantage from their irksome tasks to which you confined them. You have formed them to habits which they will not be able to lay aside: After this they cannot but be religious at some period of life, even though you have inspired them with a disgust for the exercises of religion. Those good people have also talked of the principle of *the association of ideas*. As no man stands alone in society, say they; so no one idea exists in the mind single and unconnected with others: as you are connected with your parents, your children, your friends, your countrymen; so the idea of a tree, for instance, is connected with that of the field in which it grows, of the fruit which it bears, and of contiguous, dissimilar, and resembling objects. When any one set of related ideas have been often presented to the mind in connection with one another, the mind at length comes to view them as so intimately united, that any particular one among them never fails to introduce the rest. Revisit the scenes in which you spent your earliest years; the sports and companions of your youth naturally arise to your recollection. Have you applied to the study of the classics with reluctance and constraint, and suffered much from the severity of parents and tutors for your indifference to Greek and Latin? you will, perhaps, never through the course of life see a grammar school, without recollecting your sufferings, nor look on a Virgil or Homer without remembering the stripes and confinement which they once occasioned to you. In the same manner, when religious principles are impressed on the mind in infancy in a proper manner, an happy association is formed which cannot fail to give them a powerful influence on the sentiments and conduct in future life. But if we have advanced to manhood before being informed of the existence of a Deity, and of our relation to him; the principles of religion, when communicated, no longer produce the same happy effects: the heart and the understanding are no longer in the same state; nor will the same associations be formed.

62 Dr Priestley's opinion concerning association of *ideas*.

This doctrine of *the association of ideas* has been adduced by an ingenious writer, distinguished for his discoveries in natural philosophy, and for his labours in controversial divinity, as an argument in behalf of the propriety of instructing youth in the principles of religion even in their earliest years. We admire, we esteem, the spirit which has prompted him to discover so much concern for the interests of the rising generation; but at the same time we will not conceal our opinion, that even this argument ought to be urged with caution. Many of the phenomena of human nature may indeed be explained, if we have recourse to the principle of *association*. The influence of any principle, religious or moral, depends in a great measure on the ideas and images which, in considering it, we have been accustomed to associate with it in our minds. But what are the ideas or images most likely to be associated by children with the doctrines and duties of religion, if we call them to listen to the one and perform the other at too early a period? Will they be such as may assist the influence of religion on their sentiments and conduct in the future part of life? Observe the world: Are those who, in infancy, have been most rigidly compelled to get their catechisms by rote, either the most pious or the best informed in religious matters? Indeed, when we consider what has been said of the influence of habit, and of the association of ideas, we cannot help thinking, that any arguments which on the present occasion may be adduced from either of these, tend directly to prove, not that we ought to pour in religious instruction into the minds of children, without considering whether they be qualified to receive it; but, on the contrary, that we ought cautiously to wait for and catch the proper season;—that season when the youthful mind, no longer a stranger to our language, our sentiments

Education. sentiments, our views of nature, or our manner of reasoning, will be able to go along with us, when we talk to him of a supreme Being, or our condition as dependant and accountable creatures, of truth, benevolence, and justice.

We flatter ourselves, then, that our readers will readily agree with us, 1st. That the moral and reasoning powers of children begin to display themselves at a very early age, even in infancy. 2dly, That as soon as they have made themselves acquainted with the most obvious appearances of nature, and have gained a tolerable knowledge of our language, and our manner of arranging our ideas in reasoning, we may with the greatest propriety begin to instruct them in the principles of religion. 3dly, That the most careful and judicious observation is necessary to enable us to distinguish the period at which children become capable of receiving religious instruction; because, if we either attempt to communicate to them these important truths too early, or defer them till towards manhood, we may fail of accomplishing the great end which we have in view.

If we can be so fortunate as to choose the happiest season for sowing the first seeds of piety in the infant mind, our next care will be to sow them in a proper manner. We must anxiously endeavour to communicate the principles of religion and morality, so as they may be easiest comprehended by the understanding of the learner, and may make the deepest impression on his heart. It would be a matter of the greatest difficulty to give particular directions on this head. The

63 Catechisms. discretion of the parent or tutor must here be his guide. We are afraid that some of the catechisms commonly taught are not very happily calculated to serve the purpose for which they are intended. Yet we do not wish that they should be neglected while nothing more proper is introduced in their room. In instructing children in the first principles of religion, we must beware of arraying piety in the gloomy garb, or painting her with the forbidding features, in which she has been represented by anchorites, monks, and puritans. No; let her assume a pleasing form, a cheerful dress, and an inviting manner. Describe the Deity as the affectionate parent, the benefactor, and though the impartial yet the merciful judge of mankind. Exhibit to them Jesus Christ, the generous friend and saviour of the posterity of Adam, who with such enchanting benevolence hath said, "Suffer little children to come unto me." Represent to them his yoke as easy, and his burden as light. Insist not on their saying long prayers or hearing tedious sermons. If possible, make the doctrines of religion to appear to them as glad tidings, and its duties as the most delightful of tasks.

V. *The Languages.*

Is the time usually spent in learning the languages usefully occupied? What advantages can our youth derive from an acquaintance with the languages and the learning of Greece and Rome? Would we listen to many of the fathers, the mothers, and the polite tutors of the present age, they will persuade us, that the time which is dedicated to grammar-schools, and to Virgil, Cicero, Homer, and Demosthenes, is foolishly thrown away; and that no advantages can be gained from the study of classical learning. They wish their children and pupils to be not merely scholars; they wish them to acquire what may be useful and ornamental when they come to mingle with the world; and for this purpose, they think it much better to teach their young people to smatter out French, to dance, to fence, to appear in company with invincible assurance, and to dress in such a manner as may attract the attention of the ladies. Besides, the tenderness and humanity of those people are amazing. They are shocked at the idea of the sufferings which boys undergo in the course of a classical education. The confinement, the stripes, the harsh language, the burdens laid on the memory, and the pain occasioned to the eyes, during the dreary period spent in acquiring a knowledge of Greek and Latin, affect them with horror when they think of them as inflicted on children. They therefore give the preference to a plan of education in which less intense application is required and less severity employed.

64 Prejudices against classical education.

65 Prejudices for it.

But, again, there are others who are no less warm in their eulogiums on a classical education, and no less industrious in recommending the study of Greek and Latin, than those are eager in their endeavours to draw neglect on the polished languages of antiquity. With the second class, if an adept in Greek and Latin, you are a great and learned man; but without those languages, contemptible for ignorance. They think it impossible to inspire the youthful mind with generous or virtuous sentiments, to teach the boy wisdom, or to animate him with courage, without the assistance of the ancient philosophers, historians, and poets. Indeed their superstitious reverence for the ancient languages, and for those writers whose compositions have rendered Greece and Rome so illustrious, leads them to ascribe many other still more wonderful virtues to a classical education.

With which of these parties shall we join? or shall we mediate between them? Is it improper to call youth to the study of the languages? Is it impossible to communicate any useful knowledge without them? Or are they, though highly useful, yet not always indispensably necessary?

66 Utility of classical learning towards the improvement of our mother tongue.

We have formerly taken notice of one circumstance in favor of a classical education, to which it may be proper to recal the attention of our readers. We observed, that the cultivation of classical learning has a favourable influence on the living languages. It has a tendency to preserve their purity from being debased, and their analogy from becoming irregular. In studying the dead languages, we find it necessary to pay more attention to the principles of grammar than in acquiring our mother-tongue. We learn our native language without attending much to its analogy and structure. Of the numbers who speak English, but few are skilled in the inflexion of its nouns and verbs, or able to distinguish between adverbs and conjunctions. Desirous only of making their meaning understood, they are not anxious about purity or correctness of speech. They reject not an expression which occurs to them, because it is barbarous or ungrammatical. As they grew up they learned to speak from their mothers, their nurses, and others about them: they were soon able to make known their wants, their wishes, and their observations

tions, in words. Satisfied with this, or called at a very early period to a life of humble industry, they have continued to express themselves in their mother-tongue without acquiring any accurate knowledge of its general principles. If these people find occasion to express themselves in writing, they are scarce more studious of correctness and elegance in writing than in speaking; or, though they may aspire after those properties, yet they can never attain them. But such writers or speakers can never refine any language, or reduce it to a regular analogy. Neither can they be expected to distinguish themselves as the guardians of the purity and regularity of their native tongue, if it should before have attained an high degree of perfection. But they who, are learning a language different from their native tongue, have found it necessary to pay particular attention to the principles of grammar, afterwards apply the knowledge of grammar which they have thus acquired in using their mother-tongue: and by that means become better acquainted with its structure, and learn to write and speak it with more correctness and propriety. Besides, the languages of Greece and Rome are so highly distinguished for their copiousness, their regular analogy, and for various other excellencies, which render them superior to even the chief of modern languages, that the study of them has a natural tendency to improve and enrich modern languages. If we look backwards to the 15th century, when learning began to revive in Europe, and that species of learning which began first to be cultivated was classical literature, we find that almost all the languages then spoken in Europe were wretchedly poor and barbarous. Knowledge could not be communicated, nor business transacted, without calling in the aid of Latin. Classical learning, however, soon came to be cultivated by all ranks with enthusiastic eagerness. Not only those designed to pursue a learned profession, and men of fortune whose object was a liberal education without a view to any particular profession; but even the lower ranks, and the female sex, keenly studied the languages and the wisdom of Greece and Rome. This avidity for classical learning was followed by many happy effects. But its influence was chiefly remarkable in producing an amazing change on the form of the living languages. These soon become more copious and regular; and many of them have consequently attained such perfection, that the poet, the historian, and the philosopher, can clothe their thoughts in them to the greatest advantage. Could we derive no new advantage from the study of the ancient languages, yet would they be worthy of our care, as having contributed so much to raise the modern languages to their present improved state. But they can also conduce to the preservation and support of those noble structures which have been reared by their assistance. The intercourse of nations, the affectation of writers, the gradual introduction of provincial barbarisms, and various other causes, have a tendency to corrupt and debase even the noblest languages. By such means were the languages of Greece and Rome gradually corrupted, till the language used by a Horace, a Livy, a Xenophon, and a Menander, was lost in a jargon unfit for the purposes of composition. But if we would not disdain to take advantage of them, the classical works in those languages might prevent that which we use from experiencing such a decline. He who knows and admires the excellencies of the ancient languages, and the beauties of those writers who have rendered them so celebrated, will be the firm enemy of barbarism, affectation, and negligence, whenever they attempt to debase his mother-tongue. We venture therefore to assert, that when the polished languages of antiquity cease to be studied among us, our native tongue will then lose its purity, regularity, and other excellencies, and gradually decline till it be no longer known for the language of Pope and of Addison; and we adduce it as an argument in behalf of classical learning, that it has contributed so much to the improvement of the living languages, and is almost the only means that can prevent them from being corrupted and debased.

67 For inuring to industry.

In those plans of education of which the study of the dead languages does not make a part, proper means are seldom adopted for impressing the youthful mind with habits of industry: nor do the judgment, the memory, and the other powers of the mind, receive equal improvement, as they pass not through the same exercises as in a classical education. Let us enter those academies where the way to a complete education leads not through the thorny and rugged paths of classical literature; let us attend to the exercises which the polite teachers cause their pupils to perform. Do they insist on laborious industry or intense application? No; they can communicate knowledge without requiring laborious study. They profess to allow their pupils to enjoy the sweets of idleness, and yet render them prodigies of learning. But are their magnificent promises ever fulfilled? Do they indeed cultivate the understandings of the young people intrusted to their care? They do not: their care is never once directed to this important object. To adorn them with showy and superficial qualities, is all that those gentlemen aim at. Hence, when their pupils come to enter the world and engage in the duties of active life, they appear destitute of every manly qualification. Though they have attained the age and grown up to the size of manhood, their understandings are still childish and feeble: they are capricious, unsteady, incapable of industry or fortitude, and unable to pursue any particular object with keen, unremitting perseverance. That long series of study and regular application, which is requisite in order to attain skill in the ancient languages, produces much happier effects on the youthful mind. The power of habit is universally felt and acknowledged. As he who is permitted to trifle away the earliest part of his life in idleness or in frivolous occupations, can scarce be expected to display any manly or vigorous qualities when he reaches a more mature age; so, on the contrary, he whose earlier days have been employed in exercising his memory and furnishing it with valuable treasures, in cultivating his judgment and reasoning powers, by calling the one to make frequent distinctions between various objects, and the other to deduce many inferences from the comparison of the various objects presented to the understanding, and also in strengthening and improving the acuteness of his moral powers by attending to human actions and characters, and distinguishing between them, as virtuous or vicious, as mean or glorious: he who has thus cultivated his powers may be naturally

Education. expected to distinguish himself when he comes to perform his part in active life, by prudence, activity, firmness, perseverance, and most of the other noble qualities which can adorn a human character. But in the course of a classical education, the powers of the mind receive this cultivation; and therefore these happy effects may be expected to follow from it. The repetitions which are required afford improving exercise to the memory, and store it with the most valuable treasures: the powers of the understanding are employed in observing the distinctions between words, in tracing words to the substances and qualities in nature which they are used to represent; in comparing the words and idioms of different languages, and in tracing the laws of their analogy and construction; while our moral faculties are at the same time improved, by attending to the characters which are described, and the events and actions which are related, in those books which we are directed to peruse in order to acquire the ancient languages We assert therefore, that the study of the ancient languages is particularly useful for improving and strengthening all the powers of the mind; and, by that means, for preparing us to act our part in life in a becoming manner: and this our readers will readily agree with us in considering as a weighty argument in behalf of that plan of education.

68 Fund of useful and elegant knowldege which ancient authors afford.

But, if, after all classical learning is still to be given up, where shall we find the same treasures of moral wisdom, of elegance, and of useful historical knowledge, which the celebrated writers of Greece and Rome afford? Will you content yourself with the modern writers of Italy, France, and England? Or will you deign to survey the beauties of Homer and Virgil through the medium of a translation? No surely; let us penetrate to those sources from which the modern writers have derived most of the excellencies which recommend them to our notice; let us disdain to be imposed upon by the whims or the ignorance of a translator.

Juvat integros accedere fontes.

Farther, classical learning has long been cultivated among us; and both by the stores of knowledge which it has conveyed to the mind, and the habits which it has impressed, has contributed in no small degree to form many illustrious characters. In reviewing the annals of our country, we will scarce find an eminent politician, patriot, general, or philosopher, during the two last centuries, who did not spend his earlier years in the study of the classics.

Yet though we have mentioned these things in favour of classical literature, and were we to descend to minute particulars might enumerate many more facts and circumstances to recommend it; we mean not to argue that it is absolutely impossible to be a wise, a great, or a good man, unless you are skilled in Greek and Latin. Means may, no doubt, be adopted to inspire the young mind with virtuous dispositions, to call forth the powers of the youthful understanding, and to impress habits of industry and vigorous perseverance, without having recourse to the discipline of a grammar school. But we cannot help thinking, for the reasons which we have stated to our readers, that a classical education is the most likely to produce these happy effects.

As we are afterwards to take particular notice of the course of education most suitable for those who are to occupy the humble stations in society, we shall not here inquire whether it be proper to introduce them to an acquaintance with the Greek and Latin classics.

VI. *On the Education of People of Rank and Fortune.*

69 Duties of people of rank.

Those whom the kindness of Providence has placed in an elevated station, and in affluent circumstances, so that they seem to be born rather to the enjoyment of wealth and honours than to act in any particular profession or employment, have notwithstanding a certain part assigned them to perform, and many important duties to fulfil. They are members of society, and enjoy the protection of the civil institutions of that society to which they belong; they must therefore contribute what they can to the support of those institutions. The labours of the industrious poor are necessary to supply them with the luxuries of life; and they must know how to distribute their wealth with prudence and generosity among the poor. They enjoy much leisure; and they ought to know how to employ their leisure hours in an innocent and agreeable manner. Besides, as their circumstances enable them to attract the regard and respect of those who are placed in inferior stations, and as the poor are ever ready to imitate the conduct of their superiors: it is necessary that they endeavour to adorn their wealth and honours by the most eminent virues, in order that their example may have an happy influence on the manners of the community.

Their education ought therefore to be conducted with a view to these ends. After what we have urged in favour of a classical education, our readers will naturally presume that we regard it as highly proper for a man of fortune. The youth who is destined to the enjoyment of wealth and honours, cannot spend his earlier years more advantageously than in gaining an acquaintance with the elegant remains of antiquity. The benefits to be derived from classical learning are peculiarly necessary to him. Care must be taken to preserve him from acquiring an haughty, fierce, imperious temper. The attention usually paid to the children of people of fortune, and the foolish fondness with which they are too often treated, have a direct tendency to inspire them with high notions of their own importance, and to render them passionate, overbearing and conceited. But if their temper acquire this bias even in childhood, what may be expected when they advance towards manhood, when their attention is likely to be oftener turned to the dignity and importance of that rank which they occupy, and to the pitiful humility of those beneath them? Why, they are likely to be so proud, insolent, resentful, and revengeful, as to render themselves disagreeable and hateful to all who know them; and besides, to be incapable of those delightful feelings which attend humane, benevolent, and mild dispositions. Let the man of fortune, therefore, as he is concerned for the future happiness and dignity of his child, be no less careful to prevent him from being treated in such a manner as to be inspired with haughtiness, caprice, and insolence, than to prevent his mind from being soured by harsh and tyrannical usage.

70 How to form the temper of a young man of fortune.

The manly exercises, as they are favourable to the health, the strength, and even the morals; so they are highly

Education. highly worthy of engaging the attention of the young gentleman. Dancing, fencing, running, horsemanship, the management of the musket, and the motions of military discipline, are none of them unworthy of occupying his time, at proper seasons. It is unnecessary to point out the advantages which he may derive from dancing; these seem to be pretty generally understood. Perhaps our men of fortune would be ashamed to make use of their legs for running; but occasions may occur, on which even this humble accomplishment may be useful. Though we wish not to see the young man of fortune become a jockey; yet to be able to make a graceful appearance on horseback, and to manage his horse with dexterity, will not be unworthy of his station and character. If times of public danger should arise, and the state should call for the services of her subjects against any hostile attack, they whose rank and fortune place them in the most eminent stations will be first expected to stand forth; but if unacquainted with those exercises which are connected with the military art, what a pitiful figure must they make in the camp, or on the field of battle?

71 Law. As the man of fortune may perhaps enjoy by hereditary right, or may be called by the voice of his fellow-citizens, to a seat among the legislative body of his country; he ought in his youth to be carefully instructed in the principles of her political constitution, and of those laws by which his own rights and the rights of his fellow-citizens are determined and secured.

72 Philosophy Natural philosophy, as being both highly useful and entertaining, is well worthy of the attention of all who can afford to appropriate any part of their time to scientific pursuits; to the man of fortune, a taste for natural philosophy might often procure the most delightful entertainment. To trace the wonders of the planetary systems, to mark the process of vegetation, to examine all the properties of that fine element which we breathe, to trace the laws by which all the different elements are confined to their proper functions, and above all to apply the principles of natural philosophy in the cultivation of the ground, are amusements which might agreeably and innocently occupy many of the leisure hours of the man who enjoys a splendid and independent fortune.

73 History and morals. Neither do we suppose civil history and the principles of morals to be overlooked. Without being acquainted with these, how could any just or accurate knowledge of the laws and political constitution of his country be acquired by the young gentleman? History exposes to our observation the fortune and the actions of other human beings, and thus supplies in some measure the place of experience; it teaches prudence, and affords exercise to the moral sense. When history condescends to take notice of individuals, they are almost always such as have been eminent for virtue, for abilities, or for the rank which they held in life; to the rich and great it ought to speak with peculiar efficacy, and they ought to be carefully invited to listen to its voice.

Such then is the manner in which we wish the education of young men of rank and fortune to be conducted, in order that they may be prepared for enjoying their opulence and honours with becoming dignity. Let them be early inured to habits of vigorous industry and persevering firmness, by passing through a regular course of classical learning in a free school; let them play and converse with their equals, and not be permitted to form high ideas of their own importance, nor to domineer over servants or inferiors: Let them be carefully instructed in the principles of morality and religion: Let them be taught the manly exercises: Let them be carefully informed of the nature of the political constitution of their country, and of the extent of those civil and political rights which it secures to them and their fellow-citizens: Let them be called to trace the annals of mankind through the records of history; to mark the appearances and operations of nature, and to amuse themselves by pursuing these to their general causes. We say nothing of causing the young man of fortune to learn some mechanical art: We think skill in a mechanical art might now and then afford him an innocent and pleasing amusement; but we do not consider it as absolutely necessary, and therefore do not insist on his acquiring it. With those accomplishments we hope he might become an useful member of society, might adorn the rank and fortune to which he is born, and might find wealth and high station a blessing, not a curse. It is peculiarly unfortunate for our age and country, that people of rank and fortune are not so studious that their children acquire these as the more superficial accomplishments.

VII. *On the Education of People designed for a Mercantile Employment, and for the humbler Occupations of Life not particularly connected with Literature.*

Were modern literature in a less flourishing state; were the English and French languages adorned with fewer eminent poetical, historical, and philosophical compositions; we might perhaps insist on it as necessary to give the boy, who is designed for a mercantile employment, a classical education. At present this does not appear absolutely necessary; yet we do not presume to forbid it as improper. Even the merchant will scarce find reason to repent his having been introduced to the acquaintance of Plato and Cicero. 74 Elegant literature. But still, if the circumstances of the parent, or any other just reason, should render it inconvenient to send the young man who is intended for trade to a free school to study the ancient languages, means may be easily adopted to make up for his loss. Confine him not to writing and accounts alone. These, though particularly useful to the merchant have no great power to restrain the force of evil passions, or to inspire the mind with generous and virtuous sentiments. Though you burden him not with Latin and Greek, yet strive to inspire him with a taste for useful knowledge and for elegant literature. Some of the purest and most elegant of our poets, the excellent periodical works which have appeared in our language, such as the Spectator, the Adventurer, the Mirror, and the compositions of the British historians, together with some of the best translations of the classics which we possess; these you may with great propriety put into his hands. They will teach him how to think and reason justly, and to express himself in conversation or in writing with correctness and elegance: they will refine and polish his mind, and raise him above low and gross pleasures. And as no man, who has any occasion to speak or write, ought to be entirely ignorant of the principles of grammar, you will therefore

Education. therefore be careful to instruct the young man who is designed for a mercantile occupation in the grammar of his mother-tongue.

75 Integrity. A sacred regard to his engagements, and an honesty which may prevent him from taking undue advantages or exacting unreasonable profits, are the virtues which a merchant is most frequently called to exercise; punctuality and integrity are the duties most particularly incumbent on the mercantile profession. Temptations will now and then arise to seduce the merchant to the violation of these. But if superior to every such temptation, he is one of the most illustious characters, and is likely to be one of the most successful merchants. From his earliest years, then, labour to inspire the child whom you intend for trade with a sacred regard for truth and justice: let him be taught to view deceit and fraud, and the violation of a promise, with abhorrence and disdain. Frugality is a virtue which, in the present age, seems to be antiquated or proscribed. Even the merchant often appears better skilled in the arts of profusion than in those of parsimony. The miser, a character at no time viewed as amiable, is at present beheld with double detestation and contempt. Yet, notwithstanding these unfavourable circumstances, fear not to impress on the young merchant habits of frugality. Let him know the folly of beginning to spend a fortune before he have acquired it. Let him be taught to regard a regular attention to confine his expences within due bounds, as one of the first virtues which can adorn his character.

76 Industry. Frugality and industry are so closely connected, that when we recommend the one of them to the merchant, we will be naturally understood to recommend the other also. It is easy to see, that, without industrious application, no man can reasonably expect to meet with success in the occupation in which he engages; and if the merchant thinks proper to leave his business to the management of clerks and shop-keepers, it is not very probable that he will quickly accumulate a fortune. It is, therefore, no less necessary, that he who is intended for trade be early accustomed to habits of sober application, and be carefully restrained from volatility and levity, than that he be instructed in writing, arithmetic, and keeping of accounts.

With these virtues and qualifications the merchant is likely to be respectable, and not unsuccessful, while he continues to prosecute his trade: and if, by the blessing of Providence, he be at length enabled to accumulate a moderate fortune, his acquaintance with elegant literature, and the virtuous habits which he has acquired, will enable him to enjoy it with taste and dignity. Indeed all the advantages which a man without taste, or knowledge, or virtue, can derive from the possession of even the most splendid fortune, are so inconsiderable, that they can be no adequate reward for the toil which he undergoes, and the mean arts which he practises in acquiring it. At the head of a great fortune a fool can only make himself more ridiculous, and a man of a wicked and vicious character more generally abhorred, than if fortune had kindly concealed their crimes and follies by placing them in a more obscure station.

77 Education of persons in the lowest ranks. A considerable part of the members of society are placed in such circumstances, that it is impossible for them to receive the advantages of a liberal education. The mechanic and the husbandman, who earn a subsistence by their daily labour, can seldom afford, whatever parental fondness may suggest, to favour their children with many opportunities of literary instruction. Content if they can provide them with food and raiment till such time as they acquire sufficient strength to labour for their own support, parents in those humble circumstances seldom think it necessary that they should concern themselves about giving their children learning. Happily it is not requisite that those who are destined to spend their days in this low sphere should be furnished with much literary or scientific knowledge. They may be taught to read their mother tongue, to write, and to perform some of the most common and the most generally useful operations of arithmetic: for without an acquaintance with the art of reading, it will scarce be possible for them to acquire any rational knowledge of the doctrines and precepts of religion, or of the duties of morality; the invaluable volume of the sacred scriptures would be sealed to them: we may allow them to write, in order that they may be enabled to enjoy the sweet satisfaction of communicating accounts of their welfare to their absent friends; and, besides, both writing and arithmetic are necessary for the accomplishment of those little transactions which pass among them. It would be hard, if even the lowest and poorest were denied these simple and easily acquired branches of education; and happily that degree of skill in them which is necessary for the labourer and the mechanic may be attained without greater expence than may be afforded by parents in the meanest circumstances. Let the youth who is born to pass his days in this humble station be carefully taught to consider honest patient industry as one of the first of virtues: let him be taught to regard the sluggard as one of the most contemptible of characters: teach him contentment with his lot, by letting him know that wealth and honour seldom confer superior happiness: Yet scruple not to inform him, that if he can raise himself above the humble condition to which he was born, by honest arts, by abilities virtuously exerted, he may find some comfort in affluent circumstances, and may find reason to rejoice that he has been virtuous, industrious, and active. In teaching him the principles of religion, be careful to shew him religion as intimately connected with morality: teach him none of those mysterious doctrines, whose sole tendency is to foster that enthusiasm which naturally prevails among the vulgar, and to persuade them that they may be pious without being virtuous. Labour to inspire him with an invincible abhorrence for lying, fraud, and theft. Inspire him with an high esteem for chastity, and with an awful regard to the duties of a son, an husband, and a father. Thus may he become respectable and happy, even in his humble station and indigent circumstances; a character infinitely superior, in the eyes of both God and man, to the rich and great man who misemploys his wealth and leisure in shameful and vicious pursuits.

VIII. *On the Education of the Female Sex.*

The abstracts which we have given of some of the most celebrated and original treatises on education, as well as our own observations on this subject have been hitherto either relative to the education of both the sexes, or directed chiefly to the education of the male sex. But as there is a natural difference between the characters

ters of the two sexes, and as there are certain duties peculiar to each of them; it is easy to see that the education of the boy and that of the girl cannot, ought not, to be conducted precisely in the same manner. And since the duties of the female sex are so important to society, and they form so considerable a part of our species; their education, therefore, merits the highest attention.

78 Similarity of the characters of both sexes in the first period of life.

In infancy, the instincts, the dispositions, and the faculties of boys and girls seem to be nearly the same. They discover the same curiosity, and the same disposition to activity. For a while they are fond of the same sports and amusements. But by and by, when we begin to make a distinction in their dress; when the girl begins to be more confined to a sedentary life under her mother's eye, while the boys are permitted to ramble about without doors; the distinction between their characters begins to be formed, and their taste and manners begin to become different. The boy now imitates the arts and the active amusements of his father; digs and plants a little garden, builds a house in miniature, shoots his bow, or draws his little cart; while the girl, with no less emulation, imitates her mother, knits, sews, and dresses her doll. They are no longer merely children: the one is now a girl; the other a boy. This taste for female arts, which the girl so easily and naturally acquires, has been judiciously taken notice of by Rousseau, as affording an happy opportunity for instructing her in a very considerable part of those arts which it is proper to teach her. While the girl is busied in adorning her doll, she insensibly becomes expert at needle-work, and learns how to adjust her own dress in a becoming manner. And therefore, if she be kindly treated, it will not be a matter of difficulty to prevail with her to apply to these branches of female education. Her mother or governess, if capable of managing her with mildness and prudence, may teach her to read with great facility. For being already more disposed to sedentary application than the boy of the same age, the confinement to which she must submit in order to learn to read will be less irksome to her. Some have pretended that the reasoning powers of girls begin to exert themselves sooner than those of boys. But, as we have already declared our opinion, that the reasoning powers of children of both sexes begin to display themselves at a very early period; so we do not believe that those of the one sex begin to appear, or attain maturity, sooner than those of the other. But the different occupations and amusements in which we cause them to engage from their earliest years, naturally call forth their powers in different manners, and perhaps cause the one to imitate our modes of speaking and behaviour sooner than the other. However, as we wish both boys and girls to learn the art of reading at a very early age, even as soon as they are capable of any serious application; so we wish girls to be taught the art of writing, arithmetic, and the principles of religion and morals, in the same order in which these are inculcated on boys.

We need not point out the reasons which induce us to regard these as accomplishments proper for the female sex: they seem to be generally considered as not only suitable, but necessary. It is our most important privilege, as beings placed in a situation different from that of the inferior animals, that we are capable of religious sentiments and religious knowledge; it therefore becomes us to communicate religious instruction with no less assiduity and care to the youth of the female sex than to those of our own. Besides, as the care of children during their earlier years belongs in a particular manner to the mother; she, therefore, whom nature has destined to the important duties of a mother, ought to be carefully prepared for the proper discharge of those duties, by being accurately instructed, in her youth, in such things as it will be afterwards requisite for her to teach her children.

79 Erudition, how far becoming in ladies.

Ladies have sometimes distinguished themselves as prodigies of learning. Many of the most eminent geniuses of the French nation have been of the female sex. Several of our countrywomen have also made a respectable figure in the republic of letters. Yet we cannot approve of giving girls a learned education. To acquire the accomplishments which are more proper for their sex, will afford sufficient employment for their earlier years. If they be instructed in the grammar of their mother tongue, and taught to read and speak it with propriety: be taught to write a fair hand, and to perform with readiness the most useful operations of arithmetic: if they be instructed in the nature of the duties which they owe to God, to themselves, and to society; this will be almost all the literary instruction necessary for them. Yet we do not mean to forbid them an acquaintance with the literature of their country. The periodical writers, who have taught all the duties of morality, the decencies of life, and the principles of taste, in so elegant and pleasing a manner, may with great propriety be put into the hands of our female pupil. Neither will we deny her the historians, the most popular voyages and travels, and such of the British poets as may be put into her hands without corrupting her heart or inflaming her passions. But could our opinion or advice have so much influence, we would endeavour to persuade our countrymen and countrywomen to banish from among them the novelists, those panders of vice, with no less determined severity than that which Plato excludes the poets from his republic, or that with which the converts to Christianity, mentioned in the Acts, condemned their magical volumes to the flames. Unhappily, novels and plays are almost the only species of reading in which the young people of the present age take delight; and nothing has contributed more effectually to bring on that dissoluteness of manners which prevails among all ranks.

80 Ornamental accomplishments.

But we will not discover so much austerity as to express a wish that the education of the female sex should be confined solely to such things as are plain and useful. We forbid not those accomplishments which are merely ornamental, and the design of which is to render them amiable in the eyes of the other sex. When we consider the duties for which they are destined by nature, we find that the art of pleasing constitutes no inconsiderable part of these; and it would be wrong, therefore, to deny them those arts, the end of which is to enable them to please. Let them endeavour to acquire taste in dress: to dress in a neat graceful manner, to suit colours to her complexion, and the figure of her clothes to her shape, is no small accomplishment for a young woman. She who is rigged out by the taste and dexterity of her maid and her milliner, is nothing better than a doll

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Education. fent abroad to public places as a fample of their handywork.
81. Dancing. Dancing is a favourite exercife; nay, we might almoft call it the favourite ftudy of the fair fex; fo many pleafing images are affociated with the idea of dancing; drefs, attendance, balls, elegance and grace of motion irrefiftible, admiration, and courtfhip: and thefe are fo early inculcated on the young by mothers and maids, that we need not be furprifed if little Mifs confider her leffon of dancing as a matter of much more importance than either her book or fampler. And indeed, though the public in general feem at prefent to place too high a value on dancing; and though the undue eftimation which is paid to it feems owing to that tafte for diffipation, and that rage for public amufements, which naturally prevail amid fuch refinement and opulence; yet ftill dancing is an accomplifhment which both fexes may cultivate with confiderable advantage. It has an happy effect on the figure, the air, and the carriage; and we know not if it be not favourable even to dignity of mind: yet, as to be even a firft-rate poet or painter, and to value himfelf on his genius in thefe arts, would be no real ornament to the character of a great monarch; fo any very fuperior fkill in dancing muft ferve rather to difgrace than to adorn the lady or the gentleman. There are fome arts in which, though a moderate degree of fkill may be ufeful or ornamental, yet fuperior tafte and knowledge are rather hurtful, as they have a tendency to feduce us from the more important duties which we owe to ourfelves and to fociety. Of thofe, dancing feems to be one: it is faid of a certain Roman lady, by an eloquent hiftorian, "that fhe was more fkilled in dancing than became a modeft and virtuous woman."

82 Mufic. Mufic, alfo, is an art in which the youth of the female fex are pretty generally inftructed; and if their voice and ear be fuch as to enable them to attain any excellence in vocal mufic, it may conduce greatly to increafe their influence over our fex, and may afford a pleafing and elegant amufement to their leifure hours. The harpfichord and the fpinnet are inftruments often touched by female hands; nor do we prefume to forbid the ladies to exercife their delicate fingers in calling forth the enchanting founds of thefe inftruments. But ftill, if your daughter have no voice or ear for mufic, compel her not to apply to it.

83 Drawing. Drawing is another accomplifhment which generally enters into the plan of female education. Girls are ufually taught to aim at fome fcratches with a pencil: but when they grow up, they either lay it totally afide, or elfe apply to it with fo much affiduity as to neglect their more important duties. We do not confider fkill in drawing, any more than fkill in poetry, as an accomplifhment very neceffary for the ladies; yet we agree with Rouffeau, that as far as it can contribute to improve their tafte in drefs, it may not be improper for them to purfue it. They may very properly be taught to fketch and colour flowers; but we do not wifh them to forget or lay afide this as foon as the drawing mafter is difmiffed: let them retain it to be ufeful through life. Though pride can never be lovely, even in the faireft female form; yet ought the young woman to be carefully impreffed with a due refpect for herfelf. This will join with her native modefty to be the guardian of her virtue, and to preferve her from levity and impropriety of conduct.

Such are the hints which have occurred to us on the education proper for the female fex, as far as it ought to be conducted in a manner different from that of the male. Education.

IX. *Public and private Education.*

One queftion ufually difcuffed by the writers on this fubject has not hitherto engaged our attention. It is, Whether it be moft proper to educate a young man privately, or fend him to receive his education at a public fchool? This queftion has been fo often agitated, and by people enjoying opportunities of receiving all the information which experience can furnifh on the fubject, that we cannot be expected to advance any new argument of importance on either fide. Yet we may ftate what has been urged both on the one and the other.

They who have confidered children as receiving their education in the houfe and under the eye of their parents, and as fecluded in a great meafure from the fociety of other children, have been fometimes led to confider this fituation as particularly favourable for their acquiring ufeful knowledge, and being formed to virtuous habits. Though we reap many advantages from mingling in focial life, yet in fociety we are alfo tainted with many vices to which he who paffes his life in folitary retirement is a ftranger. At whatever period of life we begin to mix with the world, we ftill find that we have not yet acquired fufficient ftrength to refift thofe temptations to vice with which we are there affailed. But if we are thus ready to be infected with the contagion of vice, even at any age, no other argument can be neceffary to fhow the propriety of confining children from thofe dangerous fcenes in which this infection is fo eafily caught. And whoever furveys the ftate of morals in a public fchool with careful and candid attention, even though it be under the management of the moft virtuous, judicious, and affiduous teachers, will find reafon to acknowledge, that the empire of vice is eftablifhed there not lefs fully than in the great world. Nothing, therefore, can be more negligent or inhuman, than for parents to expofe their children to thofe feductions which a great fchool prefents, at a time when they are ftrongly difpofed to imitate any example fet before them, and have not yet learned to diftinguifh between fuch examples as are worthy of imitation, and thofe which ought to be beheld with abhorrence. Even when under the parent's eye, from intercourfe with fervants and vifitors their native innocence is likely to fuffer confiderably. Yet the parent's care will be much more likely to preferve the manners of his child uncorrupted in his own houfe, than any affiduity and watchfulnefs of his teachers in a fchool. 84 Arguments for private education.

The morals and difpofitions of a child ought to be the firft objects of our concern in conducting his education; but to initiate him in the principles of ufeful knowledge is alfo an important object; and it will be happy, if in a private education virtue be not only better fecured, but knowledge alfo more readily acquired, than in a public. But this actually happens. When one or two boys are committed to the care of a judicious tutor, he can watch the moft favourable feafons for communicating inftruction; he can awake curiofity and command attention by the gentle arts of infinuation: though he ftrive not to inflame their breafts with emulation, which leads often to envy and invete-

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Education. rate hatred; yet he will succeed in rendering learning pleasing, by other means less likely to produce unfavourable effects on the temper and dispositions of his pupils. As his attention is not divided among a number, he can pay more regard to the particular dispositions and turn of mind of each of his pupils: he can encourage him who is modest and slow, and repress the quickness and volatility of the other; and he can call forth and improve their powers, by leading them at one time to view the scenes of nature and the changes which she successively undergoes through the varying seasons; at another, to attend to some of the most entertaining experiments of natural philosophy; and again alluring them artfully to their literary exercises. With these he may mix some active games; and he may assume so much of the fondness of the parent, as to join in them with his little pupils. These are certainly circumstances favourable both to the happiness and to the literary improvement of youth; but they are peculiar to a private education. Besides, in a private education, as children spend more of their time with grown up people than in a public; those, therefore, who receive a domestic education, sooner acquire our manner of thinking, of expressing ourselves, and of behaving, in our ordinary intercourse with one another. For the very same reason for which girls are often observed to be capable of prudence and propriety of behaviour at an earlier age than boys, those boys who receive a family education will begin sooner to think and act like men, than those who pass their earlier days in a public seminary. And though you educate your son at home, there is no reason why he should be more accustomed to domineer over his inferiors, or to indulge a capricious or inhumane disposition, than if he were brought up among fifty boys, all of the same age, size, and rank, with himself. He may also, in a private education, exercise his limbs with the same activity as in a public one. He cannot, indeed, engage in those sports for which a party of companions is necessary; but still there are a thousand objects which will call forth his activity: if in the country, he will be disposed to fish, to climb for bird-nests, to imitate all that he sees performed by labourers and mechanics: in short he will run, leap, throw and carry stones, and keenly exert himself in a variety of exercises, which will produce the most favourable effects on the powers both of his mind and body. It may indeed be possible for you to oppose the designs of nature so effectually, if you take pains for that purpose, as to repress the natural activity of your child or pupil, and cause him to pine away his time in listless indolence; but you will thus do violence to his dispositions, as well as to those instincts which nature has for wise purposes implanted in his breast. And the bad consequences which may result from this management are not to be considered as the natural effects of a domestic education, but as the effects of an education carelessly or imprudently conducted.

But there is another consideration which will perhaps be still more likely than any of those which we have hitherto urged, to prevail with the fond parent to give his child a private education. As the infant who is abandoned by its mother to the care of an hireling nurse, naturally transfers its affection from the unnatural parent to the person who supplies her room and performs the duties incumbent upon her; so the boy who is banished from his parent's house at a time when he has scarce begun to know the relation in which he stands to his father and mother, brothers or sisters, soon ceases to regard them with that fondness which he had contracted for them from living in their company and receiving their good offices. His respect, his affection, and his kindness, are bestowed on new objects, perhaps on his master or his companions; or else his heart becomes selfish and destitute of every tender and generous feeling; and when the gentle and amiable affections of filial and fraternal love are thus, as it were, torn up by the roots, every evil passion springs up, with a rapid growth, to supply their place. The boy returns afterwards to his father's house: but he returns as a stranger; he is no longer capable of regarding his parents and relations with the same tenderness of affection. He is now a stranger to that filial love which springs up in the breast of the child who is constantly sensible of the tender care of his parents, and spends his earlier years under their roof, in such a manner as to appear the effect of instinct rather than of habit. Selfish views are now the only bond which attaches him to his parents and relations; and by coming under their influence at so early a period of life, he is rendered for ever incapable of all the most amiable virtues which can adorn human nature. Let the parent, therefore, who loves his child, and wishes to obtain from him a mutual return of affection, beware of excluding him from his house, and devolving the sole charge of him upon another, in his childhood.

These views represent a private education as the most favourable to virtue, to knowledge, and to the mutual affection which ought always to unite the parent and his child. But let us now listen to the arguments which are usually urged in behalf of a public education.

68 Arguments for public education.

In the first place it has been asserted, that a public education is much more favourable than a private to the pupil's improvement in knowledge, and much more likely to inspire him with an ardour for learning. In a private education, with whatever assiduity and tenderness you labour to render learning agreeable to your pupil, still it will be but an irksome task. You may confine him to his books but for a very short space in the course of the day, and allow him an alternation of study and recreation. Still, however, you will never be able to render his books the favourite objects of his attention. He will apply to them with reluctance and careless indifference; even while he seems engaged on his lesson, his mind will be otherwise occupied; it will wander to the scenes where he pursues his diversions, and to those objects which have attracted his desires. If the period during which you require his application be extremely short; during the first part of it, he will still be thinking of the amusements from which you have called him, and regretting his confinement; during the last, he will fondly anticipate the moment when he is to be set at liberty, and think of new amusements. Again, if you confine him during a longer period, still more unfavourable effects will follow. Peevishness, dulness, and a determined aversion to all that bears the name of literature, will

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Education. be naturally impressed on his mind by such treatment. How can it be otherwise? Books possess so few of those qualities which recommend any object to the attention of children, that they cannot be naturally agreeable. They have nothing to attract and detain the eye, the ear, or any of the senses; they present things with which children are unacquainted, and of which they know not the value: children cannot look beyond the letters and words, to the things which these represent; and even though they could, yet is it much more pleasing to view scenes and objects as they exist originally in nature, than to trace their images in a faint and imperfect representation. It is vain, therefore, to hope that children will be prevailed with to pay attention to books by means of any allurements which books can of themselves present. Other means must be used; but those in a private education you cannot command. In a public seminary, the situation of masters with respect to their pupils is widely different. When a number of boys meet together in the same school, each of them soon begins to feel the impulse of a principle which enables the master to command their attention without difficulty, and prompts them to apply with cheerful ardour to tasks which would otherwise be extremely irksome. This principle is a generous emulation, which animates the breast with the desire of superior excellence, without inspiring envy or hatred of a competitor. When children are prudently managed in a great school, it is impossible for them not to feel its impulse. It renders their tasks scarce less agreeable than their amusements, and directs their activity and curiosity to proper objects. View the scholar at a public school, composing his theme, or turning over his dictionary; how alert! how cheerful! how indefatigable! He applies with all the eagerness, and all the perseverance, of a candidate for one of the most honourable places in the temple of fame. Again, behold and pity that poor youth who is confined to his chamber with no companion but his tutor; none whose superiority can provoke his emulation, or whose inferiority might flatter him with thoughts of his own excellence, and thus move him to preserve by industrious application the advantages which he has already gained. His book is before him; but how languid, how listless his posture! how heavy and dull his eye! Nothing is expressed in his countenance but dejection or indignation. Examine him concerning his lesson; he replies with confusion and hesitation. After a few minutes observation, you cannot fail to be convinced that he has spent his time without making any progress in learning; that his spirits are now broken, his natural cheerfulness destroyed, and his breast armed with invincible prejudices against all application in the pursuit of literary knowledge. Besides, in a school, there is something more than emulation to render learning less disagreeable than it naturally is to children. The slightest observation of life, or attention to our own conduct in various circumstances, will be sufficient to convince us, that whenever mankind are placed in circumstances of distress, or subjected to any disagreeable restraint, that which a single person bears with impatience or dejection will make a much less impression on his mind if a number of companions be joined with him in his suffering or restraint. It is esteemed a piece of much greater severity to confine a prisoner in a solitary cell, than when he is permitted to mix with others in the same uncomfortable situation. A journey appears much less tedious to a party of travellers, than to him who beats the path alone. In the same manner, when a number of boys in a great school are all busied on the same or on similar tasks, a spirit of industry and perseverance is communicated from one to another over the whole circle; each of them insensibly acquires new ardour and vigour; even though he feel not the spur of emulation, yet, while all are busy around him, he cannot remain idle. These are facts obvious to the most careless observer.

Neither are public schools so unfavourable to the virtue of their members as they have been represented to be. If the masters are men of virtue and prudence, careful to set a good example before their pupils, attentive to the particular character and behaviour of each individual among them, firm to punish obstinate and incorrigible depravity, and even to expel those who are more likely to injure the morals of others than to be reclaimed themselves, and at the same time eager to applaud and to encourage amiable and virtuous dispositions wherever they appear; under the government of such masters, a public school will not fail to be a school of virtue. There will no doubt be particular individuals among the pupils of such a seminary, whose morals may be corrupt and their dispositions vicious; but this, in all probability, will arise from the manner in which they were managed before entering the school, or from some other circumstances, rather than from their being sent for their education to a public school. Again, at a public school young people enjoy much greater advantages for preparing them to enter the world, than they can possibly be favoured with if brought up in a private and solitary manner. A great school is a miniature representation of the world at large. The objects which engage the attention of boys at a school are different from those which occupy their parents; the views of the boys are less extensive, and they are not yet capable of prosecuting them by so many base and mean arts; but, in other respects, the two scenes and the actors upon them nearly resemble each other; on both, you behold contending passions, opposite interests, weakness, cunning, folly, and vice. He therefore who has performed his part on the miniature scene, has rehearsed as it were for the greater; if he has acquitted himself well on the one, he may also be expected to distinguish himself on the other; and even he who has not distinguished himself at school, at least enters the world with superior advantages when viewed in comparison with him who has spent his earlier days in the ignorance and solitude of a private and domestic education. Besides, when a number of boys meet at a public seminary of education, separated from their parents and relations; nearly of the same age, engaged in the same studies, and fond of the same amusements; they naturally contract friendships with one another which are more cordial and sincere than any that take place between persons farther advanced in life. A friendship is often formed between two boys at school which continues through life, and is productive of the happiest consequences to each of them. While at school, they mutually assist and encourage each other in their learning; and their mutual affection renders their tasks less burdensome

 densome than they might otherwise find them. As they advance in life, their friendship still continues to produce happy effects on their sentiments and conduct: perhaps they are mutually useful to each other by interest or by personal assistance in making their way in the world; or when they are engaged in the cares and bustle of life, their intercourse and correspondence with each other may contribute much to console them amid the vexations and fatigues to which they may be exposed.

Such are the chief arguments usually adduced in favour of a public education. When we compare them with those which have been urged to recommend a private education, we will perhaps find that each has its peculiar advantages. A public education is the more favourable to the acquisition of knowledge, to vigour of mind, and to the formation of habits of industry and fortitude. A private education, when judiciously conducted, will not fail to be peculiarly favourable to innocence and to mildness of disposition; and notwithstanding what has sometimes been advanced by the advocates for a public education, it is surely better to keep youth at a distance from the seductions of vice till they be sufficiently armed against them, than to expose them to them at an age when they know not to what dangers they lead, and are wholly unable to resist them. Were we to give implicit credit to the specious talk of the two parties, either a private or a public education would form characters more like to angels than to those men whom we ordinarily meet in the world: but they speak with the ardour of enthusiasts; and therefore we must listen with caution both to the facts which they adduce, and to the inferences which they draw. Could we, without exposing children to the contagion of a great town, procure for them the advantages of both a public and a private education at the same time, we would by this means probably succeed best in rendering them both respectable scholars and good men. If we may presume to give our opinion freely, we would advise parents never, except when some unavoidable necessity of circumstances obliges them, to expel their children from under their own roof till they be advanced beyond their boyish years: let the mother nurse her own child; let her and the father join in superintending its education: they may then expect to be rewarded, if they have acted their parts aright, by commanding the gratitude, the affection, and the respect of their child, while he and they continue to live together. Let matters be so ordered, that the boy may reside in his father's house, and at the same time attend a public school: but let the girl be educated wholly under her mother's eye.

86 A medium between the two.

X. *On Travel.*

87 Travel considered in general.

ANOTHER question which has been often discussed comes here under our review. The Philosophers of ancient Greece travelled in search of knowledge. Books were then scarce, and those few which were to be obtained were no very rich treasuries of useful information. The rhapsodies of a poet, the rude legends of some ill-informed and fabulous historian, or the theories of fanciful philosophers, were all that they could afford. Thales, Lycurgus, Solon, Plato, travelled, seeking that knowledge among more civilized nations which they could not find in their native country. In the course of their travels, they heard the lectures of celebrated philosophers; consulted the priests, who were the guardians of the traditions of antiquity, concerning the nature and origin of those traditions; and observed the institutions of those nations which were most renowned for the wisdom of their legislature. When they set out to visit foreign countries, they seem to have proposed to themselves a certain end; and by keeping that end steadily in view during the course of their travels, they gained such improvement as to be able on their return to command the veneration of their countrymen by means of the knowledge which they were enabled to communicate. Many besides the philosophers of ancient Greece have travelled for improvement, and have succeeded in their views. But ancient history does not relate to us, that travelling was considered by the Greeks or Romans as necessary to finish the education of their young men of fortune before they entered the scenes of active life. It is true, after Greece became a province of the Roman empire, and the Romans began to admire the science and elegance of Greece, and to cultivate Grecian literature, the young noblemen of Rome often repaired to Rhodes and Athens to complete their studies under the masters of philosophy and eloquence who taught in those cities. But they went thither with the same views with which our youth in modern times are sent to free schools and universities, not to acquire knowledge by the observation of nature, of the institutions, manners, and customs of nations; but merely to hear lectures, read books, and perform exercises. In modern times, a few men of reflection and experience have now and then travelled for improvement: but the greatest part of our travellers, for a long time, were enthusiastic devotees who went in pilgrimage to visit the shrine or relics of some favourite saint; soldiers, who wandered over the earth to destory its inhabitants; or merchants, whose business as factors between widely distant countries and nations led them to brave every danger in traversing from one corner of the globe to another. But since the nations of modern Europe have begun to emerge from rudeness, ignorance, and servile depression, they have formed one great commonwealth, the members of which are scarce less intimately connected with each other than were the states of ancient Greece. The consequence of this mutual connection and dependence is, that almost all the nations of Europe have frequent intercourse with one another; and as some of them are and have long been more enlightened and refined than others, those nations who have attained the highest degrees of civilization and refinement have naturally attracted the admiration and homage of the rest. Their language has been studied, their manners and arts have been adopted, and even their dress has been imitated. Other nations have thronged to pay the homage due to their superior merit, and to study under them as masters. Hence has arisen the practice which at present prevails among us of sending our youth to complete their education by travelling, before we introduce them to active life, or require them to engage in business Formerly young men were not sent to travel till after they had proceeded through the forms of a regular education, and had at least attained such an age that they were no longer

Education. to be considered as mere boys. But the progress of luxury, the desire of parents to introduce their childern into the world at an early age that they may early attain to wealth and honours, and various other causes, have gradually introduced the practice of sending mere boys to foreign countries, under pretence of affording them opportunities of shaking off prejudices, of storing their minds with truly useful knowledge, and of acquiring those graceful manners and that manly address which will enable them to acquit themselves in a becoming manner when they are called to the duties of active life. How much travelling at such an early age contributes to fulfil the views of parents, a slight survey of the senate-house, the gambling-houses, the race-course, and the cock-pit, will readily convince the sagacious observer.

But we wish to foster no prejudices against neighbouring nations; we entertain no such prejudices in favour of Britain, as to wish to confine our countrymen within the sea-girt isle. Let us enquire, what advantages may be gained by travelling, and at what age it may be most proper to set out in pursuit of those advantages.

88 Traval necessary to the acquisition of knowledge

After all that bookish men have urged, and notwithstanding all that they may continue vehemently to urge, in behalf of the knowledge to be derived from their beloved books; it must still be acknowledged, that books can teach us little more than merely the language of men. Or, if we should grant that books are of higher importance, and that language is the least valuable part of the knowledge which they teach, yet still we need to beware that they lead us not astray; it is better to examine nature with the naked eye, than to view her through the spectacles of books. Neither the theories or experiments of philosophers, nor the narratives of travellers, nor the relations of historians, though supported by a numerous train of authorities, are worthy of implicit credit. You retire from the world, confine yourself for years to your closet, and read volume after volume, historians, philosophers, and poets; at last you fancy that you have gained an immense store of knowledge: But leave your retirement, return into the world, compare the knowledge which you have treasured up with the appearances of nature; you will find that you have laboured in vain, that it is only the semblance of knowledge which you have acquired, and will not serve for a faithful guide in life, nor even enable you to distinguish yourself for literary merit. Compare the relations of travellers with one another; how seldom do they agree when they describe the same scenes and the same people! Turn your attention to the most respectable historians, compare their accounts of the same events; what disagreement! what contrariety! Where shall truth be found? Listen to the cool, the candid philosophers; what contradictory theories do they build on the same system of facts.

We agree, then, that it is better to seek knowledge by actual observation and experiment, than to receive it at second-hand from the information of others. He who would gain an acquaintance with the beauties of external nature, must view them with his own eyes; he who would know the operations of the human understanding, must reflect upon what passes in his own mind; he who would know the customs, opinions, and manners of any people, must mingle with them, must observe their conduct, and listen to their conversation. The arts are acquired by actual practice; the sciences by actual observation in your own person, and by deducing inferences from your observations.

If therefore to extend our knowledge can contribute in any degree to render us happier, wiser, or better; travelling, as being more favourable to knowledge than the study of books, must be highly advantageous. Get well acquainted with your own country; with the manners, the customs, the laws, and the political situation of your countrymen: Get also a knowledge of books; for books would not be altogether useless, though they could serve no other purpose but to teach us the language in which mankind express themselves: And then, if your judgment have attained maturity; if curiosity prompt you; if your constitution be robust and vigorous, and your spirits lively; you may imitate the Solons, Homers, and Platos of old, and visit foreign countries in search of knowledge, and with a view to bring home something which may be of real utility to yourself and your country. You will, by this time, be so much master of the language of your own country, that you will not lose it while you are learning the languages of foreign nations; your principles of taste and of right and wrong will be so formed and fixed, that you will not despise any institution or custom or opinion merely because it prevails not in your own country; nor yet will you be ready to admire and adopt any thing, merely because it prevails among a foreign nation who are distinguished for profound and extensive knowledge, or for elegance of taste and manners. No; you will divest yourself of every prejudice, and judge only by the fixed unalterable principles which determine the distinction between right and wrong, between truth and falsehood, between beauty and deformity, sublimity and meanness. Your object will not be to learn exotic vices, to mingle in frivolous amusements, or to form a catalogue of inns. Your views, your enquiries, will have a very different direction. You will attend to the state of the arts, of the sciences, of morals, manners, and government; you will also contemplate with eager delight, the grand or beautiful scenes of nature, and examine the vegetable productions of the various regions through which you pass, as well as the different tribes of animals which inhabit them; you will observe what blessings the beneficence of nature has conferred on the inhabitants of each particular division of the globe, and how far the ingenuity and industry of man have taken advantage of the kindness of nature. Thus surveying the face of the earth, and considering how advantages and disadvantages are balanced with each other through every various region and climate from one extremity of the globe to another; you will admire and revere that impartiality with which the Author of nature has distributed his benefits to the whole human race. When from the chilly climes and stubborn soil of the north, you turn your eyes to the fertile, genial regions of the south, where every tree is loaded with exquisite fruits, and every vegetable is nourishing and delicious; you will be pleased to find, that the inhabitants of the north, by their superior ingenuity and vigour, are able to raise themselves to circumstances no leſs comfortable and reſpectable than thoſe which the nations inhabiting between the tropics enjoy: when you behold the French ſhaking off the yoke of deſpotiſm, and aſpiring to the ſweets of liberty as well as their Britiſh neighbours; you will be pleaſed to ſee, that the natural gaiety and cheerfulneſs of the former nation render them not incapable of the energy of the latter. You will be pleaſed to view the remains of antiquity, and the noble monuments of art; but you will think it below you to trifle away your time in gazing at palaces and churches, and collecting ruſty medals and fragments of marble; you will ſeek the ſociety of eminent men, and eagerly cultivate an acquaintance with the moſt diſtinguiſhed artiſts and men of ſcience who adorn the nations among whom you may happen to ſojourn: Knowing that the knowledge which is to be acquired in great towns, is by no means an adequate compenſation for the vicious habits which you are liable to contract in them; and beſides, that the luxuries, the arts, the manners, the virtues, and the vices of all great towns are nearly the ſame, ſo that when you have ſeen one, you have ſeen all others; you will avoid taking up your reſidence for any conſiderable time in any of the great towns through which you have occaſion to paſs in the courſe of your travels. The traveller who has attained the previous accompliſhments which we have mentioned as neceſſary, who ſets out with the views which we have ſuppoſed him to entertain, and who conducts his travels in this manner, cannot fail to return home enriched with much uſeful knowledge; he cannot but derive more real improvement from travelling, than he could have gained by ſpending the ſame period of time in ſolitary ſtudy: when he returns to his native country, he will appear among his countrymen as more than a philoſopher; a ſage, and a benefactor. His knowledge is ſo extenſive and accurate, his views are ſo liberal and enlarged, and he is ſo ſuperior to prejudices, without being the enemy of any uſeful eſtabliſhments, that he will be enabled to command univerſal eſteem, by performing his part in life with becoming dignity and propriety, and perhaps to render his name illuſtrious, and his memory dear to future times, by ſome important ſervices to the community to which he belongs, or even to mankind in general.

89 Circumſtances that render travelling unprofitable to the youth of the preſent age.

But though we have thus far, and we hope for obvious and ſolid reaſons, decided in favour of travelling, as being more likely than a ſolitary application to books, to furniſh the mind with uſeful and ornamental knowledge; yet we do not generally obſerve that youth either take care to furniſh themſelves with the previous knowledge which we conſider as indiſpenſably neceſſary in order to prepare them for travelling with advantage, or ſet out with proper views, or proſecute their travels in a prudent, judicious manner. After receiving a very imperfect education, in which religious and moral inſtruction are almoſt wholly neglected, and no means are uſed to inſpire the youthful mind with ſolid, virtuous, manly qualities; but every art is tried to make the young man appear learned, while his mind is deſtitute of all uſeful information, and to teach him to aſſume the confidence of manhood before he has attained even to a moderate degree of ſenſe and prudence;—after an education conducted in this manner, and with theſe views, the ſtripling is ſent abroad to view the world, and is expected to return home a finiſhed character, an ornament and a comfort to his parents and all his connections. He is hitherto unacquainted, perhaps, even with the ſimple events of the hiſtory of his native country; and either totally ignorant of claſſical literature, or but very ſuperficially inſtructed in it. He has not yet viewed with a diſcerning eye the manners and cuſtoms prevailing among his countrymen; he knows not the nature of the government under which he lives, nor the ſpirit of thoſe laws by which his civil conduct muſt be regulated. He has no fixed principles; no clear, diſtinct views. But to ſupply all his wants of this nature, he is put into the hands of a travelling governor, who is to be entirely ſubmiſſive to his will, and yet to ſerve him both for eyes and intellect. This governor is generally either ſome macaroni officer who is conſidered as well bred, and thought to know the world; or elſe, perhaps, ſome cringing ſon of literature, who having ſpent much time among his books, without acquiring ſuch ſtrength or dignity of mind as to raiſe him above frivolity of manners and converſation or pitiful fawning arts, is therefore regarded as happily qualified for this important charge. This reſpectable perſonage and his pupil are ſhipped off for France, that land of elegant diſſipation, frivolity, and faſhion. They travel on with eager impatience till they reach the capital. There the young man is induſtriouſly introduced to all the gay ſcenes which Paris can diſplay. He is, at firſt, confounded; by and by his ſenſes are faſcinated; new deſires are awaked in his breaſt; all around him he ſees the ſons of diſſipation wallowing in debauchery, or the children of vanity fluttering about like ſo many gaudy inſects. The poor youth has no fixed principles: he has not been taught to regard vanity as ridiculous, or to turn from vice with abhorrence. No attempt is made to allure him to thoſe objects, an attention to which can alone render travelling truly beneficial. Hitherto his mind had been left almoſt wholly uncultivated; and now, the ſeeds of vice are plentifully ſown in it. From one great town he is conveyed to another, till he viſit almoſt every place in Europe where profligacy of manners has attained to any uncommon height. In this happy courſe of education he probably continues to purſue improvement till he is well acquainted with moſt of the poſt-roads, the principal inns, and the great towns at leaſt in France and Italy; and perhaps till he has worn out his conſtitution, and rendered his mind totally incapable of any generous ſentiments or ſober reflection. He then reviſits his native country, to the inexpreſſible happineſs of his parents, who now eagerly long to embrace their all-accompliſhed child. But how miſerably are the poor folks diſappointed, when they find his conſtitution waſted, his underſtanding uninformed, his heart deſtitute of every manly or generous ſentiment; and perceive him to poſſeſs no accompliſhment, but ſuch as are merely ſuperficial? Perhaps, however, his parents are prevented by their partiality both for their child and for the means which they have adopted in conducting his education, from viewing his character and qualifications in a true light. Perhaps they overlook all his defects, or consider them as ornaments, and regard their dear son as the mirror of perfection. But, unfortunately, though they be blind to the hideous deformity of the monster which they have formed, they cannot hinder it from being conspicuous to others; though they may view their son's character as amiable and respectable, they cannot render it useful, they cannot prevent it from being hurtful to society. Let this youth whose education has been thus wisely conducted, let him be placed at the head of an opulent fortune, advanced to a seat in the legislative body of his country, or called to act in any public character; how will he distinguish himself? As the virtuous patriot, the honest, yet able statesman, the skilful general, or the learned, upright judge? How will he enjoy his fortune? Will he be the friend of the poor, the steady supporter of the laws and constitution under whose protection he lives? Will he show himself capable of enjoying *otium cum dignitate?* If we reason by the usual laws of probability, we cannot expect that he should: and if we observe the manners and principles of our men of wealth and high birth who have been brought up in this manner, we find our reasonings confirmed. Such are the opinions which candid observation leads us to entertain with regard to the advantages which may be gained by travelling.

He whose mind has been judiciously cultivated, and who has attained to maturity of judgment, if he set out on his travels with a view to obtain real improvements, and persist invariably in the prosecution of that view, cannot but derive very great advantage from travelling.

But again, those young men whose minds have not been previously cultivated by a judicious education, who set out without a view to the acquisition of real knowledge, and who wander among foreign nations, without attention to any thing but their luxuries, their follies, and their vices; those poor young men cannot gain any real improvement from their travels.

Comparatively few of the young men, who travel for improvement, appear to derive so much advantage from their travels as were to be wished, because they generally receive too superficial an education, set out at too early a period of life, and direct not their views to objects of real utility and importance.

XI. *On Knowledge of the World, and Entrance into Life.*

90 Unhappy effects of a too early introduction into the world.

MUCH has been said concerning the utility of a knowledge of the world, and the advantage of acquiring it at an early period of life. But those who have the most earnestly recommended this knowledge of the world, have generally explained themselves in so inaccurate a manner concerning it, that it is difficult to understand what ideas they affix to it. They seem to wish, that, in order to acquire it, young people may be early made acquainted with all the vices and follies of the world, introduced into polite company, carried to public places, and not confined even from the gaming-table and the stews. Some knowledge of the world may, no doubt, be gained by these means. But it is surely dearly purchased; nor are the advantages which can be derived from it so considerable, as to tempt the judicious and affectionate parent to expose his child to the infection of vanity, folly, and vice, for their sake. Carry a boy or girl into public life at the age of fourteen or fifteen; show them all the scenes of splendid vanity and dissipation which adorn London or Paris; tell them of the importance of dress, and of the ceremonies of good breeding and the forms of intercourse; teach them that fashionable indifference and assurance which give the *ton* to the manners of our fine gentlemen and fine ladies of the present age. What effects can you expect the scenes into which you introduce them, and the mysteries which you now teach them, to produce on the minds of the children? They have a direct tendency to inspire them with a taste for vanity, frivolity, and dissipation. If you wish them to be like the foolish, the dissipated, and the gay, you are likely to obtain your purpose; but if, on the contrary, your views are to prepare them for discharging the duties of life, you could not adopt more improper means: for though they be well acquainted with all those things on which you place so much value, yet they have not thereby gained any accession of useful knowledge. They are not now more able than before to estimate the real value of objects; nay, their judgement is now more liable than before to be misled in estimating the value of the objects around them. Luxury, vanity, and fashion, have stamped on many things an ideal value. By mingling at an early age in those scenes of the world where luxury, vanity, and fashion reign with arbitrary sway, young people are naturally impressed with all those prejudices which these have a tendency to inspire. Instead of acquiring an useful knowledge of the world, they are rendered incapable of ever viewing the world with an unprejudiced and discerning eye. If possible, therefore, we should rather labour to confine young people from mingling in the scenes of gay and dissipated life till after they have attained maturity of age and judgment. They will then view them in a proper light, and perhaps be happy enough to escape the infectious contagion of vice.

But there is another and a more valuable knowledge of the world, which we ought industriously to communicate to them as soon as they are capable of receiving it. As soon as they are made thoroughly acquainted with the distinctions between right and wrong, between virtue and vice, between piety and impiety, and have become capable of entering into your reasonings; we ought then to inform them concerning the various establishments and institutions which exist in society; concerning the customs, opinions, and manners of mankind; and concerning the various degrees of strength or weakness of mind, of ingenuity or dullness, of virtuous or vicious qualities, which discriminate those characters which appear in society. We ought also to seize every opportunity which may be presented of exemplifying our lessons by instances in real life. We must point out to them those circumstances which have led mankind to place an undue value on some objects, while they appreciate others much below their real utility and importance. Thus let us fortify their judgments against that impression which the dazzling novelty of the scene, and the force of passion, will be apt to produce; and communicate to them a knowledge of the world, without exposing them imprudently to the contagion of its vices and follies. 91 What knowledge of the world may be safely communicated to young people.

When at length the period arrives at which they must

must be emancipated from subjection, and committed to the guidance of their own conscience and reason, and of those principles which we have laboured to inculcate on their minds: let us warn them of the dangers to which they are about to be exposed; tell them of the glory and the happiness to which they may attain, inspire them, if possible, with disdain for folly, vanity, and vice, whatever dazzling or enchanting forms they may assume; and then dismiss them to enrich their minds with new stores of knowledge by visiting foreign nations; or, if that should be inconvenient, to enter immediately on the duties of some useful employment in active life.

EDULCORATION, properly signifies the rendering substances more mild. Chemical edulcoration consists almost always in taking away acids and other saline substances; and this is effected by washing the bodies to which they adhere in a large quantity of water. The washing of diaphoretic antimony, powder of algaroth, &c. till the water comes off quite pure and insipid, are instances of chemical edulcoration.—In pharmacy, juleps, potions, and other medicines, are said to be *edulcorated*, by adding sugar or syrup.

EDWARD, the name of several kings of England. See (*History of*) England.

EDWARDS (George), fellow of the royal and antiquarian societies, was born at Stratford, a hamlet belonging to Westham in Essex, England, on the 3d of April, 1694. After having spent some time at school, he was put apprentice to a tradesman in Fenchurch-street. His master, who was eminent both for his piety and skill in the languages, treated him with great kindness; but about the middle of his apprenticeship, an accident happened which totally put a stop to the hopes of young Edwards's advancing himself in the way of trade. Dr. Nicolas, a person of eminence in the physical world, and a relation of his master's, happened to die. The Doctor's books were removed to an apartment occupied by Edwards, who eagerly employed all his leisure-hours, both in the day and great part of the night, in perusing those which treated of natural history, sculpture, painting, astronomy, and antiquities. The reading of these books entirely deprived him of any inclination for mercantile business he might have formerly had, and he resolved to travel into foreign countries. In 1716, he visited most of the principal towns in Holland, and in about a month returned to England. Two years after, he took a voyage to Norway, at the invitation of a gentleman who was disposed to be his friend, and who was nephew to the master of the ship in which he embarked. At this time Charles XII. was besieging Frederickshall; by which means our young naturalist was hindered from making such excursions into the country as otherwise he would have done, for the Swedes were very careful to confine such strangers as could not give a good account of themselves. But notwithstanding all his precaution, he was confined by the Danish guard, who supposed him to be a spy employed by the enemy to get intelligence of their designs. However, by obtaining testimonials of his innocence, a release was granted. In 1718 he returned to England, and next year visited Paris by the way of Dieppe. During his stay in this country he made two journeys of 100 miles each; the first to Chalons in Champagne, in May 1720; the second on foot, to Orleans and Blois: but an edict happening at that time to be issued for securing vagrants, in order to transport them to America, as the banks of the Mississippi wanted population; our author narrowly escaped a western voyage. On his arrival in England, Mr. Edwards closely pursued his favourite study of natural history, applying himself to drawing and colouring such animals as fell under his notice. A strict attention to natural, more than picturesque beauty, claimed his earliest care: birds first engaged his particular attention; and having purchased some of the best pictures of these subjects, he was induced to make a few drawings of his own; which were admired by the curious, who encouraged our young naturalist to proceed, by paying a good price for his early labours. Among his first patrons and benefactors may be mentioned James Theobalds, Esq; of Lambeth; a gentleman zealous for the promotion of science. Our artist thus unexpectedly encouraged, increased in skill and assiduity; and procured, by his application to his favourite pursuit, a decent subsistence and a large acquaintance. However, he remitted his industry in 1731; when, in company with two of his relations, he made an excursion to Holland and Brabant, where he collected several scarce books and prints, and had an opportunity of examining the original pictures of several great masters at Antwerp, Brussels, Utrecht, and other cities. In December 1733, by the recommendation of the great Sir Hans Sloane, Bart. president of the college of physicians, he was chosen librarian, and had apartments in the college. This office was peculiarly agreeable to his taste and inclination, as he had the opportunity of a constant recourse to a valuable library, filled with scarce and curious books on the subject of natural history, which he so assiduously studied. By degrees he became one of the most eminent ornithologists in this or any other country. His merit is so well known in this respect, as to render any eulogium on his performances unnecessary: but it may be observed, that he never trusted to others what he could perform himself; and often found it so difficult to give satisfaction to his own mind, that he frequently made three or four drawings to delineate the object in its most lively character, attitude, and representation. In 1743, the first volume of the History of Birds was published in quarto. His subscribers exceeding even his most sanguine expectations, a second volume appeared in 1747. The third volume was published in 1750. In 1751, the fourth volume came from the press. This volume being the last he intended to publish at that time, he seems to have considered it as the most perfect of his productions in natural history; and therefore devoutly offered it up to the great God of nature, in humble gratitude for all the good things he had received from him in this world. Our author, in 1758, continued his labours under a new title, viz. *Gleanings of Natural History*. A second volume of the Gleanings was published in 1760. The third part, which made the seventh and last volume of his works, appeared in 1764. Thus our author, after a long series of years, the most studious application, and the most extensive correspondence to every quarter of the world, concluded a work which contains engravings and descriptions of more than 600 subjects in natural history, not before described or delineated. He likewise added a general index in French and English; which was afterwards perfected, with the Linnæan names, by by that great naturalist Linnæus himself, who frequently honoured him with his friendship and correspondence. Some time after Mr. Edwards had been appointed library-keeper to the royal college of physicians, he was, on St. Andrew's day, in the year 1750, presented with an honorary compliment by the president and council of the royal society, with the gold medal, the donation of Sir Godfrey Copley, Bart. annually given on that day to the author of any new discovery in art or nature, in consideration of his natural history just then completed. A copy of this medal he had afterwards engraved, and placed under the title in the first volume of his history. He was a few years afterwards elected fellow of the royal society, and of the society of antiquaries, London; and also a member of many of the academies of sciences and learning in different parts of Europe. In compliment to these honorary distinctions from such learned bodies, he presented elegant coloured copies of all his works, to the royal college of physicians, the royal society, the society of antiquarians, and to the British museum; also to the royal academy of sciences at Paris, from whom he received the most polite and obliging letter of thanks by their then secretary Monsieur Defouchy. His collection of drawings, which amounted to upwards of 900, were purchased by the earl of Bute. They contain a great number of British as well as foreign birds, and other animals hitherto not accurately delineated or described. After the publication of the last work, being arrived at his 70th year, he found his sight begin to fail, and his hand lost its wonted steadiness. He retired from public employment to a little house which he purchased at Plaistow; previous to which, he disposed of all the copies, as well as plates, of his works. The conversation of a few select friends, and the perusal of a few select books, were the amusement of the evening of his life; and now and then he made an excursion to some of the principal cities in England, particularly to Bristol, Bath, Exeter, and Norwich. Some years before his death, the alarming depredations of a cancer, which baffled all the efforts of physical skill, deprived him of the sight of one of his eyes: he also suffered much from the stone, a complaint to which at different periods of his life he had been subject. Yet it has been remarked, that, in the severest paroxysms of misery, he was scarcely known to utter a single complaint. Having completed his 80th year, emaciated with age and sickness, he died on the 23d of July, 1773, deservedly lamented by a numerous acquaintance.

EDYSTONE LIGHT-HOUSE, lying off Plymouth harbour, England, was first erected by the corporation of the Trinity-house in 1696; in consideration of which, the masters, &c. of English shipping agreed to pay one penny a ton outwards and inwards. It was demolished by the storm of 1703, and re-erected by act of parliament in the 4th of queen Anne, and the same duty on tonnage of ships granted for its support; which law was enforced in the 8th of June. It has been since destroyed and rebuilt.

EECKHOUT (Gerbrant Vander), history and portrait painter, was born at Amsterdam in 1621, and was a disciple of Rembrandt; whose manner of designing, colouring, and penciling, he imitated so nearly, that it is difficult to distinguish between several of his paintings and those of his master. He painted after nature, and with such a force as only nature can equal: his touch and his colouring are the same as Rembrandt's; but he rather excelled him in the extremities of his figures. His principal employment was for portraits; and in those he was admirable: but he surpassed all his cotemporaries, in the power he had of painting the mind in the countenance. But although Eeckhout painted portraits to so great a degree of perfection, yet was he much more pleased to paint historical subjects, and he executed them with equal success. In that style his composition is rich and full of judgment, the distribution of his masses of light and shadow is truly excellent; and in the opinion of many connoisseurs, he had more transparence in his colouring, and better expression, than his master. He died in 1674.

EEL, in ichthyology, a species of MURÆNA.

Eel-Fishing. See BOBBING and SNIGGLING.

The silver-eel may be catched with several sorts of baits, as powdered-beef, garden-worms, minnows, hens-guts, fish garbage, &c. The most proper time for taking them is in the night, fastening your line to the bank-sides, with your laying-hook in the water: or a line may be thrown with good store of hooks, baited and plumbed, with a float to discover where the line lies, that they may be taken up in the morning.

Microscopic Eels. See ANIMALCULE, n° 8.

Eels in Vinegar, are similar to those in sour paste. The taste of vinegar was formerly thought to be occasioned by the biting of these little animals, but that opinion has been long ago exploded. Mentzelius says, he has observed the actual transformation of these little creatures into flies: but as this hath never been observed by any other person, nor is there an instance of such a transformation in any other animalcule, it seems probable that Mentzelius hath been mistaken in his observations.

Eel-Spear, a forked instrument with three or four jagged teeth, used for catching of eels: that with the four teeth is best, which they strike into the mud at the bottom of the river, and if it strike against any eels it never fails to bring them up.

EFFARE', or EFFRAYE', in heraldry, a term applied to a beast rearing on its hind legs, as if it were frighted or provoked.

EFFECT, in a general sense, is that which results from, or is produced by, any cause. See CAUSE.

EFFEMINATE, womanish, unmanly, voluptuous.

EFFEMINATE (*Effeminati*), according to the vulgate, are mentioned in several pieces of scripture. The word is there used to signify such as were consecrated to some profane god, and prostituted themselves in honour of him. The Hebrew word *kadesh*, translated *effeminatus*, properly signifies *consecrated*, and hence was attributed to those of either sex, who publicly prostituted themselves in honour of Baal and Astarte. Moses expresly forbids these irregularities among the Israelites; but the history of the Jews shows, that they were notwithstanding frequently practised. Levit. xxiii. 18.

EFFENDI, in the Turkish language, signifies *master*: and accordingly it is a title very extensively applied; as, to the mufti and emirs, to the priests of mosques, to men of learning, and of the law. The grand chancellor of the empire is called *reis-effendi*.

EFFERVESCENCE, an intestine motion excited betwixt the parts of two bodies of different natures, when

when they reciprocally dissolve each other. Effervescences are commonly attended with bubbles, vapours, small jets of the liquid, and a hissing noise; and these phenomena are occasioned by the air which at that time disengages itself. Sometimes also they are accompanied with a great degree of heat, the cause of which is not so well known.

Formerly the word *fermentation*, was also applied to effervescences; but now that word is confined to the motion naturally excited in animal and vegetable matters, and from which new combinations among their principles take place.

EFFIGY, the portrait, figure, or exact representation of a person.

EFFIGY, is also used for the print or impression of a coin, representing the prince's head who struck it.

EFFIGY, to execute or degrade in, denotes the execution or degradation of a condemned contumacious criminal, who cannot be apprehended or seized. In France, they hang a picture on a gallows or gibbet, wherein is represented the criminal, with the quality or manner of the punishment: at the bottom is written the sentence or condemnation. Such persons as are sentenced to death are executed in effigy.

EFFLORESCENCE, among physicians, the same with exanthema. See EXANTHEMA.

EFFLORESCENCE, in chemistry, denotes the formation of a kind of mealy powder on the surface of certain bodies. Efflorescence is occasioned either by decomposition or drying. The efflorescence which happens to cobalt and martial pyrites is of the first; and that observed on the crystals of marine alkali, Glauber's salt, &c. of the latter kind. An efflorescence is sometimes also a species or crystallization, the nature of which is not well understood; as, the beautiful vegetations which shoot up from vitriolated tartar acidulated either with the vitriolic or nitrous acids, the saline spiculæ which are observed to shoot from salt butter, &c.

Besides the common crystallization of salts, all of them have the property of appearing in the form of an efflorescence, or small saline spiculæ, when mixed with any thick substance, particularly lime. Whatever salt happens to be made use of, there is little or no difference in the efflorescence. Thus, in butter very much salted, the sea-salt shoots in the form of long spiculæ, though the sea-salt itself never shoots but in the form of cubical crystals. In like manner, Glauber's salt will appear in the form of an efflorescence, as well as the fossile alkali, &c. nor will the forms of the crystals of the efflorescence be perceptibly different from those of sea-salt. The efflorscences which we see very commonly upon walls are in general Glauber's salt. In some cases (but seldom in such efflorescences as we have examined) they are composed of fossile alkali. The reason of these differences is not known. In almost all cases of this kind there seems to be a real growth of salt. On one spot of a plaster wall about two feet square, which we observed particularly, this growth was very evident. The produce was a true Glauber's salt; and by frequently taking off the efflorescence, eight ounces were procured; nor did the prolific virtue of the wall seem to be in the least impaired by the waste.

EFFLORESCENTIA, in botany, (from *effloresco* to bloom); the precise time of the year and month in which every plant shows its first flowers.

Some plants flower twice a-year, as is common between the tropics; others oftener, as the monthly rose. The former are called by botanist *biferæ*; the latter, *multiferæ*.

The time of flowering is determined by the degree of heat which each species requires. Mezereon and snowdrop produce their flowers in February; primrose, in the beginning of March; the greater number of plants, during the month of May; corn, and other grain, in the beginning of June; the vine, in the middle of the same month; several compound flowers, in the months of July and August; lastly, meadow-saffron flowers in the month of October, and announces the speedy approach of winter.

Grass of Parnassus always flowers about the time of cutting down the hay; and in Sweden, the different species of thistle, mountain lettuce, succory, and balsam, seldom flower till after the summer solstice: the country-men even know, as by a kalendar, that the solstice is past when these plants begin to produce their flowers.

The temperature of the seasons has a mighty influence both in accelerating and retarding the flowering of plants. All plants are earlier in warm countries: hence such as are cultivated out of their native soil, never flower till the heat of the climate, or situation into which they are removed, is equal to that under the influence of which they produced flowers in their own country. For this reason, all exotics from warm climates are later in Britain than many plants which it naturally produces.

In general we may observe, that the plants of the coldest countries, and those produced on the mountains in all climates, being of equal temperature, flower about the same time, viz. during the spring in Europe.

Plants that grow betwixt the tropics, and those of temperate climates, flower during our summer.

Plants of temparate climates, situated under the same parallel of latitude with certain parts of Europe, but removed much farther to the west, such as Canada, Virginia, and Mississippi, do not produce flowers till autumn.

Plants of temperate climates in the opposite hemisphere to Europe, flower during our winter, which is the summer of these regions.

Linnæus and Adanson have given a sketch of the different times in which plants flower at Upsal, and Paris.

EFFLUVIUM, in physiology, a term much used by philosophers and physicians, to express the minute particles which exhale from most, if not all, terrestrial bodies, in form of insensible vapours.

EFFRONTES, in church-history, a sect of heretics, in 1534, who scraped their forehead with a knife till it bled, and then poured oil into the wound. This ceremony served them instead of baptism. They are likewise said to have denied the divinity of the Holy Spirit.

EFFUSION, the pouring out of any liquid thing with some degree of force. In the ancient heathen sacrifices

crifices there were divers effusions of wine and other liquors, called *libations*.

Effusion, or Fusion, in astronomy, denotes that part of the sign Aquarius, represented on celestial globes and planispheres, by the water issuing out of the urn of the water-bearer.

EFT, in zoology, the English name of the common lizard. See Lacerta.

EGERIA, or Ægeria, a nymph held in great veneration by the Romans. She was courted by Numa Pompilius; and according to Ovid, she became his wife. This prince frequently visited her; and that he might introduce his laws and new regulations into the state, he solemnly declared before the Roman people, that they were previously sanctified and approved by the nymph Egeria. Ovid says, that Egeria was so disconsolate at the death of Numa, that she melted into tears, and was changed into a fountain by Diana. She is reckoned by many as a goddess who presided over the pregnancy of women; and some maintain that she is the same as Lucina.

EGG, in physiology, a body formed in certain females, in which is contained an embryo or fetus of the same species, under a cortical surface or shell. The exterior part of an egg is the shell; which in a hen, for instance, is a white, thin, and friable cortex, including all the other parts. The shell becomes more brittle by being exposed to a dry heat. It is lined every where with a very thin but a pretty tough membrane, which dividing at, or very near, the obtuse end of the egg, forms a small bag, where only air is contained. In new-laid eggs this follicle appears very little, but becomes lager when the egg is kept.

Within this are contained the albumen or white, and the vitellus or yolk; each of which have their different virtues.

The albumen is a cold, viscous, white liquor in the egg, different in consistence in its different parts. It is observed, that there are two distinct albumens, each of which is inclosed in its proper membrane. Of these one is very thin and liquid: the other is more dense and viscous, and of a somewhat whiter colour; but in old and stale eggs, after some days incubation, inclining to a yellow. As this second albumen covers the yolk on all sides, so it is itself surrounded by the other external liquid. The albumen of a fecundated egg, is as sweet and free from corruption, during all the time of incubation, as it is in new-laid eggs; as is also the vitellus. As the eggs of hens consist of two liquors separated one from another, and distinguished by two branches of umbilical veins, one of which goes to the vitellus, and the other to the albumen; so it is very probable that they are of different natures, and consequently appointed for different purposes.

When the vitellus grows warm with incubation, it becomes more humid, and like melting wax or fat; whence it takes up more space. For as the fetus increases, the albumen insensibly wastes away and condenses: the vitellus, on the contrary, seems to lose little or nothing of its bulk when the fetus is perfected, and only appears more liquid and humid when the abdomen of the fetus begins to be formed.

The chick in the egg is first nourished by the albumen; and when this is consumed, by the vitellus, as with milk. If we compare the chalazæ to the extremities of an axis passing through the vitellus, which is of a spherical form, this sphere will be composed of two unequal proportions, its axis passing through its centre; consequently, since it is heavier than the white, its smaller portion must always be uppermost in all positions of the egg.

The yellowish white round spot, called *cicatricula*, is placed on the middle of the smaller portion of the yolk; and therefore, from what has been said in the last paragraph, must always appear on the superior part of the vitellus.

Not long before the exclusion of the chick, the whole yolk is taken into its abdomen; and the shell, at the obtuse end of the egg, frequently appears cracked some time before the exclusion of the chick. The chick is sometimes observed to perforate the shell with its beak. After exclusion, the yolk is gradually wasted, being conveyed into the small-guts by a small duct.

Eggs differ very much according to the birds that lay them, as to their colour, form, bigness, age, and the different way of dressing them: those most used in food are hens eggs; of which, such as are new-laid are best.

As to the preservation of eggs; it is observed that the egg is always quite full when it is first laid by the hen; but from that time it gradually becomes less and less so, to its decay: and however compact and close its shell may appear, it is nevertheless perforated with a multitude of small holes, though too minute for the discernment of our eyes, the effect of which is a daily decrease of matter within the egg, from the time of its being laid; and the prespiration is much quicker in hot weather than in cold.

To preserve the egg fresh, there needs no more than to preserve it full, and stop its transpiration; the method of doing which is, by stopping up those pores with matter which is not soluble in watery fluids: and on this principle it is, that all kinds of varnish, prepared with spirit of wine, will preserve eggs fresh for a long time, if they are carefully rubbed all over the shell; tallow, or mutton fat, is also good for this purpose; for such as are rubbed over with this, will keep as long as those coated over with varnish.

Artificial Method of Hatching Eggs. See Hatching.

EGINA. See Ægina.

EGINHART, secretary to the emperor Charles the Great, was a German. He is the most ancient historian of that nation, and wrote very eloquently for a man of the 9th century. It is said, that he insinuated himself so well into the favour of Imma, daughter to Charles the Great, that he obtained from her whatever he desired. Charles the Great, having found out the intrigue, did not do as Augustus, who is thought to have banished Ovid because he believed him to be too much favoured by Julia; for he married the two lovers together, and gave them a fine estate in land.

EGLANTINE, in botany. See Rosa.

EGLON, a king of the Moabites, who oppressed the Israelites for 18 years (Judges iii. 12—14.) Calmet confounds this servitude of the Hebrews with that under Cushan-rushathaim, making it to subsist only eight years, from the year of the world 2591 to 2599; whereas

whereas this servitude under Eglon lasted 18 years, and commenced in the year of the world 2661, and 62 years after they had been delivered by Othniel from the subjection of Cushan-rushathaim.

EGRA, a town of Bohemia, formerly imperial, but now subject to the house of Austria. It contains a great number of able artificers, and is famous for its mineral waters. Wallenstein, the emperor's general, was assassinated here in 1634. The French became masters of this town in 1741; but afterwards being blocked up, they were forced to capitulate on September 7th, 1743. It is looked upon as a town of the greatest consequence in Bohemia, except Prague. It is seated on a river of the same name, in E. Long. 12. 30. N. Lat. 50. 21.

EGRET, in ornithology, a species of ardea. See ARDEA.

EGYPT, an extensive country of Africa, lying between 30° and 36° of east longitude, and between 21° and 31° of north latitude. It is bounded by the Mediterranean on the north; by the Red-sea and Isthmus of Suez, which divide it from Arabia, on the east; by Abyssinia or Ethiopia, on the south; and by the desarts of Barca and Nubia, on the west; being 600 miles in length from north to south, and from 100 to 200 in breadth from east to west.

As a nation, the Egyptians may with justice lay claim to as high antiquity as any in the world. The country was most probably peopled by Mizraim the son of Ham

1 Different names.

and grandson of Noah.—By its ancient inhabitants it was called *Chemia*, and is still called *Chemi* in the language of the *Copts* or native Egyptians; and this name it is supposed to have received from Ham the son of Noah. In scripture we find it most generally named *Mizraim*; though in the Psalms it is styled the *land of Ham*.—To us it is best known by the name of *Egypt*, the etymology of which is more uncertain.—Some derive it from *Ægyptus*, a supposed king of the country: others say it signifies no more than "the land of the *Copts*;" *Aia* in Greek signifying a country, and *Æcoptos* being easily softened into *Ægyptus*.—The most probable opinion, however, seems to be, that it received this name from the blackness of its soil, and the dark colour both of its river and inhabitants: for such a blackish colour is by the Greeks called *ægyptios* from *gyps*, and *ægyps* "a vulture;" and by the Latins, *subvulturius*. For the same reason, other names of a similiar import have been given to this country by the Greeks; such as *Aeria*, and *Melambolus*: the river itself was called *Melo* or *Melas*; by the Hebrews, *Shihor*; and by the Ethiopians, *Siris*; all of which signify "black."

Ancient Egypt is by some divided into two parts, the Upper and Lower Egypt: by others into three, the Upper Egypt, properly so called, or *Thebais*; the Middle Egypt, or *Heptanomis*; and the lower Egypt, the best part of which was the *Delta*, or that space encompassed by the branches of the Nile. See THEBAIS, &c.

The Egyptians, like the Chinese, pretend to an excessive antiquity, pretending to have records for ten, twenty, or even fifty thousand years. Thus their history is so much involved in obscurity and fable, that for many ages it must be passed over in silence.—The first mortal king whom the Egyptians own to have reigned in that country, was *Menes* or *Menas*. At what time he reigned, it would be to very little purpose to enquire. He had been preceded, however, by a set of immortals, who it seems left him the kingdom in a very bad situation: for the whole country, except Thebais, was a morass; the people also were entirely destitute of religion, and every kind of knowledge which could render their life comfortable and happy. Menes diverted the course of the Nile, which before that time had washed the foot of a sandy mountain near the borders of Libya, built the city of Memphis, instructed his subjects, and did other things of a similar kind which are usually attributed to the founders of kingdoms.

2 Invaded by the shepherds.

From the time of Menes, the Egyptian chronology is filled with a list of 330 kings who reigned 1400 years, but did nothing worthy of notice.—The first distinct piece of history we find concerning Egypt, is the irruption of the *Shepherds*, by whom the country was subdued; but whether this revolution happened during the vast interval of indolence abovementioned, or before or after, cannot be known. The affair is thus related by Manetho. It happened in the reign of Timaus king of Egypt, that God being displeased with the Egyptians, they suffered a great revolution: for a multitude of men, ignoble in their race, took courage, and, pouring from the east into Egypt, made war with the inhabitants; who submitted to them without resistance. The shepherds, however, behaved with the greatest cruelty; burnt the cities, threw down the temples of the gods, and put to death the inhabitants, carrying the women and children into captivity. This people came from Arabia, and were called *Hycsos*, or *king-shepherds*. They held Egypt in subjection for 259 years; at the end of which period, they were obliged by a king of Upper Egypt, named *Amosis*, or *Thethmosis*, to leave the country. This prince's father had, it seems, gained great advantages over them, and shut them up in a place called *Abaris* or *Avaris*, containing 10,000 acres of land. Here they were closely besieged by Amosis, with an army of 400,000 men; but at last the king, finding himself unable to reduce them by force, proposed an agreement, which was readily accepted. In consequence of this agreement, the shepherds withdrew from Egypt with their families, to the number of 240,000; and, taking the way of the desart entered Syria: but fearing the Assyrians, who were then very powerful, and masters of Asia, they entered the land of Judæa, and built there a city capable of holding so great a multitude, and called it *Jerusalem*.

According to Mr Bruce, the shepherds who invaded Egypt were no other than the inhabitants of Barabra. They were, he says, *carriers* to the Cushites who lived farther to the south. The latter had built the many stately temples in Thebes and other cities of Egypt; though, according to him, they had no dwelling-places but holes or caves in the rocks. Being a commercial people, they remained at home collecting and preparing their articles, which were dispersed by the *barabers* or shepherds already mentioned. These, from the nature of their employment, lived in moveable habitations, as the Tartars do at this day. By the Hebrews, he tells us, they were called *phut*, or *shepherds* by every other people; and from the name *baraber*, the word *Barabra* is derived. By their employment, which was the dispersing the Arabian and African goods all over the continent, they had become a great and powerful people; and from their opposite dispositions and manners, became very frequently enemies to the Egyptians. To one Salatis, our author ascribes the destruction of Thebes in Upper Egypt, so much celebrated by Homer for its magnificence. But this certainly cannot be the case; for Homer wrote long after the time of Joseph: and we find that even then the Egyptians had the shepherds in abhorrence, in all probability because they had been grievously oppressed by them. Mr Bruce counts three invasions of these people; the first, that of Salatis already mentioned, who overthrew the first dynasty of Egyptian kings from Menes, and destroyed Thebes: the second was that of Sabacco or *So*; for according to him this was not the name of a single prince, but of the people, and signifies *shepherds*: and the third after the building of Memphis, where 240,000 of them were besieged as above mentioned. But accounts of this kind are evidently inconsistent in the highest degree; for how is it possible that the *third* invasion, antecedent to the building of Jerusalem, could be posterior to the *second*, if the latter happened only in the days of Hezekiah?

In these early ages, however, it would seem that the kingdom of Egypt had been very powerful and its dominion very widely extended; since we find it said, that the *Bactrians* revolted from Osymandyas, another Egyptian king of very high antiquity, and of whose wealth the most marvellous accounts are given.

After an unknown interval of time from this monarch, reigned Sesostris. He was the first great warrior whose conquests are recorded with any degree of distinctness. In what age of the world he lived, is uncertain. Some chronologers, among whom is Sir Isaac Newton, are of opinion, that he is the Sesac or Shishak, who took Jerusalem in the reign of Rehoboam the son of Solomon. Others, however, place him much earlier; and Mr Whiston will have him to be the Pharaoh who refused to part with the Israelites, and was at last drowned in the Red Sea. Mr Bryant endeavours to prove that no such person ever existed; but that in his history, as well as that of many ancient heroes, we have an abridgment of that of the Cushites or Babylonians, who spread themselves over great part of the known world, and every where brought the people in subjection to them. His reign is reckoned the most extraordinary part of the Egyptian history; and the following seems to be the least fabulous account that can be got of it. The father of Sesostris was told in a dream, by the god Vulcan, that his son, who was then newly born, or perhaps still unborn, should be lord of the whole earth. His father, upon the credit of this vision, got together all the males in the land of Egypt that were born on the same day with Sesostris; appointed nurses and proper persons to take care of them, and had them treated like his own child; being persuaded that they who had been the constant companions of his youth would prove the most faithful ministers, and soldiers. As they grew up, they were inured to laborious exercises; and, in particular, were never permitted to taste any food till they had performed a course of 180 fourlongs, upwards of 22 of our miles. When the old king imagined they were sufficiently educated in the martial way he designed them to follow, they were sent by way of trial of their abilities against the Arabians. In this expedition Sesostris proved successful, and in the end subdued that people who had never before been conquered. He was sent to the westward, and conquered the greatest part of Africa; nor could he be stopped in his career till he arrived at the Atlantic ocean. Whilst he was on this expedition, his father died; and then Sesostris resolved to fulfil the prediction of Vulcan, by actually conquering the whole world. As he knew that this must take up a long time, he prepared for his journey in the best manner possible. The kingdom he divided into 36 provinces, and endeavoured to secure the affections of the people by gifts both of money and land. He forgave all who had been guilty of offences, and discharged the debts of all his soldiers. He then constituted his brother Arais the supreme regent; but forbad him to use the diadem, and commanded him to offer no injury to the queen or her children, and to abstain from the royal concubines. His army consisted of 600,000 foot, 24,000 horse, and 27,000 chariots. Besides these land-forces, he had at sea two mighty fleets; one, according to Diodorus, of 400 sail. Of these fleets, one was designed to make conquests in the west, and the other in the east; and therefore the one was built on the Mediterranean and the other on the Red Sea. The first of these conquered Cyprus, the coast of Phœnicia, and several of the islands called *Cyclades*: the other conquered all the coasts of the Red Sea; but its progress was stopped by shoals and difficult places which the navigators could not pass, so that he seems not to have made many conquests by sea.

With the land-forces Sesostris marched against the Ethiopians and Troglodites: whom he overcame, and obliged them to pay him a tribute of gold, ebony, and ivory. From thence he proceeded as far as the promontory of Dira, which lay near the straits of Babelmandel, where he set up a pillar with an inscription in sacred characters. He then marched on to the country where cinnamon grows, or at least to some country where cinnamon at that time was brought, probably some place in India; and here he in like manner set up pillars, which were to be seen for many ages after. As to his farther conquests, it is agreed by almost all authors of antiquity, that he over-ran and pillaged the whole continent of Asia, and some part of Europe. He crossed the Ganges, and erected pillars on its banks; and from thence he is said to have marched eastwards to the very extremity of the Asiatic continent. Returning from thence, he invaded the Scythians and Thracians: but all authors do not agree that he conquered them. Some even affirm, that he was overthrown by them with great slaughter, and obliged to abandon a great part of his booty and military stores. But whether he had good or bad success in these parts, it is a common opinion that he settled a colony in Colchis. Herodotus, however, who gives the most particular account of the conquests of this monarch, does not say whether the colony was designedly planted by Sesostris, or whether part of his army loitered behind the rest, and took up their residence in that region. From his own knowledge, he asserts, that the inhabitants of that country were undoubtedly of Egyptian descent. This was evident from the personal resemblance they bore to the Egyptians,

tians, who were swarthy-complexioned and frizzle-haired; but more especially from the conformity of their customs, particularly circumcision.

The utmost boundary of this mighty monarch's conquests, however, was in the country of Thrace; for beyond this country his pillars were no where to be seen. These pillars he was accustomed to set up in every country which he conquered, with the following inscription, or one to the same purpose: "Sesostris, king of kings, and lord of lords subdued this country by the power of his arms." Besides these, he left also statues of himself; two of which, according to Herodotus, were to be seen in his time; the one on the road between Ephesus and Phocæa, and the other between Smyrna and Sardis: they were armed after the Ethiopian and Egyptian manner, holding a javelin in one hand and a bow in the other. Across the breast they had a line drawn from one shoulder to the other, with the following inscription; "This region I obtained by these my shoulders." These were mistaken for images of Memnon.

3 Returns to Egypt.

The reasons given by Sesostris for his returning into Egypt from Thrace, and thus leaving the conquest of the world unfinished, were the want of provisions for his army, and the difficulty of the passes. Most probably, however, his return was hastened by the intelligence he received from the high priest of Egypt, concerning the rebellious proceedings of his brother; who, encouraged by his long absence, had assumed the diadem, violated the queen, and also the royal concubines. On receiving this news, Sesostris hastened from Thrace; and at the end of nine years came to Pelusium in Egypt, attended by an innumerable multitude of captives taken from many different nations, and loaded with the spoils of Asia. The treacherous brother met him at this city; and it is said, with very little probability, that Sesostris accepted of an invitation to an entertainment from him. At this he drank freely, together with the queen and the rest of the royal family. During the continuance of the entertainment, Armais caused a great quantity of dried reeds to be laid round the apartment where they were to sleep; and as soon as they were retired to rest set fire to the reeds. Sesostris perceiving the danger he was in, and that his guards, overcharged with liquor, were incapable of assisting him, rushed through the flames, and was followed by his wife and children. In thanksgiving for this wonderful deliverance, he made several donations to the gods, particularly to Vulcan the god of fire. He then took vengeance on his brother Armais, said to be the Danaus of the Greeks, who, being on this occasion driven out of Egypt, withdrew into Greece.

4 His great works.

Sesostris now laid aside all thoughts of war, and applied himself wholly to such works as might tend to the public good, and his own future reputation. In order to prevent the incursions of the Syrians and Arabians, he fortified the east side of Egypt with a wall which ran from Pelusium through the desert to Heliopolis, for 187½ miles. He raised also an incredible number of vast and lofty mounts of earth, to which he removed such towns as had been before been situated too low, in order to secure them from the inundations of the Nile. All the way from Memphis to the sea he dug canals which branched out from the Nile; and not only made an easier communication between different places, but rendered the country in a great measure impassable to any enemy. He erected a temple in every city in Egypt, and dedicated it to the supreme deity of the place; but in the course of such a great undertaking as this necessarily must have been, he took care not to employ any of his Egyptian subjects. Thus he secured their affection, and employed the vast multitude of captives he had brought along with him; and to perpetuate the memory of a transaction so remarkable, he caused to be inscribed on all these temples, "No one native laboured hereon." In the city of Memphis, before the temple of Vulcan, he raised six gigantic statues, each of one stone. Two of them were 30 cubits high, representing himself and his wife; the other four were 20 cubits each, and represented his four sons. These he dedicated to Vulcan in memory of his abovementioned deliverance. He raised also two obelisks of marble 120 cubits high, and charged them with inscriptions, denoting the greatness of his power, his revenues, &c.

The captives taken by Sesostris are said to have been treated with the greatest barbarity; so that at last they resolved at all events to deliver themselves from a servitude so intolerable. The Babylonians particularly were concerned in this revolt, and laid waste the country to some extent; but being offered a pardon and a place to dwell in, they were pacified, and built for themselves a city which they called *Babylon*. Towards the conquered princes who waited on him with their tribute, the Egyptian monarch behaved with unparalled insolence. On certain occasions he is said to have unharnessed his horses, and, yoking kings together, made them draw his chariot. One day, however, observing one of the kings who drew his chariot to look back upon the wheels with great earnestness, he asked what made him to look so attentively at them? The unhappy prince replied, "O king, the going round of the wheel puts me in mind of the vicissitudes of fortune: for as every part of the wheel is uppermost and lowermost by turns, so it is with men; who one day sit on a throne, and on the next are reduced to the vilest degree of slavery." This answer brought the insulting conqueror to his senses; so that he gave over the practice, and thenceforth treated his captives with great humanity. At length this mighty monarch lost his sight, and laid violent hands on himself. 5 His death.

After the death of Sesostris, we meet with another chasm of an indeterminate length in the Egyptian history. It concludes with the reign of Amasis or Ammosis; who being a tyrant, his subjects joined Actisanis the king of Ethiopia to drive him out.—Thus Actisanis became master of the kingdom; and after his death follows another chasm in the history, during which the empire is said to have been in a state of anarchy for five generations.—This period brings us down to the times of the Trojan war. The reigning prince in Egypt was at that time called *Cetes*; by the Greeks, *Proteus*. The priest reported that he was a magician; and that he could assume any shape he pleased, even that of fire. This fable, as told by the Greeks, drew its origin from a custom among the Egyptians, perhaps introduced by Proteus. They were used to adorn and distinguish the heads of their kings with the representations of animals or vegetables, or even

6 Origin of the fable of Proteus.

even with burning incenſe, in order to ſtrike the beholders with the greater awe. Whilſt Proteus reigned,
7 Arrival of Paris and Helen in Egypt.
Paris or Alexander, the ſon of Priam king of Troy, was driven by a ſtorm on the coaſt of Egypt, with Helen, whom he was carrying off from her huſband. But when the Egyptian monarch heard of the breach of hoſpitality committed by Paris, he ſeized him, his miſtreſs, and companions, with all the riches he had brought away with him from Greece. He detained Helen, with all the effects belonging to Menelaus her huſband, promiſing to reſtore them to the injured party whenever they were demanded; but commanded Paris and his companions to depart out of his dominions in three days, on pain of being treated as enemies. In what manner Paris afterwards prevailed upon Proteus to reſtore his miſtreſs, we are not told; neither do we know any thing farther of the tranſactions of this
8 Egypt conquered by Sabbaco.
prince's reign nor of his ſucceſſors, except what has entirely the air of fable, till the days of Sabbaco the Ethiopian, who again conquered this kingdom. He began his reign with an act of great cruelty, cauſing the conquered prince to be burnt alive: nevertheleſs, he no ſooner ſaw himſelf firmly eſtabliſhed on the throne of Egypt, than he became a new man; ſo that he is highly extolled for his mercy, clemency, and wiſdom. He is thought to have been the *So* mentioned in ſcripture, and who entered into a league with Hoſhea king of Iſrael againſt Shalmaneſer king of Aſſyria. He is ſaid to have been excited to the invaſion of Egypt by a dream or viſion, in which he was aſſured, that he ſhould hold that kingdom for 50 years. Accordingly, he conquered Egypt, as had been foretold; and at the expiration of the time abovementioned, he had another dream, in which the tutelar god of Thebes acquainted him, that he could no longer hold the kingdom of Egypt with ſafety and happineſs, unleſs he maſſacred the prieſts as he paſſed through them with his guards. Being haunted with this viſion, and at the ſame time abhorring to hold the kingdom on ſuch terms, he ſent for the prieſts, and acquainted them with what ſeemed to be the will of the gods. Upon this it was concluded, that it was the pleaſure of the Deity that Sabbaco ſhould remain no longer in Egypt; and therefore he immediately quitted that kingdom, and returned to Ethiopia.

Of *Anyſias*, who was Sabbaco's immediate ſucceſſor, we have no particulars worth notice. After him reign-
9 Remarkable ſtory of Sethon.
ed one Sethon, who was both king and prieſt of Vulcan. He gave himſelf up to religious contemplation; and not only neglected the military claſs, but deprived them of their lands. At this they were ſo much incenſed, that they entered into an agreement not to bear arms under him; and in this ſtate of affairs Sennacherib king of Aſſyria arrived before Peluſium with a mighty army. Sethon now applied to his ſoldiers, but in vain: they unanimouſly perſiſted in refuſing to march under his banner. Being therefore deſtitute of all human aid, he applied to the god Vulcan, and requeſted him to deliver him from his enemies. Whilſt he was yet in the temple of that god, it is ſaid he fell into a deep ſleep; during which, he ſaw Vulcan ſtanding at his ſide, and exhorting him to take courage. He promiſed, that if Sethon would but go out againſt the Aſſyrians, he ſhould obtain a complete victory over them. Encouraged by this aſſurance, the king aſſembled a body of artificers, ſhop-keepers, and labourers; and, with this undiſciplined rabble, marched towards Peluſium. He had no occaſion, however, to fight; for the very night after his arrival at Peluſium, an innumerable multitude of field-rats entering the enemies camp, gnawed to pieces the quivers, bowſtrings, and ſhield-ſtraps. Next morning, when Sethon found the enemy diſarmed, and on that account beginning to fly, he purſued them to a great diſtance, making a terrible ſlaughter. In memory of this extraordinary event, a ſtatue of Sethon was erected in the temple of Vulcan, holding in one hand a rat, and delivering theſe words: "Whoſoever beholdeth me, let him be pious."

Soon after the death of Sethon, the form of government in Egypt was totally changed. The kingdom was divided into twelve parts, over which as many of
the chief nobility preſided. This diviſion, however, 10 Reign of Pſammitichus.
ſubſiſted but for a ſhort time. Pſammitichus, one of the twelve, dethroned all the reſt, 15 years after the diviſion had been made. The hiſtory now begins to be diveſted of fable; and from this time may be accounted equally certain with that of any other nation. The vaſt conqueſts of Seſoſtris were now no longer known; for Pſammitichus poſſeſſed no more than the country of Egypt itſelf. It appears, indeed, that none of the ſucceſſors of Seſoſtris, or even that monarch himſelf, had made uſe of any means to keep in ſubjection the countries he had once conquered. Perhaps, indeed, his deſign originally was rather to *pillage* than to conquer; and therefore, on his return, his vaſt empire vaniſhed at once. Pſammitichus, however, endeavoured to extend his dominions by making war on his neighbours; but by putting more confidence in foreign auxiliaries than in his own ſubjects, the latter were ſo much offended, that upwards of 200,000 fighting men emigrated in a body, and took up their reſidence in Ethiopia.—To repair this loſs, Pſammitichus earneſtly applied himſelf to the advancement of commerce; and opened his ports to all ſtrangers, whom he greatly careſſed, contrary to the cruel maxims of his predeceſſors, who refuſed to admit them into the country. He alſo laid ſiege to the city of Azotus in Syria, which held out for 29 years againſt the whole ſtrength of the kingdom; from which we may gather, that, as a warrior, Pſammitichus was by no means remarkable. He is reported to have been the firſt king of Egypt that drank wine. He alſo ſent to diſcover the ſprings of the Nile; and is ſaid to have attempted to diſcover the moſt ancient nation in the world by the following method. Having procured two newly born children, he cauſed them to be brought up in ſuch a manner that they never heard a human voice. He imagined that theſe children would naturally ſpeak the original language of mankind: therefore, when, at two years of age, they pronounced the Phrygian word *beccos* (or ſome ſound reſembling it), which ſignifies bread, he concluded, that the Phrygians were the moſt ancient people in the world.

Nechus, the ſon and ſucceſſor of Pſammitichus, is 11 Succeeded by Nechus,
the *Pharaoh-Necho* of ſcripture, and was a prince of an enterpriſing and warlike genius. In the beginning of his reign, he attempted to cut through the iſthmus of Suez, between the Red ſea and the Mediterranean; but, through the invincible obſtacles which nature has thrown in the way of ſuch undertakings, he was obli-

ged to abandon the enterprize, after having lost 120,000 men in the attempt. After this he sent a ship, manned with some expert Phœnician mariners, on a voyage to explore the coasts of Africa. Accordingly, they performed the voyage; sailed round the continent of Africa; and after three years returned to Egypt, where their relation was deemed incredible.

12 His wars with Josiah and Nebuchadnezzar.

The most remarkable wars in which this king was engaged, are recorded in the sacred writings. He went out against the king of Assyria, by the divine command, as he himself told Josiah, but being opposed by the king of Judæa, he defeated and killed him at Megiddo: after which he set up, in that country, king Jehoiakim, and imposed on him an annual tribute of 100 talents of silver and one talent of gold. He then proceeded against the king of Assyria; and weakened him so much, that the empire was soon after dissolved. Thus he became master of Syria and Phœnicia; but in a short time, Nebuchadnezzar king of Babylon came against him with a mighty army. The Egyptian monarch, not daunted by the formidable appearance of his antagonist, boldly ventured a battle; but was overthrown with prodigious slaughter, and Nebuchadnezzar became master of all the country to the very gates of Pelusium.

13 Apries a martial and successful prince.

The reign of Apries, the *Pharaoh-Hophra* of Scripture, presents us with a new revolution in the Egyptian affairs. He is represented as a martial prince, and in the beginning of his reign very successful. He took by storm the rich city of Sidon; and having overcome the Cypriots and Phœnicians in a sea-fight, returned to Egypt laden with spoil. This success probably incited Zedekiah king of Judæa to enter into an alliance with him against Nebuchadnezzar king of Babylon. The bad success of this alliance was foretold by the prophet Jeremiah; and accordingly it happened. For Nebuchadnezzar having sat down with his army before Jerusalem, Apries marched from Egypt with a design to relieve the city; but no sooner did he perceive the Babylonians approaching him, than he retreated as fast as he could, leaving the Jews exposed to the rage of their merciless enemies; who were thereupon treated as Jeremiah had foretold; and by this step Apries brought upon himself the vengeance denounced by the same prophet.—

14 Bad consequences of his alliance with Zedekiah.

The manner in which these predictions were fulfilled is as follows: The Cyreneans, a colony of the Greeks, being greatly strengthened by a numerous supply of their countrymen under their third king *Battus* styled *the Happy*, and encouraged by the Pythian oracle, began to drive out their Libyan neighbours, and share their possessions among themselves. Hereupon Andican king of Libya sent a submissive embassy to Apries, and implored his protection against the Cyreneans. Apries complied with his request, and sent a powerful army to his relief. The Egyptians were defeated with great slaughter; and those who returned complained that the army had been sent off by Apries in order to be destroyed, and that

15 His subjects revolt.

he might tyrannize without controul over the remainder of his subjects. This thought catching the attention of the giddy multitude, an almost universal defection ensued. Apries sent one Amasis, a particular friend, in whom he thought he could confide, to bring back his people to a sense of their duty. But by this friend he was betrayed; for Amasis, taking the opportunity of the present ferment, caused himself to be proclaimed king. Apries then dispatched one Patarbemis, with orders to take Amasis and bring him alive before him. This he found impossible, and therefore returned without his prisoner; at which the king was so enraged, that he commanded Patarbemis's nose and ears to be cut off. This piece of cruelty completed his ruin; for when the rest of the Egyptians who continued faithful to Apries beheld the inhuman mutilation of so worthy and noble a person as Patarbemis was, they to a man deserted Apries, and went over to Amasis.

Both parties now prepared for war; the usurper having under his command the whole body of native Egyptians; and Apries only those Ionians, Carians, and other mercenaries whom he could engage in his service. The army of Apries amounted only to 30,000; but, though greatly inferior in number to the troops of his rival, as he well knew that the Greeks were much superior in valour, he did not doubt of victory. Nay, so far was Apries puffed up with this notion, that he did not believe it was in the power even of any *God* to deprive him of this kingdom. The two armies soon met, and drew up in order of battle near Memphis. A bloody engagement ensued; in which, though the army of Apries behaved with the greatest resolution, they were at last overpowered with numbers, and utterly defeated, the king himself being taken prisoner. Amasis now took possession of the throne without opposition. He confined Apries in one of his palaces, but treated him with great care and respect. The people, however, were implacable, and could not be satisfied while he enjoyed his life. Amasis, therefore, at last found himself obliged to deliver him into their hands. Thus the prediction received its final completion: Apries was delivered up to those *who sought his life*; and who no sooner had him in their power, than they strangled him, and laid his body in the sepulchre of his ancestors.

16 Apries defeated and taken prisoner by Amasis.

17 Egypt invaded by Nebuchadnezzar.

During these intestine broils, which must have greatly weakened the kingdom, it is probable that Nebuchadnezzar invaded Egypt. He had been for 13 years before this employed in besieging Tyre, and at last had nothing but an empty city for his pains. To take himself some amends, therefore, he entered Egypt, miserably harassed the country, killed and carried away great numbers of the inhabitants, so that the country did not recover from the effects of this incursion for a long time after. In this expedition, however, he seems not to have aimed at any permanent conquest, but to have been induced to it merely by the love of plunder, and of this he carried with him an immense quantity to Babylon.

18 Happy administration of Amasis.

During the reign of Amasis, Egypt is said to have been perfectly happy, and to have contained 20,000 populous cities. That good order might be kept among such vast numbers of people, Amasis enacted a law, by which every Egyptian was bound once a-year to inform the governor of his province by what means he gained his livelihood; and if he failed of this, to put him to death. The same punishment he decreed to those who could not give a satisfactory account of themselves.

This monarch was a great favourer of the Greeks, and married a woman of Grecian extract. To many

Greek cities, as well as particular persons, he made considerable presents. Besides these, he gave leave to the Greeks in general to come into Egypt, and settle either in the city of Naucratis, or carry on their trade upon the sea-coasts; granting them also temples, and places where they might erect temples to their own deities. He received also a visit from Solon the celebrated Athenian lawgiver, and reduced the island of Cyprus under his subjection.

19
Offends Cambyses king of Persia.

This great prosperity, however, ended with the death of Amasis, or indeed before it. The Egyptian monarch had some how or other incensed Cambyses king of Persia. The cause of the quarrel is uncertain; but whatever it was, the Persian monarch vowed the destruction of Amasis. In the mean time *Phanes* of Halicarnassus, commander of the Grecian auxiliaries in the pay of Amasis, took some private disgust; and leaving Egypt, embarked for Persia. He was a wise and able general, perfectly well acquainted with every thing that related to Egypt; and had great credit with the Greeks in that country. Amasis was immediately sensible how great the loss of this man would be to him, and therefore sent after him a trusty enuch with a swift galley. Phanes was accordingly overtaken in Lycia, but not brought back; for, making his guard drunk, he continued his journey to Persia, and presented himself before Cambyses, as he was meditating the destruction of the Egyptian monarchy.

20
And Polycrates tyrant of Samos.

At this dangerous crisis also, the Egyptian monarch imprudently made Polycrates the tyrant of Samos his enemy. This man had been the most remarkable perhaps of any recorded in history, for an uninterrupted course of success, without the intervention of one single unfortunate event. Amasis, who was at this time in strict alliance with Polycrates, wrote him a letter, in which, after congratulating him on his prosperity, he told him that he was afraid lest his successes were too many, and he might be suddenly thrown down into the greatest misery. For this reason he advised him voluntarily to take away something from his own happiness; and to cast away that which would grieve him most if he was accidently to lose it. Polycrates followed his advice, and threw into the sea a signet of inestimable value. This, however, did not answer the intended purpose. The signet happened to be swallowed by a fish, which was taken a few days afterwards, and thus was restored to Polycrates. Of this Amasis was no sooner informed, than considering Polycrates as really *unhappy*, and already on the brink of destruction, he resolved to put an end to the friendship which subsisted between them. For this purpose he dispatched an herald to Samos, commanding him to acquaint Polycrates, that he renounced his alliance, and all the obligations between them; that he might not mourn his misfortune with the sorrow of a friend. Thus Amasis left Polycrates at liberty to act against him, if he chose to do so; and accordingly he offered to assist Cambyses with a fleet of ships in his Egyptian expedition.

Amasis had not, however, the misfortune to see the calamities of his country. He died about 525 years before Christ, after a reign of 44 years; and left the kingdom to his son Psammenitus, just as Cambyses was approaching the frontiers of the kingdom. The new prince was scarce seated on the throne, when the Persians appeared. Psammenitus drew together what forces he could, in order to prevent them from entering the kingdom. Cambyses, however, immediately laid siege to Pelusium, and made himself master of it by the following stratagem: he placed in the front of his army a great number of cats, dogs, and other animals that were deemed sacred by the Egyptians. He then attacked the city, and took it without opposition; the garrison, which consisted entirely of Egyptians, not daring to throw a dart or shoot an arrow against their enemies, lest they should kill some of the holy animals.

21
Egypt invaded by Cambyses.

Cambyses had scarce taken possession of the city, when Psammenitus advanced against him with a numerous army. But before the engagement, the Greeks who served under Psammenitus, to show their indignation against their treacherous countryman Phanes, brought his children into the camp, killed them in the presence of their father and of the two armies, and then drank their blood. The Persians, enraged at so cruel a sight, fell upon the Egyptians with the utmost fury, put them to flight, and cut the greatest part of them in pieces. Those who escaped fled to Memphis, where they were soon after guilty of a horrid outrage. Cambyses sent a herald to them in a ship from Mitylene: but no sooner did they see her come into the port, than they flocked down to the shore, destroyed the ship, and tore to pieces the herald and all the crew; afterwards carrying their mangled limbs into the city, in a kind of barbarous triumph. Not long after, they were obliged to surrender; and thus Psammenitus fell into the hands of his inveterate enemy, who was now enraged beyond measure at the cruelties exercised upon the children of Phanes, the herald, and the Mitylenean sailors.

22
Cruelty and defeat of the Egyptians.

The rapid success of the Persians struck with such terror the Libyans, Cyreneans, Barcæans, and other dependents or allies of the Egyptian monarch, that they immediately submitted. Nothing now remained but to dispose of the captive king, and revenge on him and his subjects the cruelties which they had committed. This the merciless victor executed in the severest manner. On the 10th day after Memphis had been taken, Psammenitus and the chief of the Egyptian nobility were ignominiously sent into one of the suburbs of that city. The king being there seated in a proper place, saw his daughter coming along in the habit of a poor slave with a pitcher to fetch water from the river, and followed by the daughters of the greatest families in Egypt, all in the same miserable garb, with pitchers in their hands, drowned in tears, and loudly bemoaning their miserable situation. When the fathers saw their daughters in this distress, they burst into tears, all but Psammenitus, who only cast his eyes on the ground and kept them fixed there. After the young women, came the son of Psammenitus, with 2000 of young nobility, all of them with bits in their mouths and halters round their necks, led to execution. This was done to expiate the murder of the Persian herald and the Mitylenean sailors; for Cambyses caused ten Egyptians of the first rank to be publicly executed for every one of those that had been slain. Psammenitus, however, observed the same conduct as before, keeping his eyes steadfastly fixed on the ground, though all the Egyptians around him made the loudest lamentations.

22
Their dreadful punishment of Cambyses.

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24 Egypt becomes a province of the Persian and afterwards of the Grecian empire.

The Egyptians were now reduced to the lowest degree of slavery. Their country became a province of the Persian empire: the body of Amasis their late king was taken out of his grave; and after being mangled in a shocking manner, was finally burnt. But what seemed more grievous than all the rest, their god Apis was slain, and his priests ignominiously scourged; and this inspired the whole nation with such an hatred to the Persians, that they could never afterwards be reconciled to them. As long as the Persian empire subsisted, the Egyptians could never shake off their yoke. They frequently revolted indeed, but were always overthrown with prodigious loss. At last they submitted, without opposition, to Alexander the Great: after his death, Egypt again became a powerful kingdom; though since the conquest of it by Cambyses to the present time, it hath never been governed but by foreign princes agreeable to the prophecy of Ezekiel, "There shall be no more a prince of the land of Egypt."

25 Assigned to Ptolemy Lagus, who assumes the title of king.

On the death of Alexander the Great, Egypt, together with Libya, and that part of Arabia which borders on Egypt, were assigned to Ptolemy Lagus as governor under Alexander's son by Roxana, who was but newly born. Nothing was farther from the intention of this governor, than to keep the provinces in trust for another. He did not, however, assume the title of *king*, till he perceived his authority so firmly established that it could not be shaken; and this did not happen till 19 years after the death of Alexander, when Antigonus and Demetrius had unsuccessfully attempted the conquest of Egypt.

From the time of his first establishment on the throne, Ptolemy, who had assumed the title of *Soter*, reigned 20 years; which added to the former 19, make up the 39 years which historians commonly allow him to have reigned alone.—In the 39th year of his reign, he made one of his sons, named *Philadelphus*, partner in the empire: declaring him his successor, to the prejudice of his eldest son named *Ceraunus*; being excited thereto by his violent love for *Berenice* Philadelphus's mother. When the succession was thus settled, Ceraunus immediately quitted the court; and fled at last into Syria, where he was received with open arms by Seleucus Nicator, whom he afterwards murdered.

The most remarkable transaction of this reign was the embellishing of the city of Alexandria, which Ptolemy made the capital of his new kingdom, and of which an account is given under the article ALEXANDRIA. About 284 years before Christ, died Ptolemy Soter, in the 41st year of his reign, and 84th of his age. He was the best prince of his race; and left behind him an example of prudence, justice, and clemency which few of his successors chose to follow. Besides the provinces originally assigned to him, he had added to his empire those of Cælo-Syria, Ethiopia, Pamphylia, Lycia, Caria, and some of the Cyclades. His successor, Ptolemy Philadelphus, added nothing to the extent of the empire; nor did he perform any thing worthy of notice except embellishing further the city of Alexandria, and entering into an alliance with the Romans. In his time, one Magas, the governor of Libya and Cyrene, revolted; and held these provinces as an independent prince, notwithstanding the utmost efforts of Ptolemy to reduce him. At last an accommodation took place; and a marriage was proposed between Berenice, the only daughter of Magas, and Ptolemy's eldest son. The young princess was to receive all her father's dominions by way of dowry, and thus they would again be brought under the dominion of Ptolemy's family. But before this treaty could be put in execution, Magas died; and then Apamea, the princess's mother, did all she could to prevent the match. This, however, she was not able to do; tho' her efforts for that purpose produced a destructive war of four years continuance with Antiochus Theus king of Syria, and the acting of a cruel tragedy in the family of the latter. See SYRIA.

26 Succeeded by Philadelphus.

27 Ptolemy Euergetes a great conqueror.

About 246 years before Christ, Ptolemy Philadelphus died; and was succeeded by his eldest son Ptolemy, who had been married to Berenice the daughter of Magas, as above related. In the beginning of his reign, he found himself engaged in a war with Antiochus Theus king of Syria. From this he returned victorious and brought with him 2500 statues and pictures, among which were many of the ancient Egyptian idols, which had been carried away by Cambyses into Persia. These were restored by Ptolemy to their ancient temples: in memory of which favour, the Egyptians gave him the surname of *Euergetes*, or the Beneficent. In this expedition he greatly enlarged his dominions, making himself master of all the countries that lie between mount Taurus and the confines of India. An account of these conquests was given by himself, inscribed on a monument, to the following effect. "Ptolemy Euergetes, having received from his father the sovereignty of Egypt, Libya, Syria, Phænice, Cyprus, Lycia, Caria, and the other Cyclades, assembled a mighty army of horse and foot, with a great fleet, and elephants, out of Trogloditia and Ethiopia; some of which had been taken by his father, and the rest by himself, and brought from thence, and trained up for war; with this great force he sailed into Asia; and having conquered all the provinces which lie on this side the Euphrates, Cilicia, Pamphylia, Ionia, the Hellespont,

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Hellespont, and Thrace, he crossed that river with all the forces of the conquered countries, and the kings of those nations, and reduced Mesopotamia, Babylonia, Susia, Persia, Media, and all the country as far as Bactria."

On the king's return from this expedition, he passed through Jerusalem, where he offered many sacrifices to the God of Israel, and ever afterwards expressed a great favour for the Jewish nation. At this time, the Jews were tributaries to the Egyptian monarchs, and paid them annually 20 talents of silver. This tribute, however, Onias, who was then high priest, being of a very covetous disposition, had for a long time neglected to pay, so that the arrears amounted to a very large sum. Soon after his return, therefore, Ptolemy sent one of his courtiers named *Athenion* to demand the money, and desired him to acquaint the Jews that he would make war upon them in case of a refusal. A young man, however, named *Joseph*, nephew to Onias, not only found means to avert the king's anger, but even got himself chosen his receiver-general, and by his faithful discharge of that important trust, continued in high favour with Ptolemy as long as he lived.

Ptolemy Euergetes having at last concluded a peace with Seleucus the successor of Antiochus Theus king of Syria, attempted the enlargement of his dominions on the south side. In this he was attended with such success, that he made himself master of all the coasts of the Red Sea, both on the Arabian and Ethiopian sides, quite down to the straits of Babel-mandel. On his return he was met by ambassadors from the Achæans, imploring his assistance against the Etolians and Lacedemonians. This the king readily promised them: but they having in the mean time engaged Antigonus king of Macedon to support them, Ptolemy was so much offended, that he sent powerful succours to Cleomenes king of Sparta; hoping, by that means, to humble both the Achæans and their new ally Antigonus. In this, however, he was disappointed, for Cleomenes, after having gained very considerable advantages over the enemy, was at last entirely defeated in the battle of Sellasia, and obliged to take refuge in Ptolemy's dominions. He was received by the Egyptian monarch with the greatest demonstrations of kindness; a yearly pension of 24 talents was assigned him, with a promise of restoring him to the Spartan throne; but before this could be accomplished, the king of Egypt died, in the 27th year of his reign, and was succeeded by his Ptolemy Philopater.

28 Cleomenes king of Sparta takes refuge in Egypt.

Thus we have seen the Egyptian empire brought to a very great height of power; and had the succeeding monarchs been careful to preserve that strength of empire transmitted to them by Euergetes, it is very probable that Egypt might have been capable of holding the balance against Rome, and after the destruction of Carthage prevented that haughty city from becoming mistress of the world. But after the death of Ptolemy Euergetes, the Egyptian empire, being governed only by weak or vicious monarchs, quickly declined, and from that time makes no conspicuous figure in history.

29 Ptolemy Philopater a cruel tyrant.

Ptolemy Philopater began his reign with the murder of his brother; after which, giving himself up to all manner of licentiousness, the kingdom fell into a kind of anarchy. Cleomenes the Spartan king still resided at court; and being now unable to bear the dissolute manners which prevailed there, he pressed Philopater to give him the assistance he had promised for restoring him to the throne of Sparta. This he the rather insisted upon, because he had received advice that Antigonus king of Macedon was dead, that the Achæans were engaged in a war with the Etolians, and that the Lacedemonians had joined the latter against the Achæans and Macedonians. Ptolemy, when afraid of his brother Magas, had indeed promised to assist the king of Sparta with a powerful fleet, hoping by this means to attach him to his own interest: but now when Magas was out of the way, it was determined by the king, or rather his ministers, that Cleomenes should not be assisted, nor even allowed to leave the kingdom; and this extravagant resolution produced the desperate attempt of Cleomenes, of which an account is given in the history of SPARTA.

Of the disorders which now ensued in the government, Antiochus king of Syria, surnamed *the Great*, took the advantage, and attempted to wrest from Ptolemy the provinces of Cælo-Syria and Palestine. But in this he was finally disappointed; and might easily have been totally driven out of Syria, had not Ptolemy been too much taken up with his debaucheries to think of carrying on the war. The discontent occasioned by this piece of negligence soon produced a civil war in his dominions, and the whole kingdom continued in the utmost confusion till his death, which happened in the 17th year of his reign and 37th of his age.

30 Extraordinary story concerning the Jews.

During the reign of Philopater happened a very extraordinary event with regard to the Jews, which is mentioned in the Maccabees*. The king of Egypt, while on his Syrian expedition, had attempted to enter the temple of Jerusalem; but being hindered by the Jews, he was filled with the utmost rage against the whole nation. On his return to Alexandria, he resolved to make those who dwelt in that city feel the first effects of his vengeance. He began with publishing a decree, which he caused to be engraved on a pillar erected for that purpose at the gate of his palace, excluding all those who did not sacrifice to the gods worshipped by the king. By this means the Jews were debarred from suing to him for justice, or obtaining his protection when they happened to stand in need of it. By the favour of Alexander the Great, Ptolemy Sotor and Euergetes, the Jews enjoyed at Alexandria the same privileges with the Macedonians. In that metropolis the inhabitants were divided into three ranks or classes. In the first were the Macedonians, or original founders of the city, and along with them were enrolled the Jews; in the second were the mercenaries who had served under Alexander; and in the third the native Egyptians. Ptolemy now, to be revenged of the Jews, ordered, by another decree, that they should be degraded from the first rank, and enrolled among the native Egyptians. By the same decree it was enacted, that all of that nation should appear at an appointed time before the proper officers, in order to be enrolled among the common people; that at the time of their enrollment they should have the mark of an ivy leaf, the badge of Bacchus, impressed with a hot iron on their faces; that all who were thus marked should be made slaves; and, lastly, that if any one should stand out against this decree, he should be immediately

* L iii. 2, 3, 4, 5.

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immediately put to death. That he might not, however, ſeem an enemy to the whole nation, he declared, that thoſe who ſacrificed to his gods ſhould enjoy their former privileges, and remain in the ſame claſs. Yet, notwithſtanding this tempting offer, 300 only out of many thouſand Jews who lived in Alexandria could be prevailed upon to abandon their religon in order to ſave themſelves from ſlavery.

The apoſtates were immediately excommunicated by their brethern: and this their enemies conſtrued as done in oppoſition to the king's order; which threw the tyrant into ſuch a rage, that he reſolved to extirpate the whole nation, beginning with the Jews who lived in Alexandria and other cities of Egypt, and proceeding from thence to Judæa and Jeruſalem itſelf. In conſequence of this cruel reſolution, he commanded all the Jews that lived in any part of Egypt to be brought in chains to Alexandria, and there to be ſhut up in the Hippodrome, which was a very ſpacious place without the city, where the people uſed to aſſemble to ſee horſe-races and other public diverſions. He then ſent for Herman maſter of the elephants; and commanded him to have 500 of theſe animals ready againſt the next day, to let looſe upon the Jews in the Hippodrome. But when the elephants were prepared for the execution, and the people were aſſembled in great crowds to ſee it, they were for that day diſappointed by the king's abſence. For, having been late up the night before with ſome of his debauched companions, he did not awake till the time for the ſhew was over, and the ſpectators returned home. He therefore ordered one of his ſervants to call him early on the following day, that the people might not meet with a ſecond diſappointment. But when the perſon awaked him according to his order, the king was not yet returned to his ſenſes; having withdrawn, exceedingly drunk, only a ſhort time before. As he did not remember the order, he therefore fell into a violent paſſion, and threatened with death the ſervant who had awaked him; and this cauſed the ſhew to be put off till the third day. At laſt the king came to the Hippodrome attended with a vaſt multitude of ſpectators; but when the elephants were let looſe, inſtead of falling upon the Jews, they turned their rage againſt the ſpectators and ſoldiers, and deſtroyed great numbers of them. At the ſame time, ſome frightful appearances which were ſeen in the air ſo terrified the king, that he commanded the Jews to be immediately ſet at liberty, and reſtored them to their former privileges. No ſooner were they delivered from this danger than they demanded leave to put to death ſuch of their nation as had abandoned their religion; and this being granted, they diſpatched the apoſtates without excepting a ſingle man.

31 Ptolemy Philometor taken priſoner by Antiochus, and Phyſcon raiſed to the throne.

Philopater was ſucceeded by Ptolemy Epiphanes; and he, after a reign of 24 years, by Ptolemy Philometor. In the beginning of his reign, a war commenced with the king of Syria, who had ſeized on the provinces of Cœle-Syria and Paleſtine in the preceding reign. In the courſe of this war, Philometor was either voluntarily delivered up to Antiochus or taken priſoner. But however this was, the Alexandrians deſpairing of his ever being able to recover his liberty, raiſed to the throne his brother Ptolemy, who took the name of *Euergetes II.* but was afterwards called *Phyſcon*, or "the great-bellied," on account of the prominent belly which by his gluttony and luxury he had acquired. He was ſcarce ſeated on the throne, however, when Antiochus Epiphanes, returning into Egypt, drove out Phyſcon, and reſtored the whole kingdom, except Peluſium, to Philometor. His deſign was to kindle a war betwixt the two brothers, ſo that he might have an opportunity of ſeizing the kingdom for himſelf. For this reaſon he kept to himſelf the city of Peluſium; which being the key of Egypt, he might at his pleaſure re-enter the country. But Philometor, appriſed of his deſign, invited his brother Phyſcon to an accommodation; which was happily effected by their ſiſter Cleopatra. In virtue of this agreement, the brothers were to reign jointly, and to oppoſe to the utmoſt of their power Antiochus, whom they conſidered as a common enemy. On this the king of Syria invaded Egypt with a mighty army, but was prevented by the Romans from conquering it.

32 Philometor reſtored, and reigns jointly with his brother.

33 Difference between the two brothers decided by the Roman ſenate.

The two brothers were no ſooner freed from the apprehenſions of a foreign enemy than they began to quarrel with each other. Their differences ſoon came to ſuch a height, that the Roman ſenate interpoſed. But before the ambaſſadors employed to inquire into the merits of the cauſe could arrive in Egypt, Phyſcon had driven Philometor from the throne, and obliged him to quit the kingdom. On this he dethroned prince fled to Rome, where he appeared meanly dreſſed, and without attendants. He was very kindly received by the ſenate; who were ſo well ſatisfied of the injuſtice done him, that they immediately decreed his reſtoration. He was reconducted accordingly; and, on the arrival of the ambaſſadors in Egypt, an accommodation between the two brothers was negociated. By this agreement, Phyſcon was put in poſſeſſion of Libya and Cyrene, and Philometor of all Egypt and the iſland of Cyprus; each of them being declared independent of the other in the dominion allotted to them. The treaty, as uſual, was confirmed with oaths and ſacrifices, and was broken almoſt as ſoon as made. Phyſcon was diſſatisfied with his ſhare of the dominions; and therefore ſent ambaſſadors to Rome, deſiring that the iſland of Cyprus might be added to his other poſſeſſions. This could not be obtained by the ambaſſadors; and therefore Phyſcon went to Rome in perſon. His demand was evidently unjuſt; but the Romans, conſidering that it was their intereſt to weaken the power of Egypt as much as poſſible, without further ceremony adjudged the iſland to him.

34 Iſland of Cyprus adjudged to Phyſcon.

Phyſcon ſet out from Rome with two ambaſſadors; and arriving in Greece on his way to Cyprus, he raiſed there a great number of mercenaries, with a deſign to ſail immediately to that iſland and conquer it. But the Roman ambaſſadors telling him, that they were commanded to put him in poſſeſſion of it by fair means and not by force, he diſmiſſed his army, and returned to Libya, while one of the ambaſſadors proceeded to Alexandria. Their deſign was to bring the two brothers to an interview on the frontiers of their dominions, and there to ſettle matters in an amicable manner. But the ambaſſador who went to Alexandria, found Philometor very averſe from compliance with the decree of the ſenate. He put off the ambaſſador ſo long, that Phyſcon ſent the other alſo to Alexandria, hoping that the joint perſuaſions of the two would induce

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duce Philometor to comply. But the king, after entertaining them at an immense charge for 40 days, at last plainly refused to submit, and told the ambassadors that he was resolved to adhere to the first treaty. With this answer the Roman ambassadors departed, and were followed by others from the two brothers. The senate, however, not only confirmed their decree in favor of Physcon, but renounced their alliance with Philometor, and commanded his ambassador to leave the city in five days.

35 Philometor refuses to comply.

36 Rebellion against Physcon

In the mean time, the inhabitants of Cyrene having heard unfavourable accounts of Physcon's behaviour during the short time he reigned in Alexandria, conceived so strong an aversion against him, that they resolved to keep him out of their country by force of arms. On receiving intelligence of this resolution, Physcon dropped all thoughts of Cyprus for the present; and hastened with all his forces to Cyrene, where he soon got the better of his rebellious subjects, and established himself in the kingdom. His vicious and tyrannical conduct, however, soon estranged from him the minds of his subjects, in such a manner, that some of them entering into a conspiracy against him, fell upon him one night as he was returning to his palace, wounded him in several places, and left him for dead on the spot. This he laid to the charge of his brother Philometor; and as soon as he was recovered, took another voyage to Rome. Here he made his complaints to the senate, and showed them the scars of his wounds, accusing his brother of having employed the assassins of whom he received them. Though Philometor was known to be a man of a most humane and mild disposition, and therefore very unlikely to have been concerned in so black an attempt; yet the senate, being offended at his refusing to submit to their decree concerning the island of Cyprus, hearkened to this false accusation; and carried their prejudice so far, that they not only refused to hear what his ambassadors had to say, but ordered them immediately to depart from the city. At the same time, they appointed five commissioners to conduct Physcon into Cyprus, and put him in possession of that island, enjoining all their allies in those parts to supply him with forces for that purpose.

Physcon having by this means got together an army which seemed to him to be sufficient for the accomplishment of his design landed in Cyprus; but being there encountered by Philometor in person, he was entirely defeated, and obliged to shelter himself in a city called *Lapitho*. Here he was closely besieged, and at last obliged to surrender. Every one now expected that Physcon would have been treated as he deserved; but his brother, instead of punishing, restored him to the government Libya and Cyrene, adding some other territories instead of the island of Cyprus, and promising him his daughter in marriage. Thus an end was put to the war between the two brothers; for the Romans were ashamed any longer to oppose a prince who had given such a signal instance of his justice and clemency.

37 He is defeated and taken prisoner by Philometor.

On his return to Alexandria, Philometor appointed one Archias governor of Cyprus. But he, soon after the king's departure, agreed with Demetrius king of Syria, to betray the island to him for 500 talents. The treachery was discovered before it took effect; and the traitor to avoid the punishment due to his crime, laid violent hands on himself. Ptolemy being offended with Demetrius for this attempt on Cyprus, joined Attalus king of Pergamus and Ariarathes king of Cappadocia, in setting up a pretender to the crown of Syria. This was Alexander Balas; to whom he even gave his daughter Cleopatra in marriage, after he had placed him on the throne of Syria. But he notwithstanding these and many other favours, being suspected of having entered into a plot against his benefactor, Ptolemy became his greatest enemy; and marching against him, routed his army in the neighbourhood of Antioch. He did not however, long enjoy his victory; for he died in a few days after the engagement, of the wounds he had received.

38 Death of Philometor.

On the death of Philometor, Cleopatra the queen designed to secure the throne for her son. But some of the principal nobility declaring for Physcon a civil war was about to ensue, when matters were compromised on condition that Physcon should marry Cleopatra that he should reign jointly with her during his life, and declare her son by Philometor heir to the crown. These terms were no sooner agreed upon than Physcon married Cleopatra, and, on the very day of the nuptials, murdered her son in her arms.—This was only a prelude to the cruelties which he afterwards practised on his subjects. He was no sooner seated on the throne, than he put to death all those who had shown any concern for the murder of the young prince. He then wrecked his fury on the Jews, whom he treated more like slaves than subjects, on account of their having favoured the cause of Cleopatra. His own people were treated with little more ceremony. Numbers of them were every day put to death for the smallest faults, and often for no fault at all, but merely to gratify his inhuman temper. His cruelty towards the Alexandrians is particularly mentioned under the article ALEXANDRIA.—In a short time, being wearied of his queen, who was also his sister, he divorced her; and married her daughter, who was also called *Cleopatra*, and whom he had previously ravished. In short, his behaviour was so exceedingly wicked, that it soon became quite intolerable to his subjects; and he was obliged to fly to the island of Cyprus with his new queen, and *Memphites*, a son he had by her mother.

39 Monstrous wickedness of Physcon.

40 He is driven out.

On the flight of the king, the divorced queen was placed on the throne by the Alexandrians; but Physcon, fearing lest a son whom he had left behind should be appointed king, sent for him into Cyprus, and caused him to be assassinated as soon as he landed. This provoked the people against him to such a degree, that they pulled down and dashed to pieces all the statues which had been erected to him in Alexandria. This the tyrant supposed to have been done at the instigation of the queen, and therefore resolved to revenge it on her by killing his son whom he had by her. He therefore, without the least remorse, caused the young prince's throat to be cut; and having put his mangled limbs into a box, sent them as a present to his mother Cleopatra. The messenger with whom this box was sent, was one of his guards. He was ordered to wait till the queen's birth-day, which approached, and was to be celebrated with extraordinary pomp; and in the midst of the general rejoicing, he was to deliver the present.

41 Murders his son.

The horror and detestation occasioned by this unexampled piece of cruelty cannot be expressed. An army

army was soon raised, and the command of it given to one *Marsyas*, whom the queen had appointed general, and enjoined to take all the necessary steps for the defence of the country. On the other hand, Physcon, having hired a numerous body of mercenaries, sent them, under the command of one *Hegelochus*, against the Egyptians. The two armies met on the frontiers of Egypt, on which a bloody battle ensued; but at last the Egyptians were entirely defeated, and Marsyas was taken prisoner. Every one expected that the captive general would have been put to death with the severest torments; but Physcon, perceiving that his cruelties only exasperated the people, resolved to try whether he could regain their affections by lenity; and therefore pardoned Marsyas, and set him at liberty.—Cleopatra, in the mean time, being greatly distressed by this overthrow, demanded assistance from Demetrius king of Syria, who had married her eldest daughter by Philometor, promising him the crown of Egypt for his reward. Demetrius accepted the proposal without hesitation, marched with all his forces into Egypt, and there laid siege to Pelusium. But he being no less hated in Syria than Physcon was in Egypt, the people of Antioch, taking advantage of his absence, revolted against him, and were joined by most of the other cities in Syria. Thus Demetrius was obliged to return; and Cleopatra, being now in no condition to

42 Physcon restored.

oppose Physcon, fled to Ptolemais, where her daughter the queen of Syria at that time resided. Physcon was then restored to the throne of Egypt, which he enjoyed without further molestation till his death; which happened at Alexandria, in the 29th year of his reign, and 67th of his age.

To Physcon succeeded Ptolemy Lathyrus, about 122 years before Christ; but he had not reigned long, before his mother, finding that he would not be entirely

43 Ptolemy Lathyrus driven out, and Alexander set up.

governed by her, by false surmises stirred up the Alexandrians who drove him from the throne, and placed on it his youngest brother Alexander. Lathyrus after this was obliged to content himself with the government of Cyprus, which he was permitted to enjoy in quiet. Ptolemy Alexander, in the mean time, finding he was to have only the shadow of sovereignty, and that his mother Cleopatra was to have all the power, stole away privately from Alexandria. The queen used every artifice to bring him back, as well knowing that the Alexandrians would never suffer her to reign alone. At last her son yielded to her intreaties; but soon after, understanding that she had hired assassins to

44 Lathyrus restored

dispatch him, he caused her to be murdered.

The death of the queen was no sooner known to the Alexandrians, than, disdaining to be commanded by a parricide, they drove out Alexander, and recalled Lathyrus.—The deposed prince for some time led a rambling life in the island of Cos; but having got together some ships, he, the next year, attempted to return into Egypt. But being met by *Tyrrhus*, Lathyrus's admiral, he was defeated, and obliged to fly to Myra in Lycia. From Myra he steered his course towards Cyprus, hoping that the inhabitants would place him on the throne, instead of this brother. But *Chareas*, another of Lathyrus's admirals, coming up with him while he was ready to land, an engagement ensued, in which Alexander's fleet was dispersed, and he himself killed.

During these disturbances, *Ap.on* king of Cyrenaica, the son of Ptolemy Physcon by a concubine, having maintained peace and tranquillity in his dominions during a reign of 21 years, died, and by his will left his kingdom to the Romans: and thus the Egyptian empire was considerably reduced and circumscribed. 44 Cyrenaica bequeathed to the Romans.

Lathyrus being now delivered from all competitors, turned his arms against the city of Thebes, which had revolted from him. The king marched in person against the rebels; and, having defeated them in a pitched battle, laid close siege to their city. The inhabitants defended themselves with great resolution for three years. At last, however, they were obliged to submit, and the city was given up to be plundered by the soldiery. They left every where the most melancholy monuments of their avarice and cruelty; so that Thebes, which till that time had been one of the most wealthy cities of Egypt, was now reduced so low that it never afterwards made any figure. 46 City of Thebes ruined.

About 76 years before Christ, Ptolemy Lathyrus was succeeded by Alexander II. He was the son of the Ptolemy Alexander for whom Lathyrus had been driven out; and had met with many adventures. He was first sent by Cleopatra into the island of Cos, with a great sum of money, and all her jewels; as thinking that was the safest place where they could be kept. When Mithridates king of Pontus made himself master of that island, the inhabitants delivered up to him the young Egyptian prince, together with all the treasures. Mithridates gave him an education suitable to his birth; but he, not thinking himself safe with a prince who had shed the blood of his own children, fled to the camp of Sylla the Roman dictator, who was then making war in Asia. From that time he lived in the family of the Roman general, till news was brought to Rome of the death of Lathyrus. Sylla then sent him to Egypt to take possession of the throne. But, before his arrival, the Alexandrians had chosen Cleopatra for their sovereign. To compromise matters, however, it was agreed, that Ptolemy should marry her, and take her for his partner in the throne. This was accordingly done; and 19 days, after the marriage, the unhappy queen was murdered by her husband, who for 15 years afterwards showed himself such a monster of wickedness, that a general insurrection at last ensued among his subjects, and he was obliged to fly to Pompey the Great, who was then carrying on the war against Mithridates king of Pontus. But Pompey refusing to concern himself in the matter, he retired to the city of Tyre, where he died some months after. 47 Alexander II succeeds Lathyrus. 48 Marries Cleopatra and murders her.

When he was forced to shut himself up in the city of Tyre, Alexander had sent ambassadors to Rome, in order to influence the senate in his favour. But, dying before the negociation was finished, he made over by his last will all his rights to the Roman people, declaring them heirs to his kingdom: not out of any affection to the republic; but with a view to raise disputes between the Romans and his rival Auletes, whom the Egyptians had placed on the throne. The will was brought to Rome, where it occasioned warm debates. Some were for taking immediate possession of the kingdom. Others thought that no notice should be taken of such a will, because Alexander had no right to dispose of his dominions in prejudice of his successor, and to exclude from the crown those who were 49 Leaves his kingdom to the Romans.

of the royal blood of Egypt. Cicero represented, that such a notorious imposition would debase the majesty of the Roman people, and involve them in endless wars and disputes; that the fruitful fields of Egypt would be a strong temptation to the avarice of the people, who would insist on their being divided among them; and lastly, that by this means the bloody quarrels about the Agrarian laws would be revived. These reasons had some weight with the senate; but what chiefly prevented them from seizing on Egypt at this time was, that they had lately taken possession of the kingdom of Bithynia in virtue of the will of Nicomedes, and of Cyrene and Libya by the will of Apion. They thought, therefore, that if they should, on the like pretence, take possession of the kingdom of Egypt, this might too much expose their design of setting up a kind of universal monarchy, and occasion a formidable combination against them.

50 Character of Auletes the new king.

Auletes, who was now raised to the throne by the Egyptians, is said to have surpassed all the kings that went before him in the effeminacy of his manners. The name *Auletes*, which signifies the *flute-player*, was given him because he piqued himself on his skill in performing upon that instrument, and was not ashamed even to contend for the prize in the public games. He took great pleasure in imitating the manners of the Bacchanals; dancing in a female dress, and in the same measures that they used during the solemnity of their good Bacchus; and hence he had the surname of the *New Dionysius* or *Bacchus*. As his title to the crown was disputable (he being only the son of a concubine), the first care of Auletes was to get himself acknowledged by the Romans, and declared their

51 Is acknowledged by the Romans.

ally. This was obtained by applying to Julius Cæsar, who was at that time consul, and immensely in debt. Cæsar being glad of such an opportunity of raising money, made the king of Egypt pay pretty dear for his alliance. Six thousand talents, a sum equal to L. 1,162,500 Sterling, were paid partly to Cæsar himself, and partly to Pompey, whose interest was necessary for obtaining the consent of the people. Though the revenues of Egypt amounted to twice this sum, yet Auletes found it impossible for him to raise it without severely taxing his subjects. This occasioned a general discontent; and while the people were almost ready to take up arms, a most unjust decree passed at Rome for seizing the island of Cyprus. When the Alexandrians heard of the intentions of the republic, they pressed Auletes to demand that island as an ancient appendage of Egypt; and, in case of a refusal, to declare war against that haughty and imperious people, who, they now saw, though too late, aimed at nothing less than the sovereignty of the world. With this request the king refused to comply; upon which his subjects, already provoked beyond measure at the taxes with which they were loaded, flew to arms, and

52 Is driven from the throne, and flies to Rome.

surrounded the palace. The king had the good luck to escape their fury, and immediately leaving Alexandria, set sail for Rome.

In his way to that city, he landed on the island of Rhodes, where the famous Cato at that time was, being on his way to Cyprus, to put the unjust decree of the senate in execution. Auletes, desirous to confer with a man of his prudence, immediately sent to acquaint him with his arrival. He imagined, that, upon this notice, Cato would immediately come and wait upon him; but the proud Roman told the messenger, that if the king of Egypt had any thing to say to Cato, he might, if he thought proper, come to his house. Accordingly the king went to pay him a visit; but was received with very little ceremony by Cato, who did not even vouchsafe to rise out of his seat when he came

53 Cato's advice to him.

into his presence. When Auletes had laid his affairs before this haughty republican, he was blamed by him for leaving Egypt, the richest kingdom in the world, in order to expose himself, as he said, to the indignities he would meet with at Rome. There Cato told him, that nothing was in request but wealth and grandeur. All the riches of Egypt, he said, would not be sufficient to satisfy the avarice of the leading men in Rome. He therefore advised him to return to Egypt; and strive, by a more equitable conduct, to regain the affections of this people. He even offered to reconduct him thither, and employ his good offices in his behalf. But though Ptolemy was sensible of the propriety of this advice, the friends he had with him dissuaded him from following it, and accordingly he set out for Rome.

54 Infamous conduct of Auletes.

On his arrival in this metropolis, the king found, to his great concern, that Cæsar, in whom he placed his greatest confidence, was then in Gaul. He was received, however, by Pompey with great kindness. He assigned him an apartment in his own house, and omitted nothing that lay in his power to serve him But, notwithstanding the protection of so powerful a man, Auletes was forced to go from house to house like a private person, soliciting the votes of the senators. After he had spent immense treasures in procuring a strong party in the city, he was at last permitted to lay his complaints before the senate; and at the same time there arrived and embassy from the Alexandrians, consisting of 100 citizens, to acquaint the senate with the reasons of their revolt.

55 Berenice raised to the throne of Egypt.

When Auletes first set out for Rome, the Alexandrians, not knowing what was become of him, placed on the throne his daughter Berenice; and sent an embassy into Syria to Antiochus Asiaticus, inviting him into Egypt to marry the queen, and reign in partnership with her. Antiochus was dead before the arrival of the ambassadors; upon which the same proposal was

56 She marries Seleucus, and murders him.

made to his brother Seleucus, who readily accepted it. This Seleucus is described by Strabo as monstrously deformed in body, and still more so in mind. The Egyptians nicknamed him *Cybiosactes*, or *the Scullion*; a name which seemed more fit for him than any other. He was scarce settled on the throne, when he gave a signal instance of his sordid and avaricious temper. Ptolemy the first had caused the body of Alexander the Great to be deposited in a coffin of massy gold. This the king seized upon; and by that means provoked his wife Berenice to such a degree, that she caused him to

57 Marries Archelaus.

be murdered. She then married one Archelaus, high priest of Comana in Pontus, who pretended to be the son of Mithridates the Great; but was, in fact, only the son of that monarch's general.

Auletes was not a little alarmed on hearing of these transactions, especially when the ambassadors arrived, who he feared would overturn all the schemes he had laboured so much to bring about. The embassy was headed by one Dion, a celebrated academic philosopher, who

who had many powerful friends at Rome. But Ptolemy found means to get both him and most of his followers

58
Auletes murders the Egyptian ambassadors.

assassinated; and this intimidated the rest to such a degree, that they durst not execute their commission, or, for some time, even demand justice for the murder of their colleagues.

The report of so many murders, however, at last spread a general alarm. Auletes, sure of the protection of Pompey, did not scruple to own himself the perpetrator of them. Nay, though an action was commenced against one Ascitius an assassin who had stabbed Dion the chief of the embassy abovementioned, and the crime was fully proved; yet he was acquitted by the venal judges, who had all been bribed by Ptolemy. In a short time, the senate passed a decree, by

59
His restoration decreed by the senate.

which it was enacted, that the king of Egypt should be restored by force of arms. All the great men in Rome were ambitious of this commission; which, they well knew, would be attended with immense profit. Their contests on this occasion took up a considerable time; and at last a prophecy of the Sybil was found out, which forbad the assisting an Egyptian monarch with an army. Ptolemy, therefore, wearied out with so long a delay, retired from Rome, where he had made himself generally odious, to the temple of Diana at Ephesus, there to wait the decision of his fate. Here he remained a considerable time: but as he saw that the senate came to no resolution, tho' he had solicited them by letters so to do; at last, by Pompey's advice, he applied to Gabinius the proconsul of Syria. This Gabinius was a man of a most infamous character, and ready to undertake any thing for money. Therefore, though it was contrary to an express law for any governor to

60
Gabinius undertakes to restore him for a great sum.

go out of his province without positive orders from the senate and people of Rome, yet Gabinius ventured to transgress this law, upon condition of being well paid for his pains. As a recompence for his trouble, however, he demanded 10,000 talents; that is, L. 1,937,500 Sterling. Ptolemy, glad to be restored on any terms, agreed to pay the abovementioned sum; but Gabinius would not stir till he had received one half of it. This obliged the king to borrow it from a Roman knight named *Caius Rabirius Posthumius*; Pompey interposing his credit and authority for the payment of the capital and interest.

Gabinius now set out for Egypt, attended by the famous Mark Anthony, who at this time served in the army under him. He was met by Archelaus, who since the departure of Auletes had reigned in Egypt jointly with Berenice, at the head of a numerous army. The Egyptians were utterly defeated, and Archelaus taken prisoner in the first engagement. Thus Gabinius might have put an end to the war at once: but his avarice prompted him to dismiss Archelaus on his paying a considerable ransom; after which, pretending that he made his escape, fresh sums were demanded from Ptolemy for defraying the expences of the war. For these sums Ptolemy was again obliged to apply to Rabirius, who lent him what money he

61
Archelaus defeated and killed.

wanted at a very high interest. At last, however, Archelaus was defeated and killed, and thus Ptolemy again became master of all Egypt.

No sooner was Auletes firmly settled on the throne, than he put to death his daughter Berenice, and oppressed his people with the most cruel exactions, in order to procure the money he had been obliged to borrow while in a state of exile. These oppressions and

62.
Berenice put to death, and the people oppressed.

exactions the cowardly Egyptians bore with great patience, being intimidated by the garrison which Gabinius had left in Alexandria. But neither the fear of the Romans, nor the authority of Ptolemy, could make them put up an affront offered to their religion. A Roman soldier happened to kill a cat, which was an animal held sacred and even worshipped by the Egyptians; and no sooner was this supposed sacrilege known, than the Alexandrians made a general insurrection, and, gathering together in crowds, made their way through the Roman guards, dragged the soldier out of his house, and, in spite of all opposition, tore him in pieces.

Notwithstanding the heavy taxes, however, which Ptolemy laid on his people, it doth not appear that he had any design of paying his debts. Rabirius, who,

63
Ingratitude of Auletes.

as we have already observed, had lent him immense sums, finding that the king affected delays, took a voyage to Egypt, in order to expostulate with him in person. Ptolemy paid very little regard to his expostulations; but excused himself on account of the bad state of his finances. For this reason he offered to make Rabirius collector-general of his revenues, that he might in that employment pay himself. The unfortunate creditor accepted the employment for fear of losing his debt. But Ptolemy, soon after, upon some frivolous pretence or other, caused him and all his servants to be closely confined. This base conduct exasperated Pompey as much as Rabirius; for the former had been in a manner security for the debt, as the money had been lent at his request, and the business transacted at a country house of his near Alba. However, as Rabirius had reason to fear the worst, he took the first opportunity of making his escape, glad to get off with life from his cruel and faithless debtor. To complete his misfortunes, he was prosecuted at Rome as soon as he returned, 1. For having enabled Ptolemy to corrupt the senate with sums lent him for that purpose. 2. For having debased and dishonoured the character of a Roman knight, by farming the revenues, and becoming the servant of a foreign prince. 3. For having been an accomplice with Gabinius, and sharing with him the 10,000 talents which that proconsul had received for his Egyptian expedition. By the eloquence of Cicero he was acquitted; and one of the best orations to be found in the writings of that author was composed on this occasion. Gabinius was also prosecuted; and, as Cicero spoke against him, he very narrowly escaped death. He was, however, condemned to perpetual banishment, after having been stripped of all he was worth. He lived in exile till the time of the civil wars, when he was recalled by Cæsar, in whose service he lost his life.

64
Leaves his children to the care of the Romans.

Auletes enjoyed the throne of Egypt about four years after his re-establishment; and at his death left his children, a son and two daughters, under the tuition of the Roman people. The name of the son was *Ptolemy*, those of the daughters were *Cleopatra* and *Arsinoe*. This was the Cleopatra who afterwards became so famous, and had so great a share in the civil wars of Rome. As the transactions of the present reign, however, are so closely connected with the affairs of Rome, that they cannot be well understood

Egypt. without knowing the situation of the Romans at that time, we refer for an account of them to the *History of Rome*.

65 State of Egypt till its conquest by the khalif of Cairwan. With Cleopatra ended the family of Ptolemy Lagus, the founder of the Grecian empire in Egypt, after it had held that country in subjection for the space of 294 years. From this time Egypt became a province of the Roman empire, and continued subject to the emperors of Rome or Constantinople. In the year 642, it was conquered by the Arabs under Amru Ebn al As, one of the generals of the khalif Omar. In the year 889, an independent government was set up in his kingdom by Ahmed Ebn Tolun, who rebelled against Al Mokhadi khalif of Bagdad. It continued to be governed by him and his successors for 27 years, when it was again reduced by Al Moctafi khalif of Bagdad. In about 30 years after, we find it again an independent state, being joined with Syria under Mahomet Ebn Taj, who had been appointed governor of these provinces. This government, however, was also but short lived; for in the year 968 it was conquered by Jawhar, one of the generals of Moez Ledinillah, the Fatemite khalif of Cairwan in Barbary. See BARBARY, n° 34.

66 Moez takes possession of his new kingdom. No sooner was Moez informed of the success of his general, than he prepared with all expedition to go and take possession of his new conquest. Accordingly he ordered all the vast quantities of gold which he and his predecessors had amassed, to be cast into ingots of the size and figure of the mill-stones used in hand-mills, and conveyed on camels backs into Egypt. To show that he was fully determined to abandon his dominions in Barbary, and to make Egypt the residence of himself and his successors, he caused the remains of the three former princes of his race to be removed from Cairwan in Barbary, and to be deposited in a stately mosque erected for that purpose in the city of Cairo in Egypt. This was a most effectual method to induce his successors to reside in Egypt also, as it was become an established custom and duty among those princes frequently to pay their respectful visits to the tombs of their ancestors.

64 Will not suffer prayers to be said for the khalif of Bagdad. To establish himself the more effectually in his new dominions, Moez suppressed the usual prayers made in the mosques for the khalifs of Bagdad, and substituted his own name in their stead. This was complied with, not only in Egypt and Syria, but even throughout all Arabia, the city of Mecca alone excepted. The consequence was, a schism in the Mahommedan faith, which continued upwards of 200 years, and was attended with continual anathemas, and sometimes destructive wars between the khalifs of Bagdad and of Egypt.—Having fully established himself in his kingdom, he died in the 45th year of his age, three years after he had left his dominions in Barbary; and was succeeded by his son Abu Al Mansur Barar, surnamed Aziz Billah.

68 Unsuccessful expedition into Syria. The new khalif succeeded to the throne at the age of 21; and committed the management of affairs entirely to the care of Jawhar, his father's long experienced general and prime minister. In 978, he sent this famous warrior to drive out Al Aftekin, the emir of Damascus. The Egyptian general accordingly formed the siege of that place; but at the end of two months, was obliged to raise it, on the approach of an army of Karmatians under the command of Al Hakem. As Jawhar was not strong enough to venture an engagement with these Karmatians, it was impossible for him to hinder them from effecting a junction with the forces of Al Aftekin. He therefore returned, or rather fled, towards Egypt with the utmost expedition; but being overtaken by the two confederate armies, he was soon reduced to the last extremity. He was, however, permitted to resume his march, on condition that he passed under Al Aftekin's sword and Al Hakem's lance; and to this disgraceful condition Jawhar found himself obliged to submit. On his arrival in Egypt, he immediately advised Al Aziz to undertake an expedition in person into the east, against the combined army of Turks, Karmatians, and Damascenes, under the command of Al Aftekin and Al Hakem. The khalif followed his advice; and advancing against his enemies, overthrew them with great slaughter. Al Aftekin himself escaped out of the battle; but was afterwards taken and brought to Al Aziz, who made him his chamberlain, and treated him with great kindness. Jawhar, in the mean time, was disgraced on account of his bad success; and in this disgrace he continued till his death, which happened in the year of our Lord 990, and of the Hegira 381.

69 Aleppo besieged without success. This year Al Aziz having received advice of the death of Saado'dawla prince of Aleppo, sent a formidable army under the command of a general named *Manjubekin*, to reduce that place. Lulu, who had been appointed guardian to Saado'dawla's son, finding himself pressed by the Egyptians, who carried on the siege with great vigour, demanded assistance from the Greek emperor. Accordingly, he ordered a body of troops to advance to Lulu's relief. Manjubekin, being informed of their approach, immediately raised the siege, and advanced to give them battle. An obstinate engagement ensued, in which the Greeks were at last overthrown with great slaughter. After this victory, Manjubekin pushed on the siege of Aleppo very briskly; but finding the place capable of defending itself much longer than he at first imagined, and his provisions beginning to fail, he raised the siege. The khalif upon this sent him a very threatening letter, and commanded him to return before Aleppo. He did so; and continued the siege for 13 months; during all which time it was defended by Lulu with incredible bravery. At last, the Egyptians hearing that a numerous army of Greeks was on their way to relieve the city, they raised the siege, and fled with the utmost precipitation. The Greeks then took and plundered some of the cities which Al Aziz possessed in Syria; and Manjubekin made the best of his way to Damascus, where he set up for himself. Al Aziz being informed of this revolt, marched in person against him with a considerable army; but being taken ill by the way, he expired, in the 21st year of his reign and 42d of his age.

Al Aziz was succeeded by his son Abu Al Mansur, surnamed Al Hakem; who, being only 11 years of age, was put under the tuition of an eunuch of approved integrity.

70 Strange madness of the khalif Al Hakem. This reign is remarkable for nothing so much as the madness with which the khalif was seized in the latter part of it. This manifested itself first by his issuing many preposterous edicts; but at length grew to such

Egypt.

a height, that he fancied himself a god, and found no fewer than 16,000 persons who owned him as such. These were mostly the Dararians, a new sect sprung up about this time, who were so called from their chief, Mahommed Ebn Ishmael, surnamed Darari. He is supposed to have inspired the mad khalif with this impious notion; and, as Darari set up for a second Moses, he did not scruple to assert that Al Hakem was the great Creator of the universe. For this reason, a zealous Turk stabbed him in the khalif's chariot. His death was followed by a three days uproar in the city of Cairo; during which, Darari's house was pulled down, and many of his followers massacred. The sect, however, did not expire with its author. He left behind him a disciple named Hamza, who, being encouraged by the mad khalif, spread it far and wide through his dominions. This was quickly followed by an abrogation of all the Mahommedan fasts, festivals, and pilgrimages, the grand one to Mecca in particular; so that the zealous Mahometans were now greatly alarmed, as justly supposing that Al Hakem designed entirely to suppress the worship of the true God, and introduce his own in its place. From this apprehension, however, they were delivered by the death of the khalif; who was assassinated, by a contrivance of his own sister, in the year 1020.

Al Hakem was succeeded by his son Al Thaher, who reigned 15 years; and left the throne to a son under seven years of age, named Al Mostanser Billah.— In the year 1041, a revolt happened in Syria; but Al Mostanser having sent a powerful army into that country, under the command of one *Anushtekin*, he not only reduced the rebels, but considerably enlarged the Egyptian dominions in Syria.

71 Al Mostanser attempts the conquest of Bagdad.

In 1054, a Turk named Al Bassasiri, having quarrelled with the vizir Al Kayem khalif of Bagdad, fled to Egypt, and put himself under the protection of Al Mostanser. The latter, imagining this would be a favourable opportunity for enlarging his dominions, and perhaps seizing on the city of Bagdad, supplied Bassasiri with money and troops. By this assistance, he was enabled to possess himself of Arabia Irak, and ravaged that province to the very gates of Bagdad. On this, Al Kayem wrote to Togrol Beg, or Tangrolipix, the Turkish sultan, who possessed very extensive dominions in the east, to come to his assistance. The sultan immediately complied with his request, and soon arrived at Bagdad with a formidable army and 18 elephants. Of this Bassasiri gave notice to Al Mostanser, and intreated him to exert himself further for his support against so powerful an enemy. This was accordingly done, but nothing worthy of notice happened till the year 1058. At this time Bassasiri having found means to excite Ibrahim the sultan's brother to a revolt, Trogol Beg was obliged to employ all his force against him. This gave Bassasiri an opportunity of seizing on the city of Bagdad itself: and the unfortunate khalif, according to some, was taken prisoner, or, according to others, fled out of the city. Bassasiri, on his entry, caused Al Mostanser to be immediately proclaimed khalif in all quarters of the city. Al Kayem's vizir he caused to be led on a camel through the streets of Bagdad, dressed in a woollen gown, with a high red bonnet, and a leathern collar about his neck; a man lashing him all the way behind. Then being sewed up in a bull's hide, with the horns placed over his head, and hung upon hooks, he was beaten without ceasing till he died. The imperial palace was plundered, and the khalif himself detained a close prisoner.

72 Khalif of Bagdad assisted by Trogel Beg.

73 Bagdad taken.

74 The khalif restored.

This success was but short-lived; for, in 1059, Togrol Beg defeated his brother Ibrahim, took him prisoner, and strangled him with a bow-string. He then marched to Bagdad, which Bassasiri thought proper to abandon at his approach. Here the khalif Al Kayem was delivered up by Mahras, the governor of a city, called *Haditha*, who had the charge of him. The khalif was immediately restored to his dignity; which Bassasiri no sooner understood, than he again advanced towards the city. Against him Togrol Beg sent a part of his army under some of his generals, while he himself followed with the rest. A battle ensued, in which the army of Bassasiri was defeated, and he himself killed. His head was brought to Togrol Beg, who caused it to be carried on a pike through the streets of Bagdad.

75 Decline of the Egyptian empire

Thus the hopes of Al Mostanser were entirely frustrated; and from this period we may date the declension of the Egyptian empire under the khalifs. They had made themselves masters of almost all Syria; but no sooner was Bassasiri's bad success known, than the younger part of the citizens of Aleppo revolted, and set up Mahomud Azzo'dawla, who immediately laid siege to the citadel. Al Mostanser sent a powerful army against him, which Azzo'dawla entirely defeated, and took the general himself prisoner; and soon after this, he made himself master both of the city and citadel, with all their dependencies. In his new dominions he behaved with the greatest cruelty, destroying every thing with fire and sword, and making frequent incursions into the neighbouring provinces, which he treated in the same manner.

76 Terrible famine and plague.

This disaster was soon followed by others still more terrible. In 1066, a famine raged over all Egypt and Syria, with such fury, that dogs and cats were sold for four or five Egyptian dinars each, and other provisions in proportion. Multitudes of people died in Cairo for want of food. Nay, so great was the scarcity, that the vizir had but one servant left who was able to attend him to the khalif's palace, and to whom he gave the care of his horse when he alighted at the gate. But, at his return, he was surprised to find that the horse had been carried off, killed, and eaten by the famished people. Of this he complained to the khalif; who caused three of them who carried off the horse to be hanged. Next day, however, he was still more surprised to hear, that all the flesh had been picked off the bones of the three unhappy criminals, so that nothing but the skeletons were left. And to such a degree of misery were the inhabitants, not only in Cairo but through all Egypt, reduced, that the carcasses of those who died were sold for food at a great price, instead of being buried. All this time the khalif showed the greatest kindness and beneficence towards his unhappy subjects, insomuch that of 10,000 horses, mules, and camels, which he had in his stables when the famine began, he had only three left when it was removed.

77 Invaded by the Turks.

The famine was followed by a plague; and this by an invasion of the Turks under Abu Ali Hasan Naserod'dawla the very general who had been sent against

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gainst the rebel Azzo'dawla and defeated by him. He began with besieging the khalif in his own palace; and the unhappy prince, being in no condition to make resistance, was obliged to buy himself off at the expence of every thing valuable that was left in his exhausted capital and treasury. This, however, did not hinder these merciless plunderers from ravaging all the Lower Egypt from Cairo to Alexandria, and committing the most horrid cruelties through that whole tract.—This happened in the years 1067 and 1068; and in 1069 and 1070, there happened two other revolts in Syria: so that this country was now almost entirely lost.

In 1095 died the khalif Al Mostanser, having reigned 60 years; and was succeeded by his son Abul Kasem, surnamed Al Mostali.—The most remarkable

78 Jerusalem taken.

transaction of this prince's reign, was his taking the city of Jerusalem from the Turks in 1098: but this success was only of short duration; for it was, the same year, taken by the crusaders.

From this time to the year 1164, the Egyptian history affords little else than an account of the intestine broils and contests between the vizirs or prime ministers, who were now become so powerful, that they had in a great measure stripped the khalifs of their civil power, and left them nothing but a shadow of spiritual dignity. These contests at last gave occasion to

79 A revolution in the kingdom.

a revolution, by which the race of Fatemite khalifs was totally extinguished. This revolution was accomplished in the following manner.—One *Shawer*, having overcome all his competitors, became vizir to Al Aded, the eleventh khalif of Egypt. He had not been long in possession of this office, when Al Dargam, an officer of rank, endeavoured to deprive him of it. Both parties quickly had recourse to arms; and a battle ensued, in which Shawer was defeated, and obliged to fly to Nuroddin prince of Syria, by whom he was graciously received, and who promised to reinstate him in his office of vizir. As an inducement to Nuroddin to assist him more powerfully, Shawer told him that the crusaders had landed in Egypt, and made a considerable progress in the conquest of it. He promised also, that, in case he was reinstated in his office, he would pay Nuroddin annually the third part of the revenues of Egypt; and would, besides, defray the whole expence of the expedition.

As Nuroddin bore an implacable hatred to the Christians, he readily undertook an expedition against them, for which he was to be so well paid. He therefore sent an army into Egypt under the command of Shawer and a general named *Asadoddin*. Dargam, in the mean time, had cut off so many generals whom he had imagined favourable to Shawer's interest, that he thereby weakened the military force of the kingdom, and in a great measure deprived himself of the power of resistance. He was therefore easily overthrown by Asadoddin, and Shawer reinstated in the office of vizir. The faithless minister, however, no sooner saw himself firmly established in his office, than he refused to fulfil his engagements to Nuroddin by paying the stipulated sums. Upon this, Asadoddin seized Pelusium and some other cities. Shawer then entered into an alliance with the crusaders, and Asadoddin was besieged by their combined forces in Pelusium. Nuroddin, however, having invaded the Christian dominions in Syria, and taken a strong fortress called *Harem*, Shawer and his confederates thought proper to hearken to some terms of accommodation, and Asadoddin was permitted to depart for Syria.

In the mean time, Nuroddin, having subdued the greatest part of Syria and Mesopotamia, resolved to make Shawer feel the weight of his resentment, on account of his perfidious conduct. He therefore sent back Asadoddin into Egypt with a sufficient force, to compel Shawer to fulfil his engagements: but this the vizir took care to do before the arrival of Asadoddin; and thus, for the present, avoided the danger. It was not long, however, before he gave Nuroddin fresh occasion to send this general against him. That prince had now driven the crusaders almost entirely out of Syria, but was greatly alarmed at their progress in Egypt; and consequently offended at the alliance which Shawer had concluded with them, and which he still persisted in observing. This treaty was also thought to be contrived on purpose to prevent Shawer from being able to fulfil his promise to Nuroddin, of sending him annually a third of the revenues of Egypt. Nuroddin therefore again dispatched Asadoddin into Egypt, in the year 1166, with a sufficient force, and attended by the famous Salahaddin, or Saladin, his own nephew. They entered the kingdom without opposition, and totally defeated Shawer and the crusaders. They next made themselves masters of Alexandria; and, after that over-ran all the Upper Egypt. Saladin was left with a considerable garrison in Alexandria; but Asadoddin was no sooner gone, than the crusaders laid siege to that city. This at last obliged Asadoddin to return to its relief. The great losses he had sustained in this expedition probably occasioned his agreeing to a treaty with Shawer, by which he engaged to retire out of Egypt, upon being paid a sum of money.

Asadoddin was no sooner gone, than Shawer entered into a fresh treaty whith the Franks. By this new alliance he was to attack Nuroddin in his own dominions, as he was at that time engaged in quelling some revolters, which would effectually prevent his sending any more forces into Egypt. This treaty so provoked the Syrian prince, that he resolved to suspend his other conquests for some time, and exert his whole strength in the conquest of Egypt.

80 Conquests of the crusaders.

By this time the crusaders had reduced Pelusium, and made a considerable progress in the kingdom, as well as in some other countries, through the divisions which reigned among the Mahometan princes. In such places as they conquered, they put almost every body to the sword, Christians as well Mahometans; selling their prisoners for slaves, and giving up the towns to be plundered by the soldiers. From Pelusium they marched to Cairo; which was then in no posture of defence, and in the utmost confusion, by reason of the divisions which reigned in it. Shawer, therefore, as soon as he heard of their approach, caused the ancient quarter called *Mesr* to be set on fire, and the inhabitants to retire into the other parts. He also prevailed upon the khalif to solicit the assistance of Nuroddin; which the latter was indeed pretty much inclined of himself to grant, as it gave him the fairest opportunity he could have wished for, both of driving the crusaders out of Egypt, and of seizing the kingdom

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dom to himself. For this purpose he had already raised an army of 60,000 horse under his general Asadoddin; and, on the receipt of Al Aded's message, gave them orders to set out immediately. The crusaders were now arrived at Cairo; and had so closely besieged that place, that neither Shawer nor the khalif knew any thing of the approach of the Moslem army which was hastening to their relief. The vizir, therefore, finding it impossible to hold out long against the enemy, had recourse to his old subterfuge of treaties and high promises. He sent the enemy 100,000 dinars, and promised them 900,000 more, if they would raise the siege; which they, dreading the approach of Asadoddin, very readily accepted.

81
They are repulsed by the army of Nuroddin prince of Damascus.

The army of Nuroddin now approached the capital by hasty marches, and were every where received with the greatest demonstrations of joy. Asadoddin, on his arrival at Cairo, was invited by Al Aded to the royal palace, where he was entertained in the most magnificent manner, and received several presents; nor were Saladin and the other principal officers less magnificently treated. Shawer also, conscious of his perfidious conduct, was no less assiduous in attending punctually upon him. But having invited the general and some others to an entertainment, he had formed a scheme of having them seized and murdered. The plot, however, being discovered, Shawer himself had his head cut off, and Asadoddin was made vizir in his stead. He did not, however, long enjoy his new dignity; for he died two months and five days after his instalment, being succeeded in his office of vizir by his nephew Saladin.

82
Saladin becomes vizir of Egypt.

The new vizir was the youngest of all the grandees who aspired to that office, but had already given some signal proofs of his valour and conduct. What determined the khalif to prefer him to all the rest is not known; but it is certain that some of them were highly displeased with his promotion, and even publicly declared that they would not obey him. In order to gain these to his interest, therefore, Saladin found it necessary to distribute among them part of the vast treasures left by his uncle; by which means he soon governed Egypt without controul, as had been customary with the vizirs for some time before. Soon after his being installed into the office of vizir, he gave a total defeat to the negroes who guarded the royal palace, and had opposed his election; by which means, and a strong garrison he had placed in the castle of Cairo, his power became firmly established. Though he had not the least intention of continuing in his allegiance to Nuroddin, he did not think it prudent at first to declare himself. He sent for his father, however, and the rest of his family, who were in Nuroddin's dominions, in order, as he said, to make them partakers of his grandeur and happiness. Nuroddin did not think proper to deny this request; though, being already jealous of the great power of Saladin, he insisted that his family should consider him only as one of his generals in Egypt.

A good understanding subsisted between Nuroddin and Saladin for some time, which did not a little contribute to raise the credit of the latter with the Egyptians. In 1169, Nuroddin sent him orders to omit the name of Al Aded, the khalif of Egypt, in the public prayers, and substitute that of the khalif of Bagdad in its place. This was at any rate a dangerous attempt; as it might very readily produce a revolt in favour of Al Aded; or if it did not, it gave Saladin an opportunity of engrossing even that small remnant of power which was left to the khalif. Al Aded, however, was not sensible of his disgrace; for he was on his death-bed, and past recovery, when Nuroddin's orders were executed. After his death, Saladin seized on all his wealth and valuable effects; which consisted of jewels of prodigious size, sumptuous furniture, a library containing 100,000 volumes, &c. His family he caused to be closely confined in the most private and retired part of the palace; and either manumitted his slaves, or kept them for himself, or disposed of them to others.

83
Seizes the effects of the khalif.

Saladin was now arrived at the highest pitch of wealth, power, and grandeur. He was, however, obliged to behave with great circumspection with regard to Nuroddin; who still continued to treat him as his vassal, and would not suffer him to dispute the least of his commands. He relied for advice chiefly on his father Ayub; who was a consummate politician, and very ambitious of seeing his son raised to the throne of Egypt. He therefore advised Saladin to continue stedfast in his resolutions; and, whilst he amused Nuroddin with feigned submissions, to take every method in his power to secure himself in the possession of so valuable a kingdom. Nuroddin himself, however, was too great a master in the art of dissimulation to be easily imposed on by others: and therefore, though he pretended to be well pleased with Saladin's conduct, he was all this time raising a powerful army, with which he was fully determined to invade Egypt the following year. But while he meditated this expedition, he was seized with a quinsy at the castle of Damascus, which put an end to his life, in the year 1173.

84
Aspires to the crown.

Saladin, though now freed from the apprehensions of such a formidable enemy, dared not venture to assume the title of *Sovereign*, while he saw the successor of Nuroddin at the head of a very powerful army, and no less desirous than able to dispossess him. For this reason his first care was to secure to himself an asylum, in case he should be obliged to leave Egypt altogether. For this purprse he chose the kingdom of Nubia; but having dispatched his brother Malek Turanshah thither, at the head of a considerable army, the latter was so much struck with the sterility and desolate appearance of the country, that he returned without attempting any thing. Saladin then sent his brother into Arabia Felix, in order to subdue that country, which had been for some time held by Abdalnabi an Arabian prince. Malek entered the country without opposition; and having brought Abdalnabi to a general action, entirely defeated him, took him prisoner, and threw him into irons. He then over-ran and reduced under subjection to Saladin great part of the country, taking no fewer than 80 castles or fortresses of considerable strength.

85
Subdues Arabia Felix.

After this good fortune, Saladin, now sure of a convenient place of refuge in case of any misfortune, assumed the title of *Sultan* or sovereign of Egypt; and was acknowledged as such by the greater part of the states. The zeal of the Egyptians for the Fatemite khalifs, however, soon produced a rebellion. One *Al Kanz*, or *Kanzanaddowla*, governor of a city in Upper Egypt, assembled a great army of blacks, or rather swarthy

86
Assumes the title of sultan.

Egypt. swarthy natives; and marching directly into the lower country, was there joined by great numbers of other Egyptians. Against them Saladin dispatched his brother Malek, who soon defeated and entirely dispersed them. This, however, did not prevent another insurrection under an impostor, who pretended to be David the son of Al Aden the last Fatemite khalif, and had collected a body of 100,000 men. But before these had time to do any great damage, they were surprised by the sultan's forces, and entirely defeated. Above 300 were publicly hanged, and a vast number perished in the field, insomuch that it was thought scarce a fourth part of the whole body escaped.

About this time Saladin gained a considerable advantage over the crusaders, commanded by William II. king of Sicily. That prince had invaded Egypt with a numerous fleet and army, with which he laid close siege to Alexandria both by sea and land. Saladin, however, marched to the relief of the city with such surprising expedition, that the crusaders were seized with a sudden panic, and fled with the utmost precipitation, leaving all their military engines, stores, and baggage behind.

87 Saladin made sovereign of Damascus.

In the year 1175, the inhabitants of Damascus begged of Saladin to accept the sovereignty of that city and it dependencies; being jealous of the minister, who had the tuition of the reigning prince, and who governed all with an absolute sway. The application was no sooner made, than the sultan set out with the utmost celerity to Damascus, at the head of a chosen detachment of 700 horse. Having settled his affairs in that city, he appointed his brother Saif Al Islam governor of it; and set out for Hems, to which he immediately laid siege. Having made himself master of this place, he then proceeded to Hamah. The city very soon surrendered, but the citadel held out for some time. Saladin pretended that he accepted the sovereignty of Damascus and the other places he had conquered, only as Deputy to Al Malek Al Saleh, the successor of Nuroddin, and who was then under age; and that he was desirous of sending Azzoddin, who commanded in the citadel, with a letter to Aleppo, where the young prince resided. This so pleased Azzoddin, that he took the oath of fidelity to Saladin, and immediately set out with the sultan's letter. He had not, however, been long at Aleppo before he was by the minister's orders thrown into prison; upon which his brother, who had been appointed governor of the citadel Hamah in his absence, delivered it up to Saladin without further ceremony. The sultan then marched to Aleppo, with a design to reduce it; but, being vigorously repulsed in several attacks, he was at last obliged to abandon the enterprise. At the same time, Kamschlegin, Al Malek's minister or vizir, hired the chief of the Batanists, or Assassins*, to murder him. Several attempts were made in consequence of this application; but all of them, happily for Saladin, miscarried.

*See *Assassin*.

After raising the siege of Aleppo, Saladin returned to Hems, which place the crusaders had invested. On his approach, however, they thought proper to retire; after which, the sultan made himself master of the strong castle belonging to that place, which, before, he had not been able to reduce. This was soon followed by the reduction, of Balbec; and these rapid conquests so alarmed the ministers of Al Malek, that, entering into a combination with some of the neighbouring princes, they raised a formidable army, with which they designed to crush the sultan at once. Saladin, fearing the event of a war, offered to cede Hems and Hamah to Al Malek, and to govern Damascus only as his lieutenant: bu these terms being rejected, a battle ensued; in which the allied army was utterly defeated, and the shattered remains of it shut up in the city of Aleppo. This produced a treaty, by which Saladin was left master of all Syria, excepting only the city of Aleppo and the territory belonging to it.

88 Defeats his enemies.

89 Receives a terrible overthrow from the crusaders.

In 1176 Saladin returned from the conquest of Syria, and made his triumphal entry into Cairo. Here, having rested himself and his troops for some time, he began to encompass the city with a wall 29,000 cubits in length, but which he did not live to finish. Next year he led a very numerous army into Palestine against the crusaders. But here his usual good fortune failed him. His army was entirely defeated. Forty thousand of his men were left dead on the field; and the rest fled with so much precipitation, that, having no towns in the neighbourhood where they could shelter themselves, they traversed the vast desart between Palestine and Egypt, and scarce stopped till they reached the capital itself. The greatest part of the army by this means perished; and as no water was to be had in the desart abovementioned, almost all the beasts died of thirst before the fugitives arrived on the confines of Egypt. Saladin himself seemed to have been greatly intimidated; for in a letter to his brother Al Malek, he told him, that "he was more than once in the most imminent danger; and that God, as he apprehended, had delivered him from thence, in order to reserve him for the execution of some grand and important design."

In the year 1182, the sultan set out on an expedition to Syria with a formidable army, amidst the acclamations and good wishes of the people. He was, however, repulsed with loss both before Aleppo and Al Mawsel, after having spent much time and labour in besieging these two important places.

90 The Christians receive a great defeat at sea.

In the mean time, a most powerful fleet of European ships appeared on the Red Sea, which threatened the cities of Mecca and Medina with the utmost danger. The news of this armament no sooner reached Cairo, than Abu Becr, Saladin's brother, who had been left viceroy in the sultan's absence, caused another to be fitted out with all speed under the command of Lulu, a brave and experienced officer; who quickly came up with them, and a dreadful engagement ensued. The Christians were defeated after an obstinate resistance, and all the prisoners butchered in cold blood. This proved such a terrible blow to the Europeans, that they never more ventured on a like attempt.

91 Saladin's rapid conquests.

In 1183, Saladin continued to extend his conquests. The city of Amida in Mesopotamia surrendered to him in eight days; after which, being provoked by some violence committed by the prince of Aleppo, he resolved at all events to make himself master of that place. He was now attended with better success than formerly; for as his army was very numerous, and he pushed on the siege with the utmost vigour, Amadoddin the prince capitulated, upon condition of being allowed to possess certain cities in Mesopotamia which had

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had formerly belonged to him, and being ready to attend the sultan on whatever expedition he pleased. After the conquest of Aleppo, Saladin took three other cities, and then marched against his old enemies the crusaders. Having sent out a party to reconnoitre the enemy, they fell in with a considerable detachment of Christians; whom they easily defeated, taking about 100 prisoners, with the loss of only a single man on their side. The sultan, animated by this first instance of success, drew up his forces in order of battle, and advanced against the crusaders, who had assembled their whole army at Sepphoris in Galilee. On viewing the sultan's troops, however, and perceiving them to be greatly superior in strength to what they had at first apprehended, they thought proper to decline an engagement, nor could Saladin with all his skill force them to it. But though it was found impossible to bring the crusaders to a decisive engagement, Saladin found means to harass them greatly, and destroyed great numbers of their men. He carried off also many prisoners, dismantled three of their strongest cities, laid waste their territories, and concluded the campaign with taking another strong town.

92 Christians totally defeated.

For three years Saladin continued to gain ground on the crusaders, yet without any decisive advantage; but in 1187, the fortune of war was remarkably unfavourable to them. The Christians now found themselves obliged to venture a battle, by reason of the cruel ravages committed in their territories by Saladin, and by reason of the encroachments he daily made on them. Both armies therefore being resolved to exert their utmost efforts, a most fierce and bloody battle ensued. Night prevented victory from declaring on either side, and the fight was renewed with equal obstinacy next day. The victory was still left undecided; but the third day the sultan's men, finding themselves surrounded by the enemy on all sides but one, and there also hemmed in by the river Jordan, so that there was no room to fly, fought like men in despair, and at last gained a most complete victory. Vast numbers of the Christians perished on the field. A large body found means to retire in safety to the top of a neighbouring hill covered with wood; but being surrounded by Saladin's troops, who set fire to the wood, they were all obliged to surrender at discretion. Some of them were butchered by their enemies as soon as they delivered themselves into their hands, and others thrown into irons. Among the latter were the king of Jerusalem himself, Arnold prince of Al Shawbec and Al Carac, the masters of the Templars and Hospitalers, with almost the whole body of the latter. So great was the consternation of the Christians on this occasion, that one of Saladin's men is said to have taken 30 of them prisoners, and tied them together with the cord of his tent, to prevent them from making their escape. The masters of the Templars and Hospitalers with the knights acting under them, were no sooner brought into Saladin's presence, than he ordered them all to be cut in pieces. He called them *Assassins* or *Batanists*; and had been wont to pay 50 dinars for the head of every Templar or Hospitaler that was brought him. After the engagement, Saladin seated himself in a magnificent tent, placing the king of Jerusalem on his right hand, and Arnold prince of Al Shawbec and Al Carac on his left. Then he drank to the former, who was at that time ready to expire with thirst, and at the same time offered him a cup of snow-water. This was thankfully received; and the king immediately drank to the prince of Al Carac, who sat near him. But here Saladin interrupted him with some warmth: "I will not (says he) suffer this cursed rogue to drink; as that, according to the laudable and generous custom of the Arabs, would secure to him his life." Then, turning towards the prince, he reproached him with having undertaken the expedition while in alliance with himself, with having intercepted an Egyptian caravan in the time of profound peace, and massacring the people of which it was composed, &c. Notwithstanding all this, he told him, he would grant him his life, if he would embrace Mahometanism. This condition, however, was refused; and the sultan, with one stroke of his scimeter, cut off the prince's head. This greatly terrified the king of Jerusalem; but Saladin assured him he had nothing to fear, and that Arnold had brought on himself a violent death by his want of common honesty.

93 His further conquests.

The crusaders being thus totally defeated and dispersed, Saladin next laid siege to Tiberias, which capitulated in a short time. From thence he marched towards Acca or Ptolemais, which likewise surrendered after a short siege. Here he found 4000 Mahometan prisoners in chains, whom he immediately released. As the inhabitants enjoyed at present a very extensive trade, the place being full of merchants, he found there not only vast sums of money, but likewise a great variety of wares exceedingly valuable, all which he seized and applied to his own use. About the same time his brother Al Malec attacked and took a very strong fortress in the neighbourhood; after which the sultan divided his army into three bodies, that he might with the greater facility over-run the territories of the Christians. Thus, in a short time, he made himself master of Neapolis, Cæsarea, Sepphoris, and other cities in the neighbourhood of Ptolemais, where his soldiers found only women and children, the men having been all killed or taken prisoners. His next conquest was Joppa, which was taken by storm after a vigorous resistance. Every thing being then settled, and a distribution made of the spoils and captives, Saladin marched in person against Tebrien, a strong fortress in the neighbourhood of Sidon; which was taken by assault, after it had sustained a siege of six days. No sooner was he master of this place, than he ordered the fortress to be razed, and the garrison put to the sword. From Tebrien the victorious sultan proceeded to Sidon itself; which, being deserted by its prince, surrendered almost on the first summons. Berytus was next invested, and surrendered in seven days. Among the prisoners Saladin found in this place the prince of a territory called *Hobiel*, who by way of ransom delivered up his dominions to him, and was of consequence released. About the same time, a Christian ship, in which was a nobleman of great courage and experience in war, arrived at the harbour of Ptolemais, not knowing that it was in the hands of Saladin. The governor might easily have secured the vessel; but neglecting the opportunity, she escaped to Tyre, where the abovementioned nobleman, together with the prince of Hobeil, contributed not a little to

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to retrieve the affairs of the christians, and enable them to make a stand for four years after.

94 Jerusalem taken.

Saladin in the mean time went on with his conquests. Having made himself master of Ascalon after a siege of 14 days, he next invested Jerusalem. The garrison was numerous, and made an obstinate defence; but Saladin having at last made a breach in the walls by sapping, the besieged desired to capitulate. This was at first refused; upon which the Christian ambassador made the following speech: "If that be the case, know, O sultan, that we who are extremely numerous, and have been restrained from fighting like men in despair only by the hopes of an honourable capitulation, will kill all our wives and children, commit all our wealth and valuable effects to the flames, massacre 5000 prisoners now in our hands, leave not a single beast of burden or animal of any kind belonging to us alive, and level with the ground the rock you esteem sacred, together with the temple Al' Aksa. After this we will sally out upon you in a body; and doubt not but we shall either cut to pieces a much greater number of you than we are, or force you to abandon the siege." This desperate speech had such an effect upon Saladin, that he immediately called a council of war, at which all the general officers declared, that it would be most proper to allow the Christians to depart unmolested. The sultan therefore allowed them to march out freely and securely with their wives, children, and effects, after which he received ten dinars from every man capable of paying that sum, five from every woman, and two from every young person under age. For the poor who were not able to pay any thing, the rest of the inhabitants raised the sum of 30,000 dinars.

Most of the inhabitants of Jerusalem were escorted by a detachment of Saladin's troops to Tyre; and soon after, he advanced with his army against that place. As the port was blocked up by a squadron of five men of war, Saladin imagined that he should easily become master of it. But in this he found himself mistaken. For, one morning by break of day, a Christian fleet fell upon his squadron, and entirely defeated it; nor did a single vessel escape their pursuit. A considerable number of the Mahometans threw themselves into the sea during the engagement; most of whom were drowned, though some few escaped. About the same time Saladin himself was vigorously repulsed by land; so that, after calling a council of war, it was thought proper to raise the siege.

In 1188 Saladin, though his conquests were not so rapid and considerable as hitherto, continued still superior to his enemies. He reduced the city of Laodicea and some others, together with many strong castles; but met also with several repulses. At last he took the road to Antioch; and having reduced all the fortresses that lay in his way, many of which had been deemed impregnable, Bohemond prince of Antioch was so much intimidated, that he desired a truce for seven or eight months. This Saladin found himself obliged to comply with, on account of the prodigious fatigues his men had sustained, and because his auxiliaries now demanded leave to return home.

95 Crusaders retrieve their affairs.

All these heavy losses of the Christians, however, proved in some respects an advantage, as they were thus obliged to lay aside their animosities, which had originally proved the ruin of their affairs. Those who had defended Jerusalem, and most of the other fortresses taken by Saladin, having retreated to Tyre, formed there a very numerous body. This proved the means of preserving that city, and also of re-establishing their affairs for the present. For, having received powerful succours from Europe, they were enabled in 1189 to take the field with 30,000 foot and 2000 horse. Their first attempt was upon Alexandretta; from whence they dislodged a strong party of Mahometans, and made themselves masters of the place with very little loss. They next laid siege to Ptolemais; of which Saladin had no sooner received intelligence, than he marched to the relief of the place. After several skirmishes with various success, a general engagement ensued, in which Saladin was defeated with the loss of 10,000 men. This enabled the Christians to carry on the siege of Ptolemais with greater vigour; which place, however, they were not able to reduce for the space of two years.

This year the sultan was greatly alarmed by an account that the emperor of Germany was advancing to Constantinople with an army of 260,00 men, in order to assist the other crusaders. This prodigious armament, however, came to nothing. The multitude was so reduced with sickness, famine, and fatigue, that scarce 1000 of them reached the camp before Ptolemais. The siege of that city was continued, though with bad success on the part of the Christians. They were repulsed in all their attacks, their engines were burnt with naphtha, and the besieged always received supplies of provisions in spite of the utmost efforts of the besiegers; at the same time that a dreadful famine and pestilence raged in the Christian camp, which sometimes carried off 200 people a-day.

96 Richard I. of England arrives in Asia.

In 1191, the Christians received powerful succours from Europe. Philip II. of France, and Richard I. of England (from his great courage surnamed *Cœur de Lion)*, arrived before the camp at Ptolemais. The latter was esteemed the bravest and most enterprizing of all the generals the crusaders had; and the spirits of his soldiers were greatly elated by the thoughts of acting under such an experienced commander. Soon after his arrival, the English sunk a Mahometan ship of vast size, having on board 650 soldiers, a great quantity arms and provisions, going from Berytus to Ptolemais. Of the soldiers and sailors who navigated this vessel, only a single person escaped; who being taken prisoner by the English, was dispatched to the sultan with the news of the disaster. The besieged still defended themselves with the greatest resolution; and the king of England happening to fall sick, the operations of the besiegers were considerably delayed. On his recovery, however, the attacks were renewed with such fury, that the place was every moment in danger of being taken by assault. This induced them to send a letter to Saladin, informing him, that if they did not receive succours the very next day, they would be obliged to submit. As this town was the sultan's principal magazine of arms, he was greatly affected with the account of their distress, especially as he found it impossible to relieve them. The inhabitants, therefore, found themselves under a necessity of surrendering the place. One of the terms of the capitulation, was that the crusaders should receive a very considerable sum of money from Saladin, in consequence

quence of their delivering up the Mahometan prisoners they had in their hands. This article Saladin refused to comply with; and in consequence of his refusal, Richard caused 3000 of those unfortunate men to be slaughtered at once.

After the reduction of Ptolemais, the king of England, now made generalissimo of the crusaders, took the road to Ascalon, in order to besiege that place; after which, he intended to make an attempt upon Jerusalem itself. Saladin proposed to intercept his passage, and placed himself in the way with an army of 300,000 men. On this occasion was fought one of the

97 Defeat Saladin.

the greatest battles of that age. Saladin was totally defeated, with the loss of 40,000 men; and Ascalon soon fell into the hands of the crusaders. Other sieges were afterwards carried on with success, and Richard even approached within sight of Jerusalem, when he found, that, by reason of the weakened state of his army, and the divisions which prevailed among the officers who commanded it, he should be under the necessity of concluding a truce with the sultan. This was accordingly done in the year 1192; the term was, three years, three months, three weeks, three days, and three hours; soon after which the king of England set out on his return to his own dominions.

In 1193, Saladin died, to the inexpressible grief of all true Mahometans, who held him in the utmost veneration. His dominions in Syria and Palestine were shared out among his children and relations into many petty principalities. His son Othman succeeded to the crown of Egypt; but as none of his successors possessed the enterprising genius of Saladin, the history from that time to the year 1250 affords nothing re-

98 Mamlouks become masters of Egypt.

markable. At this time the reigning sultan Malek Al Salek was dethroned and slain by the *Mamelucs* or *Mamlouks*, as they are called, a kind of mercenary soldiers who served under him. In consequence of this revolution, the Mamelucs became masters of Egypt, and chose a sultan from among themselves.—These Mamlouks are thought to have been young Turks or Tartars, sold to private persons by the merchants, from whom they were bought by the sultan, educated at his expence, and employed to defend the maritime places of the kingdom. The reason of this institution originally was, that the native Egyptians were become so cowardly, treacherous, and effeminate, from a long course of slavery, that they were unfit for arms. The Mamlouks, on the contrary, made most excellent soldiers; for having no friends but among their own corps, they turned all

99 Account of them.

their thoughts to their own profession. According to M. Volney, they came originally from Mount Caucasus, and are distinguished by the flaxen colour of their hair. Here they were found by the crusaders, and were by them called *Mamelucs*, or more correctly *Mamlouks*. The expedition of the Tartars in 1227 proved indirectly the means of introducing them into Egypt. These horrible conquerors, having slaughtered and massacred till they were weary, brought along with them an immense number of slaves of both sexes, with whom they filled all the markets in Asia. The Turks, taking advantage of the opportunity, purchased about 12,000 young men, whom they bred up in the profession of arms, in which they soon attained to great perfection; but becoming mutinous, like the Roman pretorian bands, they turned their arms against their masters, and in 1260 deposed and murdered the khalif, as has been already related.

The Mamlouks having got possession of the government, and neither understanding nor putting a value upon any thing besides the art of war, every species of learning decayed in Egypt, and a great degree of barbarism was introduced. Neither was their empire of long duration notwithstanding all their martial abilities. The reason of this was, that they were originally only a small part of the sultan of Egypt's standing forces. As a numerous standing army was necessary in a country where the fundamental maxim of government was, that every native must be a slave, they were at first at a loss how to act; being justly suspicious of all the rest of the army. At last they resolved to buy Christian slaves, and educate them in the same way that themselves had formerly been. These were commonly brought from Circassia, where the people, though they professed Christianity, made no scruple of selling their children. When they were completed in their military education, these soldiers were disposed of through all the fortresses erected in the country to bridle the inhabitants; and because in their language such a fort was called *Borge*, the new militia obtained the name of *Borgites*. By this expedient the Mamlouks imagined they would be able to secure themselves in the sovereignty. But in this they were mistaken. In process of time, the old Mamlouks grew proud, insolent, 100

100 Driven out by the Borgites.

and lazy: and the Borgites, taking advantage of this, rose upon their masters, deprived them of the government, and transferred it to themselves about the year 1382.

The Borgites, as well as the former, assumed the name of *Mamlouks*; and were famous for their valour and ferocity of conduct. They were almost perpetually engaged in wars either foreign or domestic; and their dominion lasted till the year 1517, when they were 101

101 Egypt conquered by Selim.

invaded by Selim the Turkish sultan. The Mamlouks defended themselves with incredible valour; notwithstanding which, being overpowered by numbers, they were defeated in every engagement. The same year, their capital, the city of Cairo, was taken, with a terrible slaughter of those who defended it. The sultan was forced to fly; and, having collected all his force, ventured a decisive battle. The most romantic efforts of valour, however, were insufficient to cope with the innumerable multitude which composed the Turkish army. Most of his men were cut in pieces, and the unhappy prince himself was at last obliged to take shelter in a marsh. He was dragged from his hiding place, where he had stood up to the shoulders in water, and soon after put to death. With him ended the glory, and almost the existence, of the Mamlouks, who were now every where searched for and cut to pieces.

This was the last great revolution in the Egyptian affairs; a revolution very little to the advantage of the natives, who may well doubt whether their ancient or modern conquerors have behaved with the greater degree of barbarity. Selim gave a specimen of his government, the very day after his being put in full possession of it by the death of Tuman Bey the unfortunate sultan abovementioned. Having ordered a theatre to be erected with a throne upon it on the banks of the

 Nile,

Nile, he caused all the prisoners, upwards of 30,000 in number, to be beheaded in his presence, and their bodies thrown into the river.

102 His horrid cruelty.

Notwithstanding this horrid cruelty of Selim, he did not attempt the total extermination of the race of Mamlouks, though this would have been quite agreeable to the maxims of Turkish policy; but in the present case he seems to have recollected, that if he established a pacha in Egypt with the same powers with which he invested those of other parts, he would be under strong temptations to revolt by reason of the distance from the capital. He therefore proposed a new form of government, by which the power being distributed among the different members of the state, should preserve an equilibrium, so that the dependence of the whole should be upon himself. With this view, he chose from among the Mamlouks who had escaped the general massacre, a divan, or council of regency, consisting of the pacha and chiefs of the seven military corps. The former was to notify to this council the orders of the Porte, to send the tribute to Constantinople, and provide for the safety of government both external and internal; while, on the other hand, the members of the council had a right to reject the orders of the pacha, or even of deposing him, provided they could assign sufficient reasons. All civil and political ordinances must also be ratified by them. Besides this, he formed the whole body into a republic; for which purpose he issued an edict to the following purpose;

103 New form of government introduced by Selim.

104 His edict for a republic.

"Though, by the help of the Almighty, we have conquered the whole kingdom of Egypt with our invincible armies; nevertheless our benevolence is willing to grant to the 24 sangiacs (A) of Egypt a republican government, with the following conditions.

"I. That our sovereignty shall be acknowledged by the republic; and in token of their obedience, our lieutenant shall be received as our representative: but to do nothing against our will or the republic; but, on the contrary, shall co-operate with it for its welfare on all occasions. Or if he shall attempt to infringe any of its privileges, the republic is at liberty to suspend him from his authority, and to send to our Sublime Porte a complaint against him, &c.

"II. In time of war, the republic shall provide 12,000 troops at its own expence, to be commanded by a sangiac or sangiacs.

"III. The republic shall raise annually and send to our Sublime Porte the sum of 560,000 aslany (B) accompanied by a sangiac, who shall have a satisfactory receipt, &c.

"IV. The same sum to be raised for the use of Medina, and Kiabe or Mecca.

"V. No more troops or janizaries shall be kept by the republic in time of peace than 14,000; but in time of war they may be increased to oppose our and the republic's enemies.

"VI. The republic shall send annually to our granary, out of the produce of the country, one million of casiz (C) or measures of corn, *viz.* 600,000 of wheat and 400,000 of barley.

"VII. The republic, fulfilling these articles, shall have a free government over all the inhabitants of Egypt, independent of our lieutenant; but shall execute the laws of the country with the advice of the mollah or high priest under our authority and that of our successors.

"VIII. The republic shall be in possession of the mint as heretofore; but with this condition, that it shall be under the inspection of our lieutenant, that the coin may not be adulterated.

"IX. That the republic shall elect a *sheik bellet* out of the number of beys, to be confirmed by our lieutenant; and that the said sheik bellet shall be our representative, and shall be esteemed by all our lieutenants, and all our officers both of high and low rank, as the head of the republic; and if our lieutenant is guilty of oppression, or exceeds the bounds of his authority, the said sheik bellet shall represent the grievances of the republic to our Sublime Porte; but in case any foreign enemy or enemies disturb the peace of the republic, we and our successors engage to protect it with our utmost power until peace is re-established, without any cost or expence to the republic.

"Given and signed by our *clemency* to the republic of Egypt."

Thus the power of the Mamlouks still continued in a very considerable degree, and by degrees increased so much as to threaten a total loss of dominion to the Turks. During the last 50 years, the Porte having relaxed from its vigilance, such a revolution has taken place, that the Turkish power is now almost reduced to nothing. But in order to understand this, we must consider the way in which the race of Mamlouks is continued or multiplied in Egypt. This is not in the ordinary way, by marriage: on the contrary, M. Volney assures us, that "during 550 years in which there have been Mamlouks in Egypt, not one of them has left subsisting issue; all their children perish in the first or second descent. Almost the same thing holds good with regard to the Turks; and it is observed, that they can only secure the continuance of their families by marrying women who are natives, which the Mamlouks have always disdained. The means by which they are perpetuated and multiplied are the same by which they were first established, *viz.* by slaves brought from their original country. From the time of the Moguls this commerce has been continued on the banks of the Cuban and Phasis in the same manner as it is carried on in Africa, by the wars among the hostile tribes, and the misery or avarice of the inhabitants, who sell their children to strangers. The slaves thus procured are first brought to Constantinople, and afterwards dispersed through the empire, where they are purchased by the wealthy. When the Turks subdued Egypt (says M. Volney), they should undoubtedly have prohibited this dangerous traffic; their omitting

105 The Turkish power now almost entirely lost.

106 Why the children of the Mamlouks and Turks all die in Egypt.

(A) These sangiacs are the governors of provinces.

(B) Each of these coins is in value about half a crown English; and the tribute since that time has been augmented to 800,000 aslany, or about L.100,000 Sterling.

(C) Each casiz weighs 25 occa, and each occa is equal to two pounds ten ounces English avoirdupoise weight.

Egypt. ting which seems about to dispossess them of their conquest, and which several political errors have long been preparing.

"For a considerable time the Porte had neglected the affairs of this province; and in order to restrain the Pachas, had suffered the divan to extend its power till the chiefs of the janizaries and azabs were left without control. The soldiers themselves, become citizens by the marriages they had contracted, were no longer the creatures of Constantinople; and a change introduced into their discipline still more increased these disorders. At first the seven military corps had one common treasury; and though the society was rich, individuals, not having any thing at their own disposal, could effect nothing. The chiefs, finding their power diminished by this regulation, had interest enough to get it abolished, and obtained permission to possess distinct property, lands and villages. And as these lands and villages depended on the Mamlouk governors, it was necessary to conciliate them to prevent their oppressions. From that moment the beys acquired an ascendancy over the soldiers, who till then had treated them with disdain; and this could not but continually increase, since their governments procured them considerable riches. These they employed in creating themselves friends and creatures. They multiplied their slaves; and after emancipating them, employed all their interest to promote them to various employments, and advance them in the army. These upstarts, retaining for their patrons the same superstitious veneration common in the East, formed factions implicitly devoted to their pleasure." Thus, about the year 1746, Ibrahim, one of the kiayas (D) of the janizaries, rendered himself in reality master of Egypt; having managed matters so well, that of the 24 beys or sangiacs eight were of his household. His influence too was augmented by always leaving vacancies in order to enjoy the emoluments himself; while the officers and soldiers of his corps were attached to his interest; and his power was completed by gaining over Rodoan, the most powerful of all the colonels, to his interest. Thus the Pacha became altogether unable to oppose him, and the orders of the Sultan were less respected than those of Ibrahim. On his death in 1757, his family, *i. e.* his enfranchised slaves, continued to rule in a despotic manner. Waging war, however, among each other, Rodoan and several other chiefs were killed; until, in 1766, Ali Bey, who had been a principal actor in the disturbances overcame his enemies, and for some time rendered himself absolute master of Egypt.

107 Authority usurped by Ibrahim Kiaya.

108 History of Ali Bey

Of this man there are various accounts. The following is that given M. Volney. He begins with observing, that the private history of the Mamlouks in geneal must be subject to great uncertainty, by reason of their being generally carried off from their parents at a time of life when they can remember but little or nothing of their parents; and he remarks, that they are likewise unwilling to communicate the little they may happen to remember. It is most commonly supposed, however, that Ali Bey was born among the Abazans, a people of Mount Caucases; from whom, next to the Circassians, the slaves most valued by the Turks, and other nations who deal in that commodity, are to be obtained. Having been brought to a public sale at Cairo, Ali Bey was bought by two Jew brothers named Isaac and Yousef, who made a present of him to Ibrahim Kiaya. At this time he is supposed to have been about 13 or 14 years old, and was employed by his patron in offices similar to those of the pages belonging to European princes. The usual education was also given him, *viz.* that of learning to manage a horse well; fire a carbine and pistol; throw the djerid, a kind of dart used in the diversions of that country, and which shall be afterwards described. He was also taught the exercise of the sabre, and a little reading and writing. In all the feats of activity just mentioned, he discovered such impetuosity, that he obtained the surname of *Djendali*, or "madman;" and, as he grew up, discovered an ambition proportionable to the activity displayed in his youth. About the age 18 or 20, his patron gave him his freedom; the badge of which among the Turks is the letting the beard grow, for among that people it is thought proper only for women and slaves to want a beard. By his kind patron also he was promoted to the rank of kachef or governor of a district, and at last elected one of the 24 beys. By the death of Ibrahim in 1757, he had an opportunity of satisfying his ambition; and now engaged in every scheme for the promotion or disgrace of the chiefs, and had a principal share in the ruin of Rodoan Kiaya abovementioned. Rodoan's place was quickly filled by another, who did not long enjoy it; and in 1762 Ali Bey, then styled *Shaik-el-Beled*, having got Abdelrahman, the possessor at that time, exiled, procured himself to be elected in his room. However, he soon shared the fate of the rest, being condemned to retire to Gaza. This place, being under the dominion of a Turkish pacha, was by no means agreeable; for which reason Ali having turned off to another place, kept himself concealed for some time, until in 1766 his friends at Cairo procured his recal. On this he appeared suddenly in that city; and in one night killed four of the beys who were inimical to his designs, banished the rest, and assumed the whole power to himself. Still, however, his ambition was not satisfied; and he determined on nothing less than to throw off his independence on the Porte altogether, and become sultan of Egypt. With this view he expelled the pacha, refused to pay the accustomed tribute, and in the year 1768 proceeded to coin money in his own name. The Porte being at that time on the eve of a dangerous war with Russia, had not leisure to attend to the proceedings of Ali Bey; so that the latter had an opportunity of going forward with his enterprizes very vigorously. His first expedition was against an Arabian prince named *Hammam*; against whom he sent his favourite Mohammed Bey, under pretence that the former had concealed a treasure entrusted with him by Ibrahim Kiaya, and that he afforded protection to rebels. Having destroyed this unfortunate prince, he next began to put in execution a plan proposed to him by

109 He is bought and educated by Ibrahim Kiaya.

110 He is banished, but returns, and throws off the Turkish yoke.

111 Overcomes an Arabian prince.

(D) These were the commanding officers of the janizaries, azabs, &c. who after the first year laid down their employments, and became veterans, with a voice in the divan.

Egypt.

112 Proposes to make Mecca the emporium of East Indian commerce.

by a young Venetian merchant, of rendering Gedda, the port of Mecca, an emporium for all the commerce of India; and even imagined he should be able to make the Europeans abandon the passage to the Indies by the Cape of Good Hope. With this view, he fitted out some vessels at Suez; and manning them with Mamlouks, commanded the bey Hassan to sail with them to Gedda, and seize upon it, while a body of cavalry under Mahammed Bey advanced against the town. Both these commissions were executed according to his wish, and Ali became quite intoxicated with his success. Nothing but ideas of conquest now occupied his mind, without considering the immense disproportion between his own force and that of the Grand Signior. Circumstances, it must be owned, were at that time very favourable to his schemes. The Sheik Daher was in rebellion against the Porte in Syria; and the pacha of Damascus had so exasperated the people by his extortions, that they were ready for a revolt. Having therefore made the necessary preparations, Ali Bey dispatched in 1770 about 500 Mamlouks to take possession of Gaza, and thus secure an entrance into Palestine. Osman the pacha of Damascus, however, no sooner heard of the invasion than he prepared for war with the utmost diligence, while the troops of Ali Bey held themselves in readiness to fly on the first attack. They were relieved from their embarrassment by Sheik Daher, who hastened to their assistance, while Osman fled without even offering to make the least resistance; thus leaving the enemy masters of all Palestine without striking a stroke. About the end of February 1771, the grand army of Ali Bey arrived; which, by the representations made of it in Europe, was supposed to consist of 60,000 men. M. Volney, however, informs us, that this army was far from containing 60,000 soldiers; though he allows that there might be two-thirds of that number, who were classed as follow: 1. Five thousand Mamlouks, constituting the whole effective part of the army. 2. Fifteen hundred Arabs from Barbary on foot, constituting the whole infantry of the army. Besides these the servants of the Mamlouks, each of whom had two, would constitute a body of 10,000 men. A number of other servants would constitute a body of about 2000; and the rest of the number would be made up by sutlers and other usual attendants on armies. It was commanded by Mohammed Bey the friend of Ali. "But (says our author) as to order and discipline, these must not be mentioned. The armies of the Turks and Mamlouks are nothing but a confused multitude of horsemen, without uniforms, on horses of all colours and sizes, without either keeping their ranks or observing any regular order." This rabble took the road to Acre, leaving wherever they passed sufficient marks of their rapacity and want of discipline. At Acre a junction was formed with the troops of Sheik Daher, consisting of 1500 Safadians (the name of Sheik Daher's subjects, from *Safad*, a village of Galilee, originally under his jurisdiction). These were on horseback, and accompanied by 1200 Motualis cavalry under the command of Sheik Nasif, and about 1000 Mogrebian infantry. Thus they proceeded towards Damascus, while Osman prepared to oppose them by another army equally numerous and ill regulated: and M. Volney gives the following description of their operations.

113 His expedition into Syria.

114 Volney's account of his army.

"The reader must not here figure to himself a number of complicated and artificial movements; such as those which, within the last century, have reduced war with us to a science of system and calculation. The Asiatics are unacquainted with the first elements of this conduct. Their armies are mere mobs, their marches ravages, their campaigns inroads, and their battles bloody frays. The strongest or the most adventurous party goes in quest of the other, which frequently flies without making any resistance. If they stand their ground, they engage pell-mell, discharge their carbines, break their spears, and hack each other with their sabres; for they have seldom any cannon, and when they have, they are but of little service. A panic frequently diffuses itself without cause; one party flies, the other shouts victory; the vanquished submit to the will of the conqueror, and the campaign often terminates without a battle.

115 Their absurd method of carrying on war.

"Such, in a great measure, were the military operations in Syria in the year 1771. The combined army of Ali Bey and Sheik Daher marched to Damascus. The Pachas waited for them; they approached, and, on the 6th of June, a decisive action took place; the Mamlouks and Safadians rushed on the Turks with such fury, that, terrified at their courage, they immediately took to flight, and the Pachas were not the last in endeavouring to make their escape. The allies became masters of the country, and took possession of the city without opposition, there being neither walls nor soldiers to defend it. The castle alone resisted. Its ruined fortifications had not a single cannon, much less gunners; but it was surrounded by a muddy ditch, and behind the ruins were posted a few musketeers; and these alone were sufficient to check this army of cavalry. As the besieged, however, were already conquered by their fears, they capitulated the third day, and the place was to be surrendered next morning, when, at day break, a most extraordinary revolution took place."

116 Defection of Ali Bey's general.

This was no less than the defection of Mohammed Bey himself, whom Osman had gained over in a conference during the night. At the moment, therefore, that the signal of surrender was expected, this treacherous general sounded a retreat, and turned towards Egypt with all his cavalry, flying with as great precipitation as if he had been pursued by a superior army. Mohammed continued his march with such celerity, that the report of his arrival in Egypt reached Cairo only six hours before him. Thus Ali Bey found himself at once deprived of all his expectations of conquest; and what was worse, found a traitor whom he durst not punish at the head of his forces. A sudden reverse of fortune now took place. Several vessels laden with corn for Sheik Daher were taken by a Russian privateer; and Mohammed Bey, whom he designed to have put to death, not only made his escape, but was so well attended, that he could not be attacked. His followers continuing daily to increase in number, Mohammed soon became sufficiently strong to march towards Cairo; and, in the month of April 1772, having defeated the troops of Ali in a rencounter, entered the city sword in hand, while the latter had scarce time to make his escape with 800 Mamlouks. With difficulty he was enabled to get to Syria by the assistance of Sheik Daher, whom he immediately joined with the

117 He is driven out of Cairo, and with difficulty gets into Syria.

 troops

troops he had with him him. The Turks under Osman were at that time besieging Sidon, but raised the siege
118 Defeats the Turks, and retrieves his affairs. on the approach of the allied army, consisting of about 7000 cavalry. Though the Turkish army was at least three times their number, the allies did not hesitate to attack them, and gained a complete victory. Their affairs now began to wear a more favourable aspect; but the military operations were retarded by the siege of Yafa, a place which had revolted; and which, though defended only by a garden wall, without any ditch, held out for eight months. In the beginning of 1773 it capitulated, and Ali Bey began to think of returning to Cairo. For this purpose Sheik Daher had promised to furnish him with succours; and the Russians, with whom he had now contracted an alliance, made him a
119 He is ruined by his own impatience. promise of the like kind. Ali, however, ruined every thing by his own impatience. Deceived by an astrologer, who pretended that the auspicious moment when he was highly favoured by the stars was just arrived, he would needs set out without waiting for the arrival of his allies. He was also farther deceived by a stratagem of Mohammed, who had by force extorted from the friends of Ali Bey letters pressing his return to Cairo, where the people were weary of his ungrateful slave, and wanted only his presence in order to expel him. Confiding in these promises. Ali Bey imprudently set out with his Mamlouks and 1500 Safadians given him by Daher; but had no sooner entered the desert which separates Gaza from Egypt, than he was attacked by a body of 1000 chosen Mamlouks who were lying in wait for his arrival. They were commanded by a young Bey, named *Mourad;* who, being enamoured of the wife of Ali Bey, had obtained a promise of her from Mohammed, in case he could bring him her husband's head. As soon as Mourad perceived the dust by which the approach of Ali Bey's army was announced, he rushed upon him, attacked and took prisoner Ali Bey himself, after wounding him in the forehead with a sabre. Being conducted to Mohammed Bey, the latter pretended to treat him with extraordinary respect, and ordered a magnificent tent to be erected for him; but in three days he was found dead of his wounds, as was given out; though some affirm, perhaps with equal reason, that he was poisoned.

120 Is succeeded by Mohammed Bey. After the death of Ali Bey, Mohammed Bey took upon him the supreme dignity; but this change of masters proved of very little service to the Egyptians. At first he pretended to be only the defender of the rights of the Sultan, remitted the usual tribute to Constantinople, and took the customary oath of unlimited obedience; after which he solicited permission to make war upon Sheik Daher, the ally of Ali Bey. The reason of this request was a mere personal pique; and as soon as it was granted, he made the most diligent preparations for war. Having procured an extraordinary train of artillery, he provided foreign gunners, and gave the command of them to an Englishman named
121 His expedition against Sheik Daher. Robinson. He brought from Suez a cannon 16 feet long, which had for a considerable time remained useless; and at length, in the month of February 1776, he appeared in Syria with an army equal in number to that which he had formerly commanded when in the service of Ali Bey. Daher's forces, despairing of being able to cope with such a formidable armament, abandoned Gaza, which Mohammed immediately took possession of, and then marched towards a fortified town name Yafa. The history of this siege M. Vol-
ney gives as a specimen of the Asiatic mannner of conducting operations of that kind. "Yafa (says he), the ancient Joppa, is situated on a part of the coast, the general level of which is very little above the sea. The city is built on an eminence, in the form of a sugar loaf, in height about 130 feet perpendicular. The houses distributed on the declivity, appear rising above each other, like the steps of an amphitheatre. On the summit is a small citadel, which commands the town; the bottom of the hill is surrounded by a wall without a rampart, of 12 or 14 feet high, and two or three in thickness. The battlements of the top are the only tokens by which it is distinguished from a common garden wall. This wall, which has no ditch, is environed by gardens, where lemons, oranges, and citrons grow in this light soil to a most prodigious size. The city was defended by five or six hundred Safadians and as many inhabitants, who, at the sight of the enemy, armed themselves with their sabres and muskets; they had likewise a few brass cannon, 24 pounders, without carriages; these they mounted as well as they could, on timbers prepared in a hurry; and supplying the place of experience by hatred and courage, they replied to the summons of the enemy with menaces and cannon-shot. 122 Account of the siege of Yafa: a specimen of the Asiatic method of besieging towns.

"Mohammed, finding he must have recourse to force, formed his camp before the town; but was so little acquainted with the business in which he was engaged, that he advanced within half cannon-shot. The bullets, which showered upon the tents, apprizing him of his error, he retreated; and, by making a fresh experiment, was convinced he was still too near. At length he discovered the proper distance, and set up his tent, in which the most extravagant luxury was displayed: around it, without any order, were pitched those of the Mamlouks, while the Barbary Arabs formed huts with the trunks and branches of the orange and lemon-trees, and the followers of the army arranged themselves as they could: a few guards were distributed here and there; and, without making a single entrenchment, they called themselves encamped.

"Batteries were now to be erected; and a spot of rising ground was made choice of to the south-eastward of the town, where, behind some garden walls, eight pieces of cannon were pointed, at 200 paces from the town; and the firing began, notwithstanding the musketry of the enemy, who, from the tops of the terraces, killed several of the gunners.

"It is evident that a wall only three feet thick, and without a rampart, must soon have a large breach in it; and the question was not now how to mount, but how to get through it. The Mamlouks were for doing it on horseback; but they were made to comprehend that this was impossible; and they consented, for the first time, to march on foot. It must have been a curious sight to see them, with their huge breeches of thick Venetian cloth, embarrassed with their tucked up *beniches*, their crooked sabres in hand, and pistols hanging to their sides, advancing and tumbling among the ruins of the wall. They imagined that they had conquered every difficulty when this obstacle was surmounted; but the besieged, who formed a better judgment, waited till they arrived at the empty space between

between the city and wall; where they assailed them from the terraces and windows of the houses with such a shower of bullets, that the Mamlouks did not so much as think of setting them on fire, but retired under a persuasion that the breach was utterly impracticable, since it was impossible to enter it on horseback. Morad Bey brought them several times back to the charge, but in vain.

"Six weeks passed in this manner; and Mohammed was distracted with rage, anxiety, and despair. The besieged, however, whose numbers were diminished by the repeated attacks, became weary of defending alone the cause of Daher. Some persons began to treat with the enemy; and it was proposed to abandon the place, on the Egyptians giving hostages. Conditions were agreed upon, and the treaty might be considered as concluded, when, in the midst of the security occasioned by this belief, some Mamlouks entered the town, numbers of others followed their example, and attempted to plunder. The inhabitants defended themselves, and the attack recommenced: the whole army then rushed into the town, which suffered all the horrors of war; women and children, young and old men, were all cut to pieces, and Mohammed, equally mean and barbarous, caused a pyramid formed of the heads of these unfortunate sufferers to be raised as a monument of his victory."

123 The town taken and the inhabitants massacred.

By this disaster the greatest terror and consternation were every where diffused. Sheik Daher himself fled, and Mohammed soon became master of Acre also. Here he behaved with his usual cruelty, and abandoned the city to be plundered by his soldiers. The French merchants claimed an exemption, and it was procured with the utmost difficulty: nor was even this likely to be of any consequence; for Mohammed, informed that the treasures of Ibrahim Kiaya of Daher had been deposited in that place, made an immediate demand of them, threatening every one of the merchants with death if the treasures were not instantly produced. A day was appointed for making the research; but before this came, the tyrant himself died of a malignant fever after two days illness. His death was no sooner known than the army made a precipitate retreat, such as has been already mentioned from Damascus. Sheik Daher continued his rebellion for some time, but was at last entirely defeated, and his head sent to Constantinople by Hassan Pacha the Turkish high-admiral.

124 Death of Mohammed Bey.

125 History of Egypt from that time to the year 1786.

The death of Mohammed was no sooner known in Egypt, than Morad Bey hastened to Cairo in order to dispute the sovereignty with Ibrahim Bey, who had been entrusted with the government on his departure from that place for Syria. Preparations for war were made on both sides; but at last, both parties finding that the contest must be attended with great difficulty, as well as very uncertain in the event, thought proper to come to an accommodation, by which it was agreed that Ibrahim should retain the title of Shaik El Beled, and the power was to be divided between them. But now the beys and others who had been promoted by Ali Bey, perceiving their own importance totally annihilated by this new faction, resolved to shake off the yoke, and therefore united in a league under the title *of the house of Ali Bey*. They conducted their matters with so much silence and dexterity, that both Morad and Ibrahim were obliged to abandon Cairo. In a short time, however, they returned and defeated their enemies though three times their number; but notwithstanding this success, it was not in their power totally to suppress the party. This indeed was owing entirely to their unskilfulness in the art of war, and their operations for some time were very trifling. At last, a new combination having been formed among the beys, five of them were sentenced to banishment in the Delta. They pretended to comply with this order, but took the road of the desart of the Pyramids, through which they were pursued for three days to no purpose. At last they arrived safe at *Miniah*, a village situated on the Nile, 40 leagues above Cairo. Here they took up their residence, and being masters of the river, soon reduced Cairo to distress by intercepting its provisions. Thus a new expedition became necessary, and Ibrahim took the command of it upon himself. In the month of October 1783, he set out with an army of 3000 cavalry; the two armies soon came in sight of each other, but Ibrahim thought proper to terminate the affair by negociation. This gave such offence to Morad, who suspected some plot against himself, that he left Cairo. A war betwixt the two rivals was now daily expected, and the armies continued for 25 days in sight of each other, only separated by the river. Negociations took place; and the five exiled beys, finding themselves abandoned by Morad, took to flight, but were pursued and brought back to Cairo. Peace seemed now to be re-established; but the jealousy of the two rivals producing new intrigues, Morad was once more obliged to quit Cairo in 1784. Forming his camp, however, directly at the gates of the city, he apppeared so terrible to Ibrahim, that the latter thought proper in his turn to retire to the desert, where he remained till March 1785. A new treaty then took place; by which the rivals agreed to share the power between them, though there was certainly very little probability that such a treaty would be long observed. Since that time we have no accounts of any remarkable transaction in Egypt; nor indeed can we reasonably expect any thing of consequence in a country where matters are managed, as M. Volney expresses himself, by a series of "cabals, intrigues, treachery, and murders."

Of late Egypt has been visited by several travellers, all of whom have published descriptions of the country, its productions, inhabitants, &c. The latest are M. Savary, M. Volney, the baron de Tott, and Mr. Bruce; and from the accounts published by those gentlemen the following geographical description is principally compiled.

126 Account of the country.

This country is still divided into two principal parts, called the *Upper* and *Lower Egypt*. According to M. Savary, the former is only a long narrow valley beginning at Sienna and terminating at Cairo. It is bounded by two chains of mountains running from north to south, and taking their rise from the last cataract of the Nile. On reaching the latitude of Cairo they separate to the right and left; the one taking the direction of mount Colzoum, the other terminating in some sand banks near Alexandria; the former being composed of high and steep rocks, the latter of sandy hillocks over a bed of calcareous stone. Beyond these mountains are deserts bounded by the Red Sea on the east, and on the west by other parts of Africa; having

Egypt.

in the middle that long plain which, even where widest, is not more than nine leagues over. Here the Nile is confined in its course betwixt these insuperable barriers, and during the time of its inundation overflows the country all the way to the foot of the mountains; and Mr Bruce observes that there is a gradual slope from the bed of the river to those mountains on both sides. The baron de Tott says, that the mountains four leagues from the Nile, and facing Cairo, "are only a ridge of rocks about 40 or 50 feet high, which divide Egypt from the plains of Libya; which ridge accompanies the course of the river, at a greater or lesser distance, and seems as if only intended to serve as a bank to the general inundation."

Lower Egypt, according to M. Savary, comprehends all the country between Cairo, the Mediterranean, the Isthmus of Suez, and Libya. "This immense plain (says he) presents on the borders of its parching sands a stripe of lands cultivated along the canals of the river, and in the middle a triangular island to which the Greeks gave the name of *Delta*;" at the top of the angle of which, the Baron de Tott informs us, the rocks of Libya and the coasts of Arabia open and recede from each other towards the east and west, parallel to the Mediterranean. This great extent of country, from the kingdom of Barca to Gaza, is either overflowed by the river, or capable of being so; which thus fertilizes in a high degree a tract of country seemingly devoted to perpetual barrenness on account of the want of rain and the heat of the climate.

127
Coast of Egypt extremely low.

According to the testimonies of both Mr. Bruce and M. Volney, the coast of Egypt is so extremely low, that it cannot be discovered at sea till the mariners come within a few leagues of it. In ancient times the sailors pretended to know when they approached this country by a kind of black mud brought up by their sounding-line from the bottom of the sea: but this notion, though as old as the days of Herodotus, has been discovered to be a mistake by Mr Bruce; who found the mud in question to arise while the vessel was opposite to the deserts of Barca. All along the coast of Egypt a strong current sets to the eastward.

128
Of the fertility of ancient and modern Egypt.

In former times Egypt was much celebrated for its fertility; and there is great reason to believe, that were the same pains bestowed upon the cultivation of the ground, and the distribution of the waters of the Nile in a proper manner, the same fertility would still be found to remain. The cause of decrease in the produce of Egypt we shall describe in the words of M. Savary. "The canals," says he, speaking of the Delta, "which used to convey fertility with their waters, are now filled. The earth no longer watered, and continually exposed to the burning ardour of the sun, is converted into a barren sand. In those places where formerly were seen rich fields and flourishing towns, on the Pelusiac, the Tarictic, and the Mendesian branches, which all strike out from the canal of Damietta, nothing is to be found at this day but a few miserable hamlets, surrounded by date-trees and by deserts. These once navigable canals are now no more than a vain resemblance of what they were: they have no communication with the lake Menzall, but what is merely temporary, on the swelling of the Nile; they are dry the remainder of the year. By deepening them by removing the mud deposited by the river since the Turks have made themselves masters of Egypt, the country they passed through would be again fertilized, and the Delta recover a third of its greatness."

129
Savary's account of the formation of the Delta.

Concerning this island, it has been the opinion of a great many, even from very ancient times, that it was produced by the mud brought down by the inundations of the Nile; and this opinion we find adopted in the strongest manner by M. Savary. His account of the supposed rise of the Delta, and indeed of the greatest part of Egypt, is to the following purpose. In those early ages where history has not fixed any epoch, a certain people descended from the mountains near the cataracts into the valley overflowed by the Nile, and which was then an uninhabitable morass overgrown with reeds and canes. In what manner, or from what motive, these people were induced to descend from their ancient habitations to such a place, or how they found means to penetrate into a morass, which he expresly tells us was *impenetrable*, we are not informed, neither is it to our present purpose to inquire. At that time, however, the sea bathed the feet of those mountains where the pyramids are built, and advanced far into Libya. It covered also part of the Isthmus of Suez, and every part of what we now call the Delta formed a great gulph. After many ages the Egyptians, by what means is unknown, at least not specified by our author (though they ought to have been so, as the country it seems was then overflowed not only by the river but by the ocean), formed canals to carry off the stagnant waters of the Nile; opposed strong dykes to its ravages; and, tired of dwelling in the caverns of rocks, built towns and cities upon spots elevated either by nature or art. Already the river was kept within its bounds, the habitations of men were out of the reach of its inundations, and experience had taught the people to foresee and announce them. One of the kings of Egypt undertook to change the course of the river. After running 150 leagues between the barriers already mentioned, meeting with an unsurmountable obstacle to the right, it turned suddenly to the left; and taking its course to the southward of Memphis, it spread its waters thro' the sands of Libya. The prince we speak of caused a new bed to be dug for it to the east of Memphis; and by means of a large dyke obliged it to return between the mountains, and discharge itself into the gulph that bathes the rock on which the castle of Cairo is built. The ancient bed of the river was still to be seen in the time of Heredotus, and may even be traced at this day across the deserts, passing to the westward of the lakes of Natrum. The Arabs still bestow upon it the name of *Bahr Belama*, "or sea without water," and it is now almost choaked up. To the labours of this monarch Egypt is indebted for the Delta. A reflux of the sea was occasioned by the enormous weight of the waters of the Nile, which precipitated themselves into the bottom of the gulph. Thus the sands and mud carried along with them were collected into heaps; and thus the Delta, at first very inconsiderable, rose out of the sea of which it repelled the limits. It was a gift of the river, and it has since been defended from the attacks of the ocean by raising dykes around it. Five hundred years before the Trojan war, according to Herodotus, Egypt. rodotus, the Delta was in its infancy; eight cubits of water being then sufficient to overflow it. Strabo tells us, that boats passed over it from one extremity to the other; and that its towns, built upon artificial eminences, resembled the islands of the Egean Sea. At the time that Herodotus visited this country, fifteen cubits were necessary to cover all the lower Egypt; but the Nile then overflowed the country for the space of two days journey to the right and left of the island. Under the Roman Empire 16 cubits performed the same effect. When the Arabs came to have the dominion, 17 cubits were requisite; and at this day 18 are necessary to procure a plentiful crop, but the inundation stops at Cairo and the neighbouring country, without being extended over the Lower Egypt. Sometimes, however, the Nile rises to 22 cubits; and the cause of this phenomenon is the mud for so many years accumulated on the island. Here, in the space of 3284 years, we see the Delta elevated 14 cubits. Our author wrote in 1777, and informs us that he twice made the tour of the island during the time of the inundation. "The river (says he) flowed in full streams in the great branches of Rosetta and Damietta, as well as in those which pass through the interior part of the country; but it did not overflow the lands, except in the lower parts, where the dykes were pierced for the purpose of watering the plantations of rice. We must not, however, imagine, as several travellers pretend, that this island will continue to rise, and that it will become unfruitful. As it owes its increase to the annual settling of the mud conveyed thither by the Nile, when it ceases to be overflowed it will no longer increase in height, for it is demonstrated that culture is not sufficient to raise land.

"It is natural to imagine that the Delta has increased in length as well as in height; and of this we may look upon the following fact to be a remarkable proof. Under the reign of Psammiticus, the Milesians, with 30 vessels, landed at the mouth of the Bolbitine branch of the Nile, now called that of *Rosetta*, where they fortified themselves. There they built a town called *Metelis*, the same as *Faoüe*, which, in the Coptic vocabularies, has preserved the name of *Messil*. This town, formerly a sea-port, is now nine leagues distant from the sea; all which space the Delta has increased in length from the time of Psammiticus to the present. Homer, in his Odyssey, puts the following words in the mouth of Menelaus. 'In the stormy sea which washes Egypt, there is an island called *Pharos*. Its distance from the shore is such, that a vessel with a fair wind may make the passage in a day.' From the way in which he speaks of this island in other places, also, we may suppose that the island of Pharos, in his time, was not less than 20 leagues distant from the Egyptian coast, though now it forms the port of Alexandria; and this sentiment is confirmed by the most ancient writers.

"What prodigious changes great rivers occasion on the surface of the globe! How they elevate at their mouths, islands which become at length large portions of the continent! It is thus that the Nile has formed almost all the Lower Egypt, and created out of the waters the Delta, which is 90 leagues in circumference. It is thus that the Meander, constantly repelling the waves of the Mediteranean, and gradually filling up the gulph into which it falls, has placed in the middle of the land the town of Miletis, formerly a celebrated harbour. It is thus that the Tigris and the Euphrates, let loose from the Armenian hills, and sweeping with them in their course the sands of Mesopotamia, are imperceptibly filling up the Persian gulph."

130 Mr Bruce's reasons for the contrary opinion.

These are the reasons assigned by Mr. Savary for thinking that the Delta, as well as the greatest part of the Lower Egypt, have been produced by the Nile; but this opinion is violently contested by other late travellers, particularly Mr. Bruce, who has given a pretty long dissertation upon it, as well as many occasional remarks through the course of his work. He begins with observing, 1. That the country of Egypt is entirely a valley bounded by rugged mountains; whence it might seem natural to imagine that the Nile; overflowing a country of this kind, would be more ready to wash away the soil than to add to it. 2. It is observed by Dr. Shaw, and the same is confirmed by our author, that there is a gentle slope from the middle of the valley to the foot of the mountains on each side; so that the middle, in which is the channel of the Nile, is really higher than any other part of the valley. Large trenches are cut across the country from the channel of the river, and at right angles with it, to the foot of the mountains. 3. As the river swells, the canals become filled with water, which naturally descending to the foot of the mountains, runs out at the farther end, and overflows the adjacent level country. 4. When the water, having attained the lowest ground, begins to stagnate, it does not acquire any motion by reason of the canal's being at right angles with the channel of the Nile, unless in case of excessive rains in Ethiopia, when the water by its regurgitation again joins the stream. In this case, the motion of the current is communicated to the whole mass of waters, and every thing is swept away by them into the sea. It has been the opinion of several authors, that there was a necessity for measuring the height of the inundation on account of the quantity of mud brought down annually by the waters, by which the land-marks were so covered, that the proprietors could not know their own grounds after the river subsided. But whatever might be the reason of this covering of the land-marks in ancient times it is certain that the mud left by the Nile could not be so in the time of Herodotus, or during any period of time assigned by that historian; for he assigns only one foot of increase of soil throughout Egypt in an hundred years from the mud left by the river: the increase during one year, therefore, being only the hundredth part of a foot, could not cover any land-mark whatever. Besides, the Egyptian lands are at this day parted by huge blocks of granite, which frequently have gigantic heads at the ends of them; and these could not, at the rate mentioned by Herodotus, be covered in several thousand years. 6. The Nile does not now bring down any great quantity of mud; and it is absurd to suppose that it can at present bring down as much as it did soon after the creation, or the ages immediately succeeding the deluge. Throughout Abyssinia, according to the testimony of our author, the channel of every torrent is now worn to the bare rock, and almost every rivulet runs in a hard stony bed, all the loose earth being long ago washed away; so that an annual and

and equable increase of the earth from the sediment of the waters is impossible. 7. Our author made a great number of trials of the water of the Nile during the time of the inundation in different places. At Basboch, when just coming down from the cultivated parts of Abyssinia, and before it enters Sennaar, the sediment is composed of fat earth and sand, and its quantity is exceedingly small. At the junction of the Nile and Astaboras the quantity of sediment is very little augmented; consisting still of the same materials, but now mostly sand. At Syene the quantity of sediment was almost nine times greater than before; but was now composed almost entirely of sand, with a very small quantity of black earth. The conclusion of our author's experiments, however, is different from what we should have been led to expect from those just mentioned. "The experiment at Rosetta (says he) was not so often repeated as the others: but the result was, that in the strength of the inundation, the sediment consisted mostly of sand; and, towards the end, was much the greater part earth. I think these experiments conclusive, as neither the Nile coming fresh from Abyssinia, nor the Atbara, though joined by the Mareb, likewise from the same country, brought any great quantity of soil from thence."

8. Our author goes on to observe, that had the Nile brought down the quantities of mud which it has been said to do, it ought to have been most charged with it at Syene; as there it contained the whole that was to be conveyed by it into Egypt. Instead of this, however the principal part of the sediment at this place was sand; and this very naturally accounted for from the vast quantities of sand taken up by the winds in the deserts between Gooz and Syene. Here our traveller frequently saw vast pillars of this kind of sand, which is so fine and light as to form an impalpable powder, traversing the desert in various directions. Many of these were driven upon the river; and when it became calm in the evening, fell down into it entirely; thus, affording materials for the many sandy islands to be met with in the Nile.

9. Mr Bruce adopts the opinion of those who suppose that there has been a continual decrease of water since the creation of the world. In this case, therefore, if the land of Egypt had been continually increasing in height while the water that was to cover it decreased; there must have been frequent famines on account of the want of a sufficient inundation. But so far is this from being the case, that, according to the testimony of several Arabian MSS. there had not, when Mr Bruce was in Egypt, been one scarce season from the lowness of the inundation for 34 years; tho' during the same space they had three times experienced a famine by too great an abundance of water, which carried away the millet.

10. If there had been such an increase of land as Herodotus and others suppose, it must now have been very perceptible in some of the most ancient public monuments. This, however, is by no means the case. The base of every obelisk in Upper Egypt is to this day quite bare and visible. Near Thebes there are still extent two Colossal statues, plainly designed for nilometers, and which ought by this time to have been almost covered with earth; but notwithstanding the lengh of time these have remained there, they are still bare to the very base.

The strongest argument which the advocates for the increase of land of Egypt can make use of is, that the measures by which the quantity of inundation is determined are smaller now than in former times; and these small measures are said to have been introduced by the Saracens. On this Mr Bruce very justly observes, that such an expedient could not have answered any good purpose; as no decrease of the measure could have augmented the quantity of corn produced by the ground. M. Savary observes, that, to render his calculation concerning the growth of land in Egypt absolutely exact, it would be necessary to determine the precise length of the Greek, Roman, and Arabian cubit; and even to know the different alterations which that measure had undergone among these people: But this nicety he thinks needless; looking upon the general fact to be fully established by what he had said before. Mr Bruce, however, has treated the subject with much greater accuracy. He observes, that from the situation of Canopus, the distance betwixt Egypt and Cyprus, and the extension of the land to the northward, it appears that no addition of any consequence has been made to it for 3000 years past. The only argument left for the increase of land therefore must be taken from the nilometer. The use of this instrument was to determine the quantity of inundation, that so it might be known whether the crop would be sufficient to enable the people to pay the taxes exacted of them by the sovereign or not. The first step was to know what space of ground was overflowed in a given number of years; and this being determined by mensuration, the next thing was to ascertain the produce of the ground upon an average. Thus becoming acquainted with the greatest and least crops produced, together with the exact extent of ground overflowed, they were furnished with all the necessary principles for constructing a nilometer; and nothing now remained but to erect a pillar in a proper place, and divide it exactly into cubits. This was accordingly done; the pillar was first divided into cubits, and these again were subdivided into digits. The first division of this kind was undoubtedly that mentioned in scripture, and called the *cubit of a man*; being the length of the arm from the middle of the round bone in the elbow to the point of the middle finger; a measure still in use among all rude nations. As no standard could be found by which this measure might be exactly determined, authors have differed very much concerning the true length of the cubit when reduced to our feet and inches. Dr Arbuthnot reckons two cubits mentioned in scripture; one of them containing one foot nine inches and $\frac{888}{1000}$ of an inch; the other one foot and $\frac{824}{1000}$ of a foot; but Mr Bruce is of opinion that both of these are too large. He found, by mensuration, the Egyptian cubit to be exactly one foot five inches and three-fifths of an inch; and Herodotus mentions that in his time the cubit used for determining the increase of the Nile was the Samian cubit, about 18 of our inches. The latter also informs us, that in the time of Moeris, the minimum of increase was 8 cubits, at which time all Egypt below the city of Memphis was overflowed; but that in his time 16 or at least 15 cubits were necessary to produce the same effect. But to this account Mr Bruce objects, that Herodotus could have no certain information concerning the nilometer, because he himself says that the priests,

131 Opinions of various authors concerning the rise of the Nile in ancient times.

priests, who alone had access to it, would tell him nothing of the matter. Herodotus also informs us, that in the time of Moeris, great lakes were dug to carry off the waters of the inundation; and this superfluous quantity Mr. Bruce supposes to have been conveyed into the desert for the use of the Arabs, and that by such a vast drain the rise of the water on the nilometer would undoubtedly be diminished. But even granting that there was such a difference between the rise of the water in the time of Moeris and in that of Herodotus, it does not appear that any thing like it has appeared ever since. Strabo, who travelled into Egypt 400 years after the time of Herodotus, found that eight cubits were then the minimum, as well as in the time of Moeris. From some passages in Strabo, however, it appears that it required a particular exertion of industry to cause this quantity of water produce a plentiful crop; but there is not the least reason to suppose, that the very same industry was not necessary in the time of Moeris; so that still there is not any increase of land indicated by the nilometer. About 100 years afterwards, when the emperor Adrian visited Egypt, we are informed from unquestionable authority, that 16 cubits were the minimum when the people were able to pay their tribute; and in the fourth century, under the emperor Julian, 15 cubits were the standard; both which accounts correspond with that of Herodotus. Lastly, Procopius, who lived in the time of Justinian, informs us, that 18 cubits were then requisite for a minimum.

132
No increase of land in these ages can reasonably be supposed;

From these accounts, so various and discordant, it is obvious that no certain conclusion can be drawn. It is not indeed easy to determine the reason of this difference in point of fact. The only conjecture we can offer is, that as it appears that by a proper care a smaller quantity of water will answer the purpose of producing a plentiful crop, so it is not unreasonable to suppose that at different periods the industry of the people has varied so much as to occasion the disagreement in question. This would undoubtedly depend very much upon their governor; and indeed Strabo informs us that it was by the care of the governor Petronius, that such a small quantity of water was made to answer the purpose. The conclusion drawn by Mr Bruce from the whole of the accounts above related, is, that from them it is most probable that no increase of land has been indicated by the nilometer from the time of Moeris to that of Justinian.

135
Nor in more modern times.

On the conquest of Egypt by the Saracens, their barbarous and stupid khalif destroyed the nilometer, causing another to be built in its stead, and afterwards fixed the standard of paying tribute considerably below what it had usually been. The Egyptians were thus kept in continual terror, and constantly watched the new nilometer to observe the gradual increase or decrease of the water. On this he ordered the new nilometer to be destroyed, and another to be constructed, and all access to it to be denied to the people. Which prohibition is still continued to Christians; though our author found means to get over this obstacle, and has given a figure of the instrument itself. That the people might not, however, be supposed to remain in total ignorance of their situation, he commanded a proclamation to be daily made concerning the height of the water, but in such an unintelligible manner that nobody was made any wiser; nor, according to our author, is the proclamation understood at this day. From his own observations, however, Mr Bruce concludes, that 15 cubits are now the minimum of inundation, and as this coincides with the accounts of it in the times of Herodotus and Adrian, he supposes with great probability, that the same quantity of water has been necessary to overflow this country from the earliest accounts to the present time.

134
M. Savary's opinion concerning the isle of Pharos refuted by M. Volney.

It now remains only to take notice of what is said by M. Savary concerning the former distance of the island of Pharos from the land to which it is now joined. With regard to his other assertions concerning the city of Metelis having been once a sea-port, M. Volney proves that he has quoted Strabo unfairly, and consequently no stress is to be laid upon them. The principal, indeed the only, evidence therefore which remains, is the passage already quoted from Homer, viz. that "the island of Pharos is as far distant from one of the mouths of the Nile as a vessel can sail in one day before the wind." "But (says M. Volney) when Homer speaks of the distance of this island, he does not mean its distance from the shore opposite, as that traveller (M. Savary) has translated him, but from the land of Egypt and the river Nile. In the second place, by a day's sail we must not understand that indefinite space which the vessels, or rather the boats, of the ancient Greeks, could pass through in a day; but an accurate and determined measure of 540 stadia. This measure is ascertained by Herodotus, and is the precise distance between Pharos and the Nile, allowing, with M. d'Anville, 27,000 toises to 540 stadia. It is therefore far from being proved, that the increase of the Delta or of the continent was so rapid as has been represented; and, if we were disposed to maintain it, we should still have to explain how this shore, which has not gained half a league from the days of Alexander, should have gained eleven in the far shorter period from the time of Menelaus to that conqueror. The utmost extent of the encroachment of this land upon the sea, however, may be learned from the words of Herodotus; who informs us, that, "the breadth of Egypt, along the sea-coast, from the gulph of Plinthine to the lake Serbonis near mount Casius, is 3600 stadia; and its length from the sea to Heliopolis 1500 stadia." Allowing therefore the stadium of Herodotus to be between 50 and 51 French toises, the 1500 stadia just mentioned are equal to 76,000 toises; which, at the rate of 57,000 to a degree, gives one degree and near 20 minutes and an half. But from the astronomical observations of M. Niebuhr, who travelled for the king of Denmark in 1761, the difference of latitude between Heliopolis, now called *Matarea*, and the sea, being one degree 29 minutes at Damietta, and one degree 24 minutes at Rosetta, there is a difference on one side of three minutes and an half, or a league and an half encroachment; and eight minutes and an half, or three leagues and an half on the other."

Thus the dispute concerning the augmentation of the land of Egypt by the Nile seems to be absolutely decided; and the encroachments of it on the sea so trifling, that we may justly doubt whether they exist, or whether we are not entirely to attribte the apparent differences to those which certainly take place betwixt the ancient and modern mensuration. M. Volney gives a very particular description of the face of the country; but takes notice of the inconveniences under which travellers labour in this country, by which it is rendered extremely difficult

to

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to say any thing certain with regard to the nature of the soil or mineral productions. These arise from the barbarity and superstition of the people, who imagine all the Europeans to be magicians and sorcerers, who come by their magic art to discover the treasures which the genii have concealed under the ruins. So deep rooted is this opinion, that no person dares walk alone in the fields, nor can he find any one willing to accompany him; by which means he is confined to the banks of the river, and it is only by comparing the accounts of various travellers that any satisfactory knowledge can be acquired.

135
Volney's account of the face of the country.

According to this author, the entrance into Egypt at Rosetta presents a most delightful prospect, by the perpetual verdure of the palm-trees on each side, the orchards watered by the river, with orange, lemon, and other fruit-trees, which grow there in vast abundance; and the same beautiful appearance is continued all the way to Cairo. As we proceed farther up the river, he says, that nothing can more resemble the appearance of the country than the marshes of the lower Loire, or the plains of Flanders: instead, however, of the numerous trees and country houses of the latter, we must imagine some thin woods of palms and sycamores, with a few villages of mud-walled cottages, built on artificial mounds. All this part of Egypt is very low and flat, the declivity of the river being so gentle, that its waters do not flow at a greater rate than one league in an hour. Throughout the country nothing is to be seen but palm-trees, single or in clumps, which become more rare in proportion as you advance; with wretched villages composed of huts with mud-walls, and a boundless plain, which at different seasons is an ocean of fresh water, a miry morass, a verdant field, or a dusty desert; and on every side an extensive and foggy horizon, where the eye is wearied and disgusted. At length, towards the junction of the two branches of the river, the mountains of Cairo are discovered on the east; and to the south-west three detached masses appear, which from their triangular form are known to be the pyramids. We now enter a valley which turns to the southward, between two chains of parallel eminences. That to the east, which extends to the Red Sea, merits the name of a mountain from its steepness and height, as well as that of a desert from its naked and savage appearance. Its name in the Arabic language is *Mokattam*, or the *hewn-mountain*. The western is nothing but a ridge of rock covered with sand, which has been very properly termed a *natural mound* or *causeway*. In short, that the reader may at once form an idea of this country, let him imagine on one side a narrow sea and rocks; on the other, immense plains of sand; and in the middle, a river flowing through a valley of 150 leagues in length and from three to seven wide, which at the distance of 30 leagues from the sea separates into two arms; the branches of which wander over a soil almost free from obstacles, and void of declivity.

From comparing his own observations with those of other travellers, our author concludes, that the basis of all Egypt from *Asouan* (the ancient Syene) to the Mediterranean, is a continued bed of calcareous stone of whitish hue, and somewhat soft, containing the same kind of shells met with in the adjacent seas, and which forms the immense quarries extending from Saouadi to Manfalout for the space of more than 25 leagues, according to the testimony of Father Sicard.

136
Mr Bruce's account of the deserts, marble, mountains, &c.

Mr. Bruce, however, gives us a much more particular account of the sources from whence were derived the vast quantities of marble met with in the remains of ancient buildings in this country. These he discovered during his journey from Kenne to Cosseir on the Red Sea, before he took his expedition to Abyssinia. He gives a most dismal idea of the deserts through which he passed. What houses he met with were constructed, like those M. Volney mentions, of clay, being no more than six feet in diameter, and about ten in height. The mountains were the most dreary and barren that can be imagined; and the heat of the sun so great, that two sticks rubbed together only for half a minute would take fire and flame. In these burning regions no living creature was to be met with, even the poisonous serpents and scorpions not being able to find subsistence. The first animal he saw was a species of ants in a plain called *Hamra* from the purple colour of its sand; and it was remarkable that these insects were of the same colour with the sand itself. No water was any where to be met with on the surface; though at a place called *Lageta* there were some draw-wells, the water of which was more bitter than soot itself. At Hamra the porphyry mountains and quarries begin, the stone of which is at first soft and brittle; but the quantity is immense, as a whole day was taken up in passing by them. These porphyry mountains begin in the latitude of nearly 24 degrees, and continue along the coast of the Red Sea to about 22° 30′, when they are succeeded by the marble mountains; these again by others of alabaster, and these last by basaltic mountains. From the marble mountains our author selected twelve kinds, of different colours, which he brought along with him. Some of the mountains appeared to be composed entirely of red and others of green marble, and by their different colours afforded an extraordinary spectacle. Not far from the porphyry mountains the cold was so great, that his camels died on his return from Abyssinia, though the thermometer stood no lower than 42°.

Near to Cosseir he discovered the quarries whence the ancients obtained those immense quantities of marble with which they constructed so many wonderful works. The first place where the marks of their operations were very perceptible, was a mountain much higher than any they had yet passed, and where the stone was so hard that it did not even yield to the blows of a hammer. In this quarry he observed that some ducts or channels for conveying water terminated; which, according to him, shows that water was one of the means by which these hard stones were cut. In four days, during which our author travelled among these mountains, he says, that he had "passed more granite, porphyry, marble, and jasper, than would build Rome, Athens, Corinth, Syracuse, Memphis, Alexandria, and half a dozen such cities." It appeared to him that the passages between the mountains and which he calls *defiles*, were not natural but artificial openings; where even whole mountains had been cut out, in order to preserve a gentle slope towards the river. This descent our author supposes not to be above one foot in 50; so that the carriages must have gone very easily, and rather required something to retard

tard their velocity than any force to pull them forward. Concerning the mountains in general, he observes, that the porphyry is very beautiful to the eye, and is discovered by a fine purple sand without any gloss. An unvariegated marble of a green colour is generally met with in the same mountain; and where the two meet, the marble becomes soft for a few inches, but the porphyry retains its hardness. The granite has a dirty brown appearance, being covered with sand; but on removing this, it appears of a grey colour with black spots, with a reddish cast all over it. The granite mountains lie nearer to the Red Sea, and seem to have afforded the materials for Pompey's pillar. The redness abovementioned seems to go off on exposure to the air: but re-appears on working or polishing the stone farther. The red marble is next to the granite, though not met with in the same mountain. There is also a red kind with white veins, and vast quantities of the common green serpentine. Some samples of that beautiful marble named *Isabella* were likewise observed; one of them of that yellowish cast called *quaker-colour*, the other of the bluish kind named *dove-colour*. The most valuable kind is that named *verde antico*, which is found next to the Nile in the mountains of serpentine. It is covered by a kind of blue fleaky stone, somewhat lighter than a slate, more beautiful than most kinds of marble, and when polished having the appearance of a volcanic lava. In these quarries the verde antico had been uncovered in patches of about 20 feet square. There were small pieces of African marble scattered about in several places, but no rocks or mountains of it; so that our author conjectures it to lie in the heart of some other kind. The whole is situated on a ridge with a descent to the east and west; by which means it might easily be conveyed either to the Nile or Red Sea, while the hard gravel and level ground would readily allow the heaviest carriages to be moved with very little force.

137 Of a supposed emerald mine.

Travellers have talked of an emarald mine in these deserts; but from the researches of Mr Bruce, it does not appear to have any existence. In the Red Sea indeed, in the latitude of 25° 3′, at a small distance from the south-western coast, there is an island called the *Mountain of Emeralds*; but none of these precious stones are to be met with there. Here, as well as on the continent, there were found many pieces of a green pellucid substance; but veined, and much softer than rock-crystal, though somewhat harder than glass. A few yards up the mountain he found three pits, which are supposed to have been the mines whence the ancients obtained the emeralds; but though many pieces of the green substance abovementioned were met with about these pits, no signs of the true emerald could be perceived. This substance, however, he conjectures to have been the *smaragdus* of the Romans. In the mountains of Cosseir, as well as in some places of the deserts of Nubia, our author found some rocks exactly resembling petrified wood.

158 Stones of a curious appearance.

The only metal said by the ancients to be produced in Egypt is copper. On the road to Suez, are found great numbers of those stones called *Egyptian flints* and *pebbles*, though the bottom is a hard, calcareous, and sonorous stone. Here also M. Volney tells us, that the stones abovementioned, and which resemble petrified wood, are to be met with. These, he says, are in the form of small logs cut slanting at the ends, and might easily be taken for petrifactions, though he is convinced they are the real minerals.

139 Salt lakes.

F. Sicard mentions two lakes, from the water of which is produced annually a great quantity of salt containing much mineral alkali; and M. Volney informs us, that the whole soil of this country is impregnated with salt; so that, upon digging to some depth in the ground, we always meet with brackish water impregnated in some degree with the mineral alkali as well as with common salt. The two lakes mentioned by Sicard are situated in the desert to the west of the Delta; and are three or four leagues in length, and about a quarter of a league in breadth, with a solid and stony bottom. For nine months in the year they are without water; but in the winter time there oozes out of the earth a reddish violet-coloured water, which fills the lakes to the height of five or six feet. This being evaporated by the return of the heat, there remains a bed of salt two feet thick and very hard which is broken in pieces with iron bars; and no less than 30,000 quintals are procured every year from these lakes. So great is the propensity of the Egyptian soil to produce salt, that even when the gardens are overflowed for the sake of watering them, the surface of the ground, after the evaporation and absorption of the water, appears glazed over with salt. The water found in the wells contains mineral alkali, marine salt, and a little nitre.

140 Vegetable mould of Egypt not originally derived from Ethiopia.

M. Volney is of opinion, that the fertile mould of Egypt, which is of a black colour, differs essentially from that of the other parts; and is derived from the internal parts of Ethiopia along with the water of the Nile. This seems to contradict what he had before advanced against M. Savary concerning the increase of the land of Egypt by means of the waters of this river: but there is no reason at all to suppose this kind of earth to be of a foreign origin, it being always the result of vegetation and cultivation. Even the most barren and sandy spots in the world, if properly watered, and such vegetables planted in them as would grow there, in time would be covered with this black earth as well as others: and of this kind of artificial formation of soil travellers give us a remarkable instance in the garden of the monks at Mount Sinai, where the country is naturally as barren as in any place in the world. "The monks of Sinai (says Dr. Shaw), in a long process of time, have covered over with dung and the sweepings of their convent near four acres of naked rocks; which produce as good cabbage, roots, sallad, and all kinds of pot-herbs, as any soil and climate whatsoever. They have likewise raised olive, plum, almond, apple, and pear trees, not only in great numbers, but of excellent kinds. The pears particularly are of such esteem at Cairo, that there is a present of them sent every year to the bashaw and persons of the first quality. Neither are their grapes inferior in size and flavour to any whatsoever: it being fully demonstrated, by what this little garden produces, how far an indefatigable industry can prevail over nature; and that several places are capable of culture and improvement which were intended by nature to be barren, and which the lazy and slothful have always suffered to be so."

From this general account of the country, we may reasonably conclude, that the natural fertility of Egypt

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141 Natural fertility of Egypt not diminished.

gypt is not diminished in modern times, provided the same pains were taken in the cultivation of it as formerly; but this is not to be expected from the present degenerate race of inhabitants. "The Delta (says Mr Savary) is at present in the most favourable state for agriculture. Washed on the east and west by two rivers formed by the division of the Nile, each of which is as large and more deep than the Loire, intersected by innumerable rivulets; it presents to the eye an immense garden, all the different compartments of which may be easily watered. During the three months that the Thebais is under water, the Delta possesses fields covered with rice, barley, vegetables, and winter fruits. It is also the only part of Egypt where the same field produces two crops of grain within the year, the one of rice, the other of barley."

142 Method of purifying and cooling the water in Egypt.

The only cause of all this fertility is the Nile, without which the whole country would soon become an uninhabitable desert, as rain falls very seldom in this part of the world. It flows with a very gentle stream through the flat country, and its waters are very muddy, so that they must have time to settle, or even require filtration before they can be drunk. For purifying the water, the Egyptians, according to M. Volney, use bitter almonds, with which they rub the vessel containing it, and then the water becomes light and good; but on what principle this ingredient acts, we cannot pretend to determine. Unglazed earthen vessels filled with water are kept in every apartment; which by by a continual evaporation though their porous substance, render the contained fluid very cool even in the greatest heats*. The river continues muddy for six months; and during the three which immediately precede the inundation, the stream being reduced to an inconsiderable depth, becomes heated, green, fetid, and full of worms. The Egyptians in former times paid divine honours to the Nile, and still hold it in great veneration. They believe its waters to be very nourishing, and that they are superior to any in the world; an opinion very excusable in them, as they have no other, and large draughts of cold water are among their highest luxuries.

* See *Evaporation*.

143 Of the inundation of the Nile.

This river, swelled by the rains which fall in Abyssinia, begins to rise in Egypt about the month of May; but the increase is inconsiderable till towards the end of June, when it is proclaimed by a public crier thro' the streets of Cairo. About this time it has usually risen five or six cubits; and when it has risen to 16, great rejoicings are made, and the people cry out *Waffah Allah*, that is, that God has given them abundance. This commonly takes place about the latter end of July, or at farthest before the 20th of August; and the sooner it takes place, so much the greater are the hopes of a good crop. Sometimes, though rarely, the necessary increase does not take place till later. In the year 1705, it did not swell to 16 cubits till the 19th of September; the consequence of which was, that the country was depopulated by famine and pestilence.

We may easily imagine that the Nile cannot overflow the whole country of itself in such a manner as to render it fertile; for which reason there are innumerable canals cut from it across the country, as has already been observed, by which the water is conveyed to distant places, and almost every town or village has one of these canals. In those parts of the country where the inundation does not reach, and where more water is required than it can furnish, as for watering the gardens, they must have recourse to artificial means for raising it from the river. In former times they made use of Archimedes's screw*; but that is now disused, and in place of it they have chosen the Persian wheel. This is a large wheel turned by oxen, having a rope hung with several buckets which fill as it goes round, and empty themselves into a cistern at the top. Where the banks of the river are high, they frequently make a bason in the side of them, near which they fix an upright pole, and another with an axle across the top of that, at one end of which they hang a great stone, and at the other a leathern bucket; this bucket being drawn down into the river by two men, is raised by the descent of the stone, and emptied into a cistern placed at a proper height. This kind of machine is used chiefly in the upper parts of the country, where the raising of water is more difficult than in places near the sea. When any of their gardens or plantations want water, it is conveyed from the cisterns into little trenches, and from thence conducted all round the beds in various rills, which the gardener easily stops by raising the mould against them with his foot, and diverts the current another way as he he sees occasion.

* See *Hydrostatics*.

144 Nilometer described.

The rise of the inundation is measured, as has already been observed, by an instrument adapted for the purpose, and called *mikeas*, which we translate *nilometer*. Mr Bruce informs us, that this is placed between Geeza and Cairo, on the point of an island named *Rhoda*, about the middle of the river, but somewhat nearer to Geeza. It is a round tower with an apartment, in the middle of which is a cistern neatly lined with marble. The bottom of this cistern reaches to that of the river, and there is a large opening by which the water has free access to the inside. The rise of the water is indicated by an octagonal column of blue and white marble, on which are marked 20 peeks or cubits of 12 inches each. The two lowermost of these have no subdivisions; but each of the rest is divided into 24 parts call *digits*; the whole height of the pillar being 36 feet 8 inches.

145 Of the canals by which the water is conveyed, &c.

When the river has attained its proper height, all the canals are opened, and the whole country laid under water. During the time of the inundation a certain vortical motion of the waters takes place; but notwithstanding this, the Nile is so easily managed, that many fields lower than the surface of its waters are preserved from injury merely by a dam of moistened earth not more than eight or ten inches in thickness. This method is made use of particularly in the Delta when it is threatened with a flood.

As the Nile does not always rise to an height sufficient for the purposes of agriculture, the former sovereigns of Egypt were at vast pains to cut proper canals in order to supply the deficiency. Some of these are still preserved; but great numbers are rendered useless through the indolence or barbarity of their successors. Those which convey the water to Cairo, into the province of Fayoom, and to Alexandria, are best taken care of by government. The last is watched by an officer appointed for that purpose, whose office it is to hinder the Arabs of Bachria, who receive this superfluous water, from turning it off before Alexandria be pro-

Egypt. provided for, or opening it before the proper time, which would hinder the increase of the river. In like manner, that which conveys the water to Fayoom is watched and cannot be opened before that of Cairo, which is called the *Canal of Trajan*. A number of other canals, only taken care of by those who derive advantage from them, proceed from that arm of the Nile which runs to Damietta, and fertilize the province of Sharkia; which making part of the isthmus of Suez, is the most considerable of Egypt, and the most capable of a great increase of cultivation. The plains of Gaza which lie beyond, and are possessed by the Arabs, would be no less fertile, were it not for the excessive inclination these people have to destroy, so that they make war even with the spontaneous productions of the earth. A number of other canals run through the Delta; and the vestages of those which watered the provinces to the eastward and westward, show that in former times these were the best cultivated parts of Egypt. "We may also presume (says the Baron de Tott), from the extent of the ruins of Alexandria, the construction of the canal, and the natural level of the lands which encompass the lake Mareotis, and extend themselves westward to the kingdom of Barca, that this country at present given up to the Arabs, and almost desert, was once sufficiently rich in productions of every kind to furnish the city of Alexandria with its whole subsistence."

146
Air and climate of Egypt.

The air and climate of Egypt are extremely hot, not only from the height of the sun, which in summer approaches to the zenith, but from the want of rain and from the vicinity of those burning and sandy deserts which lie to the southward. In the months of July and August, according to M. Volney, Reamur's thermometer stands, even in the most temperate apartments, at the height of 24 or 25 degrees above the freezing point; and in the southern parts it is said to rise still higher. Hence, he says, only two seasons should be distinguished in Egypt, the cool and the hot, or spring and summer. The latter continues for the greatest part of the year, viz. From March to November or even longer; for by the end of February the sun is intolerable to an European at nine o'clock in the morning. During the whole of this season, the air seems to be inflamed, the sky sparkles, and every one sweats profusely, even without the least exercise, and when covered with the lightest dress. This heat is tempered by the inundation of the Nile, the fall of the night-dews, and the subsequent evaporation; so that some of the European merchants, as well as the natives, complain of the cold in winter. The dew we speak of does not fall regularly throughout the summer as with us; the parched state of the country not affording a sufficient quantity of vapour for the purpose. It is first observed about St John's day (June 24th), when the river has begun to swell, and consequently a great quantity of water is raised from it by the heat of the sun, which being soon condensed by the cold of the night air, falls down in copious dews.

It might naturally be imagined, that as for three months in the year Egypt is in a wet and marshy situation, the excessive evaporation and putrefaction of the stagnating waters would render it very unhealthy. But this is by no means the case. The great dryness of the air makes it absorb vapours of all kinds with the utmost avidity; and these rising to a great height are carried off by the winds either to the southward or northward, without having time to communicate any of their pernicious effects. This dryness is so remarkable in the internal parts of the country, that flesh meat exposed to the open air does not putrefy even in summer, but soon becomes hard and dry like wood. In the deserts there are frequently dead carcases thus dried in such a manner, and become so light, that one may easily lift that of a camel with one hand. In the maritime parts, however, this dryness of the air is not to be expected. They discover the same degree of moisture which usually attends such situations. At Rosetta and Alexandria, iron cannot be exposed to the air for 24 hours without rusting. According to M. Volney, the air of Egypt is also strongly impregnated with salts; for which opinion he gives the following reason. "The stones are corroded by natrum (mineral alkali), and in moist places long crystallizations of it are to be found, which might be taken for salt-petre. The wall of the Jesuits garden at Cairo, built with earth and bricks, is every where covered with a crust of this natrum as thick as a crown-piece: and when this garden has been overflowed by the waters of the kalidj (canal), the ground after they have drained off, appears sparkling on every side with crystals, which certainly were not brought thither by the water, as it shows no sign of salt either to the taste or by distillation."—But whatever may be the quantity of salt contained in the earth, it is certain that M. Volney's opinion of its coming thither from the air cannot be just. The salt in question is excessively fixed, and cannot be dissipated into the air without the violent heat of a glass-house furnace; and even after this has been done, it will not remain diffused through the atmosphere, but quickly falls back again. No experiments have ever shown that any salt was or could be diffused in the air, except volatile alkali, and this is now known to be formed by the union of two permanently elastic fluids; and it is certain that a saline air would quickly prove fatal to the animals who breathed it. The abundance of this kind of salt in Egypt therefore only shows, that by some unknown operation the heat of the sun forms it from the two ingredients of earth and water, though we do not yet understand the manner, nor are able to imitate this natural operation.

147
Why exotic plants will not thrive in Egypt.

To this saline property of the earth M. Volney ascribes the excessive quickness of vegetation in Egypt, which is so great, that a species of gourd called *kara* will, in 24 hours, send forth shoots of four inches in length; but for the same reason, in all probability, it is that no exotic plant will thrive in Egypt. The merchants are obliged annually to send to Malta for their garden seeds; for though the plants thrive very well at first, yet if the seed of them is preserved, and sown a second year, they always come up too tall and slender.

By reason of the great dryness of the air, Egypt is exempted from the phenomena of rain, hail, snow thunder and lightning. Earthquakes are also seldom heard of in this country; though sometimes they have been very fatal and destructive, particularly one in the year 1112. In the Delta, it never rains in summer,

summer, and very seldom at any other time. In 1761, however, such a quantity of rain unexpectedly fell, that a great number of houses, built with mud-walls, tumbled entirely down by being soaked with the water, to which they were unaccustomed. In the Higher Egypt the rain is still less frequent; but the people, sensible of the advantages which accrue from it, always rejoice when any falls, however insufficient to answer the purpose. This deficiency of rain is supplied by the inundation and dews already mentioned.

148 **Cause of the dews in Egypt.**

The latter proceed, as has already been said, partly from the waters of the inundation and partly from the sea. At Alexandria, after sunset, in the month of April, the clothes exposed to the air and the terraces are soaked with them as if it had rained. These dews are more or less copious according to the direction of the wind. They are produced in the greatest quantity by the westerly and northerly winds, which blow from the sea; but the south and south-east winds, blowing over the deserts of Africa and Arabia, produce none.

149 **Remarkable regularity of the winds.**

The periodical return of winds from a certain quarter is a very remarkable phenomenon in this country. When the sun approaches the tropic of Cancer, they shift from the east to the north; and, during the month of June, they always blow from the north or north-west. They continue northerly all the month of July, varying only sometimes towards the east, and sometimes the contrary way. About the end of this month, and during the whole of August and September, they blow directly from the north, and are but of a moderate strength, though somewhat weaker in the night than in the day. Towards the end of September they return to the east, though they do not absolutely fix on that point, but blow more regularly from it than any other except the north. As the sun approaches the southern tropic, they become more variable and tempestuous, blowing most commonly from the north, north-east, and west, which they continue to do throughout the months of December, January, and February; and, during that season, the vapours raised from the Mediterranean condense into mist, or even sometimes into rain. Toward the end of February, and in the succeeding month, they more frequently blow from the south than from any other quarter. During some part of the month of March and in that of April, they blow from the south, south-east, and south-west; sometimes from the north and east, the latter becoming most prevalent about the end of that month, and continuing during the whole of May.

It is to the long continuance of the north winds, formerly called the *Etesian winds*, that Egypt probably owes its extreme dryness, as well as part of the inundation by which it is fertilized.

150 **Rains in Abyssinia and in Armenia occasioned by two opposite currents of air.**

From the month of April to July, there appear to be two immense currents in the atmosphere, the under one blowing from the north, and the upper from the south. By the former the vapours are raised from the Mediterranean and southern parts of Europe, where they are carried over Abyssinia, desolving there in immense deluges of rain; while by the latter the superfluous vapours, or those raised from the country of Abyssinia itself, are carried northward toward the sources of the Euphrates. Here the clouds coming from the south, descending into the lower part of the atmosphere, dissolve in like manner into rain, and produce an inundation of the Euphrates similar to that of the Nile, and immediately succeeding it. Mr. Bruce had an opportunity of ascertaining this fact in the month of June 1768; for at that time, while on a voyage from Sidon to Alexandria, he observed great numbers of thin white clouds moving rapidly from the south, and in direct opposition to the Etesian winds.

Besides the ordinary winds here spoken of, Egypt is infested with the destructive blasts common to all warm countries which have deserts in their neighbourhood. These have been distinguished by various names, such as *poisonous winds*, *hot winds of the desert*, *Samiel*, *the wind of Damascus*, *Kamsin*, and *Simoom*.

151 **Of the hot winds.**

In Egypt they are denominated "winds of 50 days," because they most commonly prevail during the 50 days preceding and following the equinox; though, should they blow constantly during one half of that time, an universal destruction would be the consequence. Of these travellers have given various descriptions. M. Volney says, that the violence of their heat may be compared to that of a large oven at the moment of drawing out the bread. They always blow from the south; and are undoubtedly owing to the motion of the atmosphere over such vast tracts of hot sand, where it cannot be supplied by a sufficient quantity of moisture. When they begin to blow, the sky loses its usual serenity, and assumes a dark, heavy, and alarming aspect, the sun himself laying aside his usual splendor, and becoming of a violet colour. This terrific appearance seems not to be occasioned by any real haze or cloud in the atmosphere at that time, but solely to the vast quantity of fine sand carried along by those winds, and which is so excessively subtle that it penetrates every where. The motion of this wind is always rapid, but its heat is not intolerable till after it has continued for some time. Its pernicious qualities are evidently occasioned by its excessive avidity of moisture. Thus it dries and shrivels up the skin; and by doing the same to the lungs, will in a short time produce suffocation and death. The danger is greatest to those of a plethoric habit of body, or who have been exhausted by fatigue; and putrefaction soon takes place in the bodies of such as are destroyed by it. Its extreme dryness is such, that water sprinkled on the floor evaporates in a few minutes; all the plants are withered and stripped of their leaves; and a fever is instantly produced in the human species by the suppression of perspiration. It usually lasts three days, but is alogether insupportable if it continue beyond that time. The danger is greatest when the wind blows in squalls, and to travellers who happen to be exposed to its fury without any shelter. The best method in this case is to stop the nose and mouth with an handkerchief. Camels, by a natural instinct, bury their noses in the sand, and keep them there till the squall is over. The inhabitants, who have an opportunity of retiring to their houses, instantly shut themselves up in them, or go into pits made in the earth, till the destructive blast be over.

The description of a blast of this kind which overtook Mr. Bruce in the desert of Nubia is still more terrible than that just given from M. Volney. We have already mentioned something of the pillars of moving sand raised by the winds in the desert. These were observed by our traveller on this occasion in all their ter-

Egypt.

rific majesty. Sometimes they appeared to move slowly; at other times with incredible swiftness, so that they could not have been avoided by the fleetest horse. Sometimes they came so near, that they threatened destruction to the whole company. Frequently the tops, when arrived at an immense height, so that they were lost in the clouds, suddenly separated from the bodies, and dispersed themselves in the air; and sometimes the whole column broke off near the middle, as if it had received a cannon shot; and their size was such, that, at the distance of about three miles, they appeared ten feet in diameter. Next day they appeared of a smaller size, but more numerous, and sometimes approached within two miles of the company. The sun was now obscured by them, and the transmission of his rays gave them a dreadful appearance, resembling pillars of fire. This was pronounced by the guide to be a sign of the approaching *Simoom* or hot wind; and he directed, that, when it came, the people should fall upon their faces and keep their mouths on the sand, to avoid the drawing in this pernicious blast with their breath. On his calling out that the Simoom was coming, Mr Bruce turned for a moment to the quarter from whence it came, which was the south-east. It appeared like a haze or fog of a purple colour, but less bright than the purple part of the rainbow; seemingly about 20 yards in breadth, and about 12 feet high from the ground. It moved with such rapidity, that before he could turn about and fall upon his face, he felt the vehement heat of its current upon his face; and even after it passed over, which was very quickly, the air which followed was of such an heat as to threaten suffocation. Mr. Bruce had unfortunately inspired some part of the pernicious blast; by which means he almost entirely lost his voice, and became subject to an asthmatic complaint, from which he did not get free for two years. The same phenomenon occurred twice more on their journey through this desert. The second time it came from the south a little to the east: but it now seemed to have a shade of blue along with the purple, and its edges were less perfectly defined; resembling rather a thin smoke, and having about a yard in the middle tinged with blue and purple. The third time, it was preceded by an appearance of sandy pillars more magnificent than any they had yet observed; the sun shining through them in such a manner as to give those which were nearest a resemblance of being spangled with stars of gold. The simoom which followed had the same blue and purple appearance as before, and was followed by a most suffocating wind for two hours, which reduced our travellers to the lowest degree of weakness and despondency. It was remarkable that this wind always came from the south-east, while the sandy pillars, which prognosticated its approach, affected to keep to the westward, and to occupy the vast circular space inclosed by the Nile to the west of their route, going round by Chaigie towards Dongola. The heaps of sand left by them when they fell, or raised by the whirlwinds which carried them up, were 12 or 13 feet high, exactly conical, tapering to a fine point, and their bases well proportioned.

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Of the inhabitants of Egypt.

The inhabitants of Egypt may now be distinguished into four distinct races of people.

I. The *Arabs*, who may be subdivided into three classes. 1. The posterity of those who settled here immediately after the conquest of the country by Amrou Ebn Al As the khalif Omar's general. 2. The *Magrebians*, or Western Arabs, who at different times have migrated from the countries to the westward of Egypt, and are descended from the Saracen conquerors of Mauritania. 3. The *Bedouins*, or Arabs of the desert, known to the ancients by the name of *Scenites*, or dwellers in tents. The first of these classes are now found among the husbandmen and artizans; and are distinguished from the others by being of a more robust habit of body, as well as of a larger stature than the others. They are in general five feet four inches high; and many of them attain two or three inches more, and are muscular without being fleshy. Their countenances are almost black, but their features are not disagreeable; and as those of the country do not ally themselves in marriage but with the people of their own tribe, their faces have all a strong resemblance to each other. This is not the case with such as live in towns, by reason of their promiscuous marriages. The second class are more numerous in the Said, where they have villages and even distinct sovereigns of their own. Like the former, they apply themselves to agriculture and mechanical occupations. The Bedouins pass their lives among the rocks, ruins, and sequestrated places where they can find water; sometimes uniting in tribes and living in low smoky tents, and shifting their habitations from the desert to the banks of the river and back again, as best suits their conveniency. Their time of inhabiting the desert is the spring; but after the inundation they take up their residence in Egypt, in order to profit by the fertility of the country. Some farm lands in the country which they cultivate, but change annually. In general, all these Bedouins are robbers, and are a great terror to travellers as well as to the husbandmen; but though their number is estimated at not less that 30,000, they are dispersed in such a manner that they cannot attempt any thing of consequence.

II. The *Copts* are descendants of those inhabitants of Egypt whom the Arabs subdued, and who were composed of original Egyptians, Persians, and Greeks. M. Volney is of opinion that their name of Copts is only an abbreviation of the Greek word *Aigouptios*, an Egyptian. They are principally to be met with in the Said, though some also inhabit the Delta. They have all a yellowish dusky complexion, puffed up visage, swoln eyes, flat noses, and thick lips; and in fact the exact countenance of a mulatto. M. Volney, from a view of the sphynx, and finding its features to be such as is just now described, concludes, that the ancient Egyptians were real negroes; which he thinks is likewise confirmed by a passage in Herodotus, where he concludes, that the inhabitants of Colchis were descended from the Egyptians, "on account of the blackness of their skins and frizzled hair." M. Volney also remarks, that the countenance of the negroes is such as exactly represents that state of contraction assumed by our faces when strongly affected by heat. The eye-brows are knit, the cheeks rise, the eye-lids are contracted, and the mouth distorted; and this state of contraction to which the features of the negroes are perpetually exposed in the hot climates they inhabit, is become particularly characteristic. Excessive cold and snow produces the same effect; and hence this

this kind of countenance is also common among the Tartars; while in the temperate climates, the features are proportionably lengthened, and the whole countenance expanded.

The Copts profess the Christian religion, but follow the heresy of the Eutychians, whence they have been persecuted by the Greeks; but having at last got the better of their adversaries, they are become the depositaries of the registers of the lands and tribes. At Cairo they are called *writers*; and are the intendants, secretaries, and collectors for government. The head of their class is writer to the principal chief; but they are all hated by the Turks to whom they are slaves, as well as by the peasants whom they oppress. Their language bears a great resemblance to the Greek: but they have five letters in their alphabet, as well as a number of words in their language, which may be considered as the remains of the ancient Egyptian. These are found to bear a near resemblance to the dialects of some of the neighbouring nations, as the Arabic, Ethiopian, Syriac, &c. and even of those who lived on the banks of the Euphrates. The language of the Copts, however, has fallen into disuse for upwards of 300 years. On the conquest of the country by the Saracens, the latter obliged the people to learn their language; and about the year 722 the use of the Greek tongue was prohibited throughout the whole of their empire: the Arabic language then of course become universal: while the others, being only met with in books, soon became totally neglected. The true Coptic, therefore, though there is a translation of the scriptures and many books of devotion written in it, is understood by nobody, not even the monks and priests.

III. The *Turks*, have the title of being masters of Egypt, but are chiefly to be met with at Cairo, where they possess the religious and military employments. Formerly they possessed also the posts under government; but these are now occupied by the fourth race of inhabitants, viz.

IV. The *Mamlouks*. Of the origin of these we have already given some account: we have only, therefore, to relate some of the most remarkable particulars concerning their constitution and government, manners, &c.

These people, as has already been mentioned, are the real masters of Egypt; and in order to secure themselves in the possession of the country, they have taken several precautions. One of the principal of these is the degradation of the two military corps of azabs and janizaries, both of which were formerly very formidable. They have been able to effect this only in consequence of the corrupt and wretched government of the Turks; for before the revolt of Ibrahim Kiaya, the Turkish troops, which ought to have consisted of 40,000, were reduced to less than half that number through the avarice and malversation of their officers. Their degradation was completed by Ali Bey; who having first displaced all the officers who gave him any umbrage, left their places vacant, and so reduced the consequence of the whole, that the azabs and janizaries are now only a rabble of vagabonds, who dread the Mamlouks as much as the meanest of the populace. The principal body of the Mamlouks reside at Cairo; but many of them are dispersed through the country, in order to keep up their authority, collect the tribute, and oppress the people; yet it should seem very easy for the Porte to dispossess them of this usurped authority, as their number is supposed not to exceed 8,500, including among these a great many youth under 20 years of age.

The Mamlouks are all horseman; and as war is accounted the only honourable employment among them, it is reckoned disgraceful to walk on foot, none but cavalry being accounted soldiers. The other inhabitants are allowed only the use of mules and asses; and the same mark of indignity is imposed upon Europeans; though, by proper management and liberal presents, this may be got over. In the year 1776 lord Algernoun Percy, afterwards lord Louvaine, and the earl of Charlemont, obtained permission to ride upon horseback. The Mamlouks, however, are not incited to this continual appearance on horseback merely by their supposed superiority to the rest of the inhabitants; it is rendered necessary by their dress, which is extremely unwieldly and cumbersome. It consists of a wide shirt of thin yellowish-coloured cotton; over which is a gown of India linen, or some of the light stuffs of Damascus or Aleppo. Over this is a second covering of the same form and wideness, with sleeves reaching down to the ends of the fingers. The former covering is called *antari*, and the latter *caftan*. The caftan is usually made of silk or some finer stuff than the under garments; and both of them are fastened by a long belt, which divides the whole dress into two bundles. Over all these they have a third, named *djouha*, consisting of cloth without lining, and made nearly similar to the others, but that the sleeves are cut in the elbow. This coat is lined, sometimes even in summer with fur; and as if all this was not sufficient, they have an outer covering called the *beniche*, which is the cloak or robe of ceremony; and so completely covers the body, that even the ends of the fingers are not to be seen. Thus, when the beniche and other accoutrements are on, the whole body appears like a long sack, with a bare neck and bald head covered with a turban thrust out of it. This turban is called a *kaouk*; and is of a cylindrical form, yellow, and turned up on the outside with a roll of muslin artificially folded up. On their feet they have a sock of yellow leather reaching up to their heels, slippers without any quarters, which consequently are always ready to be left behind in walking. Lastly, to complete this extraordinary dress, they have a kind of pantaloon or trowsers, long enough to reach up to the chin, and so large that each of the legs is big enough to contain the whole body; but that they may walk more at their ease under such a number of impediments, they tie all the loose parts of their dress with a running sash. "Thus swaddled (says M. Volney), we may imagine the Mamlouks are not very active walkers; and those who are not acquainted by experience with the prejudices of the different countries, will find it scarcely possible to believe that they look on this dress as exceedingly commodious. In vain we may object that it hinders them from walking, and encumbers them unnecessarily on horseback; and that in battle a horseman once dismounted is a lost man. They reply, *It is the custom*, and every objection is answered."

153 Absurd dress and accoutrements of the Mamlouks.

In the accoutrements of their horses, the Mamlouks are almost equally absurd. The saddle is a clumsy piece of furniture, weighing with the saddle-cloths not less than

than 25 pounds; while the weight of the ſtirrups is never leſs than 9 or 10 pounds, nay, frequently exceeds 13. On the back-part of the ſaddle riſes a truſſequin about eight inches in height, while a pummel before projects four or five inches, in ſuch a manner as to endanger the breaſt of the horſeman if he ſhould happen to ſtoop. Inſtead of a ſtuffed frame, they have three thick woollen coverings below the ſaddle; the whole being faſtened by a ſurcingle, which, inſtead of a buckle, is tied with leather thongs in very complicated knots, and liable to ſlip. Inſtead of a crupper they have a large martingale which throws them upon the horſes ſhoulders. The ſtirrups are made of copper, longer and wider than the foot, having circular edges an inch high in the middle, and gradually declining towards each end. The edges are ſharp, and uſed inſtead of ſpurs, by which means the poor animal's ſides are much wounded. The weight of the furniture has already been mentioned; and is the more ridiculous as the Egyptian horſes are very ſmall. The bridle is equally ill contrived, and greatly injures the horſe's mouth, eſpecially by reaſon of the violent method they have of managing the animal. Their uſual way is to put the horſe to a full gallop, and ſuddenly ſtop him when at full ſpeed. Thus checked by the bit, he bends in his hind legs, ſtiffens the fore ones, and moves along as if he ſcarce had joints in his body: yet, notwithſtanding all thoſe diſadvantages, our author acknowledges that they are vigorous horſemen, having a martial appearance which pleaſes even ſtrangers.

154 Their arms, education &c.

In the choice of their arms they have ſhown themſelves more judicious. Their principal weapon is an Engliſh carbine about 30 inches long; but ſo large in the bore, that it can diſcharge 10 or 12 balls at a time, which can ſcarce fail of doing great execution even from the moſt unſkilful hand. Beſides two large piſtols carried in the belt, they have ſometimes a heavy mace at the bow of the ſaddle for knocking down their enemy; and by the ſhoulder-belt, they ſuſpend a crooked ſabre meaſuring 24 inches in a ſtraight line from the hilt to the point, 30 at leaſt in the curve. The reaſon of the preference given to the crooked blade is, that the effect of a ſtraight one depends merely on the force with which it falls, and is confined to a ſmall ſpace, but that of a crooked one is continued longer by the action of the arm in retiring. The Mamlouks commonly procure their ſabres from Conſtantinople, or other parts of Europe; but the beys rival each other in thoſe of Perſia and ſuch as are fabricated of the ancient ſteel of Damaſcus. For theſe they frequently pay as high as 40l. or 50l. ſterling; but though it muſt be allowed that the edge of theſe weapons is exquiſitely keen, yet they have the defect of being almoſt as brittle as glaſs. The whole education and employment of the Mamlouks conſiſts in the exerciſe of theſe weapons, or what is conducive to it; ſo that we ſhould imagine they might at laſt become altogether irreſiſtible. Every morning the greater part of them exerciſe themſelves in a plain near Cairo, by firing their carbines and piſtols in the moſt expeditious manner, having an earthen veſſel for a mark to ſhoot at; and the perſon who breaks it is highly applauded by the beys who attend in order to encourage them. Here alſo they exerciſe themſelves in the uſe of the ſabre, as well as of the bow and arrows; though they do not any longer make uſe of theſe laſt in their engagements. Their favourite diverſion is throwing the *djerid*; a word properly ſignifying a reed, but which is generally made uſe of to ſignify any ſtaff thrown by the hand after the manner of the Roman pilum. In this exerciſe they make uſe of the branches of the palm-tree freſh ſtripped. Theſe branches, which have the form of the ſtalk of an artichoke, are about four feet long, and weigh five or ſix pounds. With theſe the cavaliers enter the liſts, riding full ſpeed, and throwing them afterwards at each other from a conſiderable diſtance. As ſoon as the aſſailant has thrown his weapon, he turns his horſe, and his antagoniſt purſues in his turn. The diverſion, however, frequently turns out very ſerious, as ſome are capable of throwing theſe weapons with force ſufficient to wound their antagoniſts mortally. Ali Bey was particularly dexterous at this kind of ſport, and frequently killed thoſe who oppoſed him. All theſe military exerciſes, however, are by no means ſufficient to render the Mamlouks formidable in the field. In their engagements they have neither order, diſcipline, nor even ſubordination; ſo that their wars are only ſcenes of robbery, plunder, and tumultuary encounters, which begin very often ſuddenly in the ſtreets of Cairo without the leaſt warning. If the contention happens to be transferred to the country, it is ſtill carried on in the ſame manner. The ſtrongeſt or moſt daring party purſues the other. If they are equal in courage, they will perhaps appoint a field of battle, and that without the leaſt regard to advantages of ſituation, but fighting in platoons, with the boldeſt champions at the head of each. After mutual defiances the attack begins, and every one chooſes out his man. After diſcharging their fire-arms, if they have an opportunity they attack with their ſabres; and ſuch as happen to be diſmounted are helped up again by their ſervants; but if nobody happens to be near, the ſervants will frequently kill them for the ſake of the money they carry about them. Of late, however, the ordinary Mamlouks, who are all ſlaves to the reſt, ſeem convinced that their patrons are the perſons principally intereſted; for which reaſon they reaſonably enough conclude that they ought to encounter the greateſt dangers. Hence they generally leave them to carry on the diſpute by themſelves; and being always ſure of finding a maſter who will employ them, they generally return quietly to Cairo until ſome new revolution takes place.

155 Are not formidable in war.

156 Their expenſive way of living.

The mode of living among the Mamlouks is exceedingly expenſive, as may eaſily be conceived from what has already been related. There is not one of them who does not coſt above 100l. ſterling annually, and many of them upwards of 200l. At every return of the faſt of Ramadan, their maſters muſt give them a new ſuit of French and Venetian cloths, with ſtuffs from India and Damaſcus. Frequently they require new horſes and harneſs: they muſt likewiſe have piſtols and ſabres from Damaſcus, with gilt ſtirrups, and ſaddles and bridles plated with ſilver. The chiefs are diſtinguiſhed from the vulgar by the trinkets and precious ſtones they wear; by riding Arabian horſes of 200l. or 300l. value, wearing ſhawls of Caſhmire in value from 25l. to 50l. each, with a variety of peliſſes, the cheapeſt of which coſts above 20l. Even the European merchants have given into this kind of extravagance;

vagance; so that not one of them looks upon his wardrobe to be decently furnished unless it be in value 500l. or 600l.

Anciently it was customary for the women to adorn their heads with sequins; but this is now rejected as not sufficiently expensive. Instead of these, diamonds, emeralds, and rubies, are now substituted; and to these they add French stuffs and laces. In other respects the character of the Mamlouks is almost the worst that can be imagined. Without affection, tie, or connection with each other or with the rest of mankind, they give themselves up without controul to the most enormous vices; and, according to M. Volney, they are at once ferocious, perfidious, seditious, base, deceitful, and corrupted by every species of debauchery, not excepting even the unnatural vice; of which he tells us not one is free, this being the very first lesson each of them receives from his master, all being orinally slaves, as has already been mentioned.

157 Their bad character.

158 Miserable state of the Egyptians.

As these are the present governors of Egypt, we may easily judge that the condition of the common people cannot be very agreeable. The greater part of the lands indeed are in the hands of the Mamlouks, beys, and professors of the law, the property of all others being very precarious. Contributions are to be paid, or damages repaired, every moment; and there is neither a right of succession nor inheritance for real property, but every thing must be purchased from government. The peasants are allowed nothing but what is barely sufficient to sustain life. They cultivate rice and corn indeed, but are not at liberty to use either. The only food allowed them is dora or Indian millet, from which they make a kind of tasteless bread; and of this, with water and raw onions, consists all their fare thoughout the year. They esteem themselves happy, therefore, if along with these they can sometimes procure a little honey, cheese, sour milk, or a few dates. They are very fond of flesh meat and fat; neither of which, however, they have an opportunity of tasting except at extraordinary festivals. Their ordinary dress consists of a shirt of coarse blue linen, and a clumsy black cloak; with a sort of black bonnet over their heads; and over all they wear a long red woollen handkerchief. Their arms, legs, and breasts, are naked, and most of them do not even wear drawers. They live in mud-walled huts of the most miserable construction, where they are exposed to the inconveniences of smoke, heat, and unwholesome air; to all which are to be added the continual fears they live in of being robbed by the Arabs, oppressed by the Mamlouks, or some other grievous calamity. The only conversation is concerning the intestine troubles and misery of the country, murders, bastinadoes, and executions. Here sentence of death is executed without the least delay or form of trial. The officers who go the rounds in the streets either by night or day, are attended by executioners, who carry along with them leathern bags for receiving the heads they cut off in these expeditions. Even the appearance of guilt is not necessary to infer a capital punishment; for frequently nothing more is requisite than the possession of wealth, or being supposed to possess it. In this case the unfortunate person is summoned before some bey; and when he makes his appearance, a sum of money is demanded of him. If he denies that he possesses it, he is thrown on his back, and receives two or three hundred blows on the soles of his feet, nay perhaps is put to death without any ceremony. The only security to those who possess any wealth in this country therefore is, to preserve as great an appearance of poverty as possible.

159 Diseases prevalent in this country.

Though the climate of Egypt is far from being unhealthy; yet there are not a few diseases which seem to be peculiar to it, and to have their origin either from the constitution of the atmosphere, or the manner of living of the inhabitants. One of these till lately has been supposed to be the plague; which opinion we find supported by Dr. Mead, who has endeavoured to assign a natural reason why it should take its origin in this country. But it is now universally agreed, that the plague never originates in the interior parts of Egypt, but always begins at Alexandria, passing successively from thence to Rosetta, Cairo, Damietta, and the rest of the Delta. It is likewise observed, that its appearance is always preceded by the arrival of some vessel from Smyrna or Constantinople; and that, if the plague has been very violent in either of these cities, the danger to Egypt is the greater. On proper inquiry, it is found to be really a native of Constantinople; from whence it is exported by the absurd negligence of the Turks, who refuse to take any care to prevent the spreading of the infection. As they sell even the clothes of the dead without the least ceremony, and ships laden with this pernicious commodity are sent to Alexandria, it is no wonder that it should soon make its appearance there. As soon as it has reached Cairo, the European merchants shut themselves up with their families in their *khans* or lodgings, taking care to have no further communication with the city. Their provisions are now deposited at the gate of the khan, and are taken up by the porter with iron tongs; who plunges them into a barrel of water provided for the purpose. If they have occasion to speak to any person, they take care to keep at such a distance as to avoid touching or even breathing upon each other. By these precautions they certainly escape the general calamity, except by accident; and it not long ago happened that the disease was conveyed by a cat into the dwellings of the French merchants in Cairo; by which two were infected and one died. In this manner they are imprisoned for three or four months, without any other amusement than walking on their terraces in the evenings, cards, or conversation with one another. There is a remarkable difference betwixt the plague at Constantinople and in Egypt. In the former, it is most violent in summer; and in the latter in winter, ending there always in the month of June. It is also remarkable, that the water-carriers of Egypt, whose backs are constantly wet from the nature of their occupation, never have the plague. It appears in Egypt every fourth or fifth year, when it makes such ravages as would depopulate the country, were it not for the vast concourse of strangers which arrive here every year from all parts of the Turkish empire.

A malady which seems in reality to be peculiar to Egypt is blindness. This is so common at Cairo, as M. Volney informs us, that out of 100 people whom he has met on the street, he might reckon 20 quite blind; ten without the sight of one eye; and 20 others with their eyes red, purulent, or blemished. Almost every one, says he, wears a fillet, a token of an approaching or convalescent ophthalmy. In considering the causes of this disorder, he reckons the sleeping upon terraces to be a principal one. The south wind, says he, cannot be the cause; otherwise the Bedouins would be equally subject to it with the Egypbans themselves: but what is with the greatest probability to be assigned as the cause, according to our author, is the very poor and little nutritive food which the natives are obliged to use. "The cheese, sour-milk, honey, confection of grapes, green fruits, and raw vegetables (says he), which are the ordinary food of the people, produce in the stomach a disorder which physicians have observed to affect the sight; the raw onions, especially, which they devour in great quantities, have a peculiar heating quality, as the monks of Syria made me remark on myself. Bodies thus nourished, abound in corrupted humours, which are constantly endeavouring a discharge. Diverted from the ordinary channels, by habitual perspiration, these humours fly to the exterior parts, and fix themselves where they find the least resistance. They therefore naturally attack the head, because the Egyptians, by shaving it once a week, and covering it with a prodigiously hot head-dress, principally attract to it the perspiration; and if the head receives ever so slight an impression of cold on being uncovered, this perspiration is suppressed, and falls upon the teeth, or still more readily on the eyes as being the tenderest part. It will appear the more probable that the excessive perspiration of the head is a principal cause, when we reflect that the ancient Egyptians who went bare-headed, are not mentioned by physicians as being so much afflicted with ophthalmies; though we are informed by historians that some of the Pharoahs died blind. The Arabs of the desert also, who cover the head but little, especially when young, are also very little subject to them." In this country blindness is often the consequence of the small-pox, a disorder very frequent and very fatal among the Egyptians; and no doubt the more dangerous on account of their absurd method of treating it, of which it is needless to enter into any discussion in this place. They are not unacquainted with inoculation; but seem not to be sensible of its advantages, as they very seldom practise it.

To the same case, *viz.* unwholesome food, M. Volney ascribes the general deformity of the beggars, and the miserable appearance of the children; which he says are no where so wretched. "Their hollow eyes, pale and puffed faces, swollen bellies, meagre extremities, and yellow skins, make them always seem as if they had not long to live. Their ignorant mothers pretend that this is the effect of the *evil eye* of some envious person, who has bewitched them; and this ancient prejudice is still general in Turkey: but the real cause is the badness of their food. In spite of the talismans, therefore, an incredible number of them perish; nor is any city more fatal to the population of the neighbouring country than Grand Cairo."

The venereal disease, which, for reasons best known to themselves, the inhabitants call the *blessed evil*, is so general at Cairo, that one half of the inhabitants are infected. It is extremely difficult to cure, though the symptoms are comparatively very mild, insomuch that people who are infected with it will frequently live to the age of 80; but it is fatal to children born with the infection, and exceedingly dangerous to such as emigrate to a colder climate.

Besides these, there are two uncommon diseases met with in Egypt, *viz.* a cutaneous eruption which returns annually; and a swelling of the testicles, which often degenerates into an enormous hydrocele. The former comes on towards the end of June or beginning of July, making its appearance in red spots and pimples all over the body, occasioning a very troublesome itching. The cause of this distemper, in M. Volney's opinion, is the corruption of the waters of the Nile, which towards the end of April become very putrid, as has already been observed. After this has been drunk for some time, the waters of the inundation, which are fresh and wholesome, tend to introduce some change in the blood and humours; whence a cutaneous eruption is a natural consequence.

The hydrocele most commonly attacks the Greeks and Copts; and is attributed to the quantity of oil they make use of, as well as to their frequent hot-bathing. Our author remarks, that "in Syria as well as in Egypt, constant experience has shown, that brandy distilled from common figs, or from the fruit of the sycamore tree, as well as from the dates and the fruit of the nopal, has a most immediate effect on the testicles, which it renders hard and painful the third or fourth day after it has been drunk; and if the use of it be not discontinued, the disorder degenerates into a confirmed hydrocele. Brandy distilled from dried raisins has not the same effect: this is always mixed with annisecds; and is very strong, being distilled three times. The Christians of Syria and the Copts of Egypt make great use of it; the latter especially drink whole bottles of it at their supper. I imagined this an exaggeration; but I have myself had occular proofs of its truth, though nothing could equal my astonishment that such excesses do not produce instant death, or at least every symptom of the most insensible drunkenness."

In the spring season malignant fevers prevail in this country; concerning which our author mentions no remarkable particular, but that eggs are a kind of poison, and that bleeding is very prejudicial. He recommends a vegetable diet, and the bark in very large quantity.

160 Commerce of Cairo considerable.

Notwithstanding the oppression which the Egyptians labour under, a very considerable trade is carried on from Cairo. This flourishing state of commerce in the midst of the most desperate barbarity and despotism is owing to three causes. 1. That all the commodities consumed in Egypt are collected within the walls of the city. 2. That the Mamlouks and all the people of property reside in that place, and there spend their whole revenues. 3. By the situation of this city it is a centre of circulation; corresponding with Arabia and India, by the Red Sea; with Abyssinia and the interior parts of Africa, by the Nile; and with Europe and the Turish empire, by means of the Mediterranean. A caravan comes here annually from Abyssinia, bringing from 1000 to 1200 slaves, with gum, ivory, gold-dust, ostrich feathers, parrots and monkeys.—Another, which sets out from the extreme parts of Morocco, takes in pilgrims for Mecca from all that country as far south as the mouth of the river Senegal. It consists of not fewer than three or four thousand camels;

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mels; and, passing along the coasts of the Mediterranean, collects likewise the pilgrims from Algiers, Tripoli, and Tunis, arriving at last at Alexandria by the way of the desert. Proceeding thence to Cairo, it joins the Egyptian caravan; and then setting out both together, they take their journey to Mecca, from whence they return in one hundred days; but the Morocco pilgrims, who have still 600 leagues to go, are upwards of a year in returning. The commodities they bring along with them are, India stuffs, shawls, gums, perfumes, pearls, and principally coffee. Besides the profits of this merchandize, considerable sums arise from the duties paid by pilgrims, and the sums expended by them.

The caravans abovementioned are not the only means by which these commodities are brought to Cairo. They arrive also at Suez, to which port the southerly winds bring in the month of May six or eight and twenty sail of vessels from Jedda. Small caravans likewise arrive from time to time from Damascus with silk and cotton stuffs, oils, and dried fruits. During the proper season there are also a number of vessels in the road of Damietta, unloading hogsheads of tobacco from Latakia, vast quantities of which are consumed in this country. For this commodity rice is taken in exchange; while other vessels bring clothing, arms, furs, passengers, and wrought silk from Constantinople. There are other vessels which come from Marseilles, Leghorn, and Venice, with cloths, cochineal, Lyons stuffs and laces, grocery ware, paper, iron, lead, Venetian sequins, and German dahlers. These are conveyed to Rosetta in barks called by M. Volney *djerm*, but which seem to be the same mentioned by Mr Bruce under the name of *cania*, and which are particularly described by him. He informs us, that there is a peculiarity in the form of this vessel which makes it useful for navigating the river Nile; and that is, that the keel is not straight, but a portion of a parabola, whose curve is almost insensible to the eye. Hence, as sand banks are very common in the Nile, and vessels are apt to strike them when the water becomes low, the middle of the canja will be aground while the extremities are afloat, and thus by means of oars and other assistance, it is always possible to get clear; but were the keel straight, this would be altogether impossible, by reason of the vast sails those vessels carry, which would urge them on with too much force to be recovered. The accommodation on board those vessels is much better than what could be expected: but they are liable to the depredations of robbers, who either swim under water in the day time, or upon goats skins during the night; though these seldom attack any boats where there are Europeans, whom they dread on account of their skill in fire-arms.

161 Vessels which navigate the Nile described.

From so many sources we need not wonder that the commerce of Cairo should be in a very flourishing state. In 1783, according to the report of the commissioner-general of the customs, it amounted to no less than 6,250,000l. but notwithstanding this show of wealth, the trade carried on at Cairo contributes very little to the enriching of the people. This will readily appear, when we consider, that great part of the coffee and other merchandise brought from India is exported to foreign countries, the value being paid in goods from Turkey and other European countries; while the country consumption consists entirely, or mostly, in articles of luxury already finished, and the produce given in return is mostly in raw materials.

162 Of cutting through the Isthmus of Suez.

Schemes have frequently been projected of enlarging the commerce of Egypt by cutting through the isthmus of Suez, and thus joining the Mediterranean and Red Seas by a canal. This is looked upon by M. Volney as impracticable. He owns, indeed, that no objection can arise from the distance, which is not more than 18 or 19 leagues; neither does any obstacle arise from mountains, or the inequality of levels, the whole being a sandy barren plain. The difficulty, which he considers as insuperable, proceeds from the nature of the corresponding coasts of the Mediterranean and Red Seas; both of which are low and sandy, where the water forms lakes, shoals, and morasses, so that ships cannot come within a considerable distance of either; and it would be scarce possible to cut a permanent canal amidst these shifting sands: not to mention, that the shore is destitute of harbours, which must be entirely the work of art. The country, besides, has not a drop of fresh water; which it would therefore be necessary to bring as far as from the Nile. The best method of effecting this junction therefore is by means of the river itself; and for this the ground is perfectly well calculated. This has been already done by several Egyptian princes, particularly Sesostris; and the canal is said to have been 170 feet wide, and deep enough for large vessels. After the Grecian conquest it was renewed by the Ptolemies, then by Trajan, and lastly by the Arabs. Part of it still remains, running from Cairo to the north-east of the *Berket-el-Hadj*, or Lake of the Pilgrims, where it loses itself. At present the commerce with Suez is only carried on by means of caravans, which set out towards the end of April or beginning of May, or in the months of July and August: waiting the arrival of the vessels, and setting out on their departure. The caravans are very numerous; that with which M. Volney travelled consisting of 5000 or 6000 men and 3000 camels. The country is as desert and barren as possible, without a single tree or the smallest spot of verdure; so that every necessary for those who accompany the caravan must be carried on the backs of the camels, wood and water not excepted.

The custom-houses of Egypt are in the hands of the Christians of Syria. Formerly they were managed by Jews; but these were completely ruined by the extortion of Ali Bey in 1769. The Syrian Christians came from Damascus somewhat more than 50 years ago; and having by their economy and industry gained possession of the most important branches of commerce, they were at length enabled to farm the custom-houses, which is an office of great consequence. There were at first only three or four families of them; but their number has since increased to more than 500, and they are reckoned very opulent.

163 Low state of the arts and learning.

From what has already been said concerning the state of the Egyptians, we may naturally conclude, that the arts and all kinds of learning are at a very low ebb among them. Even the most simple of the mechanical professions are still in a state of infancy. The work of their cabinet-makers, gunsmiths, and locksmiths, is extremely clumsy. There are manufactures of gun-powder and sugar; but the quality of both are very indifferent. The only thing in which they can be said to arrive at any degree of perfection is the manufacture

facture of silk stuffs; though even these are far less highly finished than those of Europe, and likewise bear a much higher price. One very extraordinary art indeed is still extant among the Egyptians, and appears to have existed in that country from the most remote antiquity; and that is a power of enchanting the most deadly serpents in such a manner, that they shall allow themselves to be handled, nay even hurt in the severest manner, without offering to bite the person who injures them. Those who have this art are named PSYLLI; to which article we refer for an account of what has been said on the subject by ancient and modern travellers.

For a description of those stupendous and almost indestructible monuments of human grandeur, the pyramids, so often take notice of and described by travellers; see the article PYRAMIDS.

EGYPTIANS, or GYPSIES. See GYPSIES.

EHRETIA, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 41st order, *Asperifoliæ*. The fruit is a bilocular berry; the seeds solitary and bilocular; the stigma emarginated.

EHRHARTA, in botany: A genus of the monogynia order, belonging to the hexandria class of plants. The calyx is a two-valved, abbreviated, and one flowered glume; the corolla is a double glume, each two-valved; the exterior one compressed, and scymeter-shaped, transversely wrinkled, and gashed at the base. There are six stamina, three on each side the pistil in a parallel line. The stigma is simple, compressed, four-tufted, and torn at the top.

EHUD, the son of Gera, a Benjamite, a man left-handed, who delivered Israel from the oppression of Eglon king of Moab, under whom they served for 18 years. See EGLON. It being customary for the Israelites to send a present or tribute to the king of Moab; in the year of the world 2579, being the last year of their servitude, Ehud was apppointed to carry it, who having a design either to free his country from this oppression, or perish in the attempt, had for this purpose provided himself with a dagger which had two edges, and which he had concealed on his right side, (Judges iii. 15, &c.) After he had delivered the present, pretending he had something of great importance to communicate to the king, he obtained a private audience of him; when taking his opportunity, he stabbed him with the poniard to the heart, and so shutting the door after him, had time to make his escape; for as the king was a very corpulent man, his attendants supposed that he was either reposing or easing himself, and therefore forebore to enter his apartment until Ehud was quite gone. As soon as he came to mount Ephraim, he gathered together the Israelites that lay nearest him, acquainted them with what he had done; and then securing the fords of Jordan that none of them might escape, he fell upon the Moabites, and subdued them.

EIA, or EY, in our old writers, are used for an island. Hence the names of places ending in *ey*, denotes them to be islands. Thus, Ramsey, the isle of rams; Shepey, the isle of sheep, &c.

EIA is also sometimes used for water; and hence the names of places near waters or lakes terminate in *ey*.

EJACULATOR, in anatomy, a name applied to two muscles of the penis from their office in the ejection of the seed. See ANATOMY, *Table of the Muscles*.

EICETÆ, called also HEICETÆ and HICETÆ, heretics of the seventh century, who made profession of the monastic life.—From that passage in Exodus, where Moses and the children of Israel are said to have sung a song in praise of the Lord, after they had passed the Red Sea, wherein their enemies had perished; the eicetæ concluded that they must sing and dance to praise God aright: and as Miriam the prophetess, sister of Moses and Aaron, took a drum in her hand, on the same occasion, and all the women did the like, to testify their joy, by playing, beating, and dancing; the eicetæ, the better to imitate their conduct herein, endeavoured to draw women to them to make profession of the monastic life, and assist in their mirth.

EICK. See BRUGES.

EIDER-DUCK. See ANAS.

EIDER-DOWN. See DOWN.

EJECTA, a term used by lawyers for a woman deflowered or cast from the virtuous.

EJECTION, in the animal economy, evacuation, or the discharging any thing through some of the emunctories, as by stool, vomit, &c.

EJECTION, in Scots law, is the turning out the possessor of any heritable subject by force; and is either *legal* or *illegal*. Legal ejection is where a person having no title to possess, is turned out by the authority of law. Illegal ejection is one person's violently turning another out of possession without lawful authority.

EJECTMENT, in English law, a writ or action which lies for the lessee for years, on his being ejected or put out of his land, before the expiration of his term, either by the lessor or a stranger. It may also be brought by the lessor against the lessee, for rent in arrears, or holding over his term, &c. Ejectment of late years is become an action in the place of many real actions, as writs of right, formedons, &c. which are very difficult, as well as tedious and expensive; and this is now the common action for trial of titles, and recovering of lands, &c. illegally held from the right owner; yet where entry is taken away by descents, fines, recoveries, disseisins, &c. an ejectment shall not be brought; whereby we find that all titles cannot be tried by this action.

The method of proceeding in the action of ejectment is to draw up a declaration, and feign therein a lease for three, five, or seven years, to him that would try the title; and also feign a casual ejector or defendant; and then deliver the declaration to the ejector, who serves a copy of it on the tenant in possession, and gives notice at the bottom for him to appear and defend his title; or that he the feigned defendant will suffer judgment by default, whereby the true tenant will be turned out of possession; to this declaration the tenant is to appear at the beginning of next term by his attorney, and consent to a rule to be made defendant, instead of the casual ejector, and take upon him the defence, in which he must confess lease, judgment, entry, and ouster, and at the trial stand upon the title only: but in case the tenant in possession does not appear, and enter into the said rule in time, after the declaration served, then, on affidavit being made of the service of the declaration, with the notice to appear as aforesaid,

said, the court will order judgment to be entered against the casual ejector by default; and thereupon the tenant in possession, by writ *habere facias possessionem*, is turned out of his possession. On the trial in ejectment, the plaintiff's title is to be set forth from the person last seised in fee of the lands in question, under whom the lessor claims down to the plaintiff, proving the deeds, &c. and the plaintiff shall recover only according to the right which he has at the time of bringing his action. And here, another who hath title to the land, upon a motion made for that purpose, may be defendant in the action with the tenant in possession, to defend his title; for the possession of the lands is primarily in question, and to be recovered, which concerns the tenant, and the title thereto is tried collaterally, which may concern some other.

EKRON, a city and government of the Philistines. It fell by lot to the tribe of Judah, in the first division made by Joshua (xv. 45.), but afterwards it was given to the tribe of Dan (*id.* xix. 43.) It was situated very near the Mediterranean, between Ashdod and Jamnia. Ekron was a powerful city, and it does not appear by history that the Jews were ever sole peaceable possessors of it: the Ekronites were the first who said that it was necessary to send back the ark of the God of Israel, in order to be delivered from those calamities which the presence of it brought upon their country, (1 Sam. v. 10.) The idol Baalzebub was principally adored at Ekron (2 Kings i. 2, &c.)

ELÆAGNUS, OLEASTER, or *Wild Olive:* A genus of the monogynia order, belonging to the tetrandria class of plants; and in the natural method ranking under the 16th order, *Calyciflorae.* There is no corolla; the calyx is campanulated, quadrifid, superior; the fruit is a plum below the campanulated calyx. There are three species: 1. The spinosa, or eastern broad-leaved olive with a large fruit, is a native of the Levant and some parts of Germany. The leaves are about two inches long, and one and a half broad in the middle. They are placed alternate, and of a silver colour: at the footstalk of every leaf there comes out a pretty long sharp thorn, which are alternately longer: the flowers are small, the inside of the empalement is yellow, and they have a strong scent when fully open. 2. The inermis, without thorns, is that kind commonly preserved in the gardens of Britain. The leaves are more than three inches long, and half an inch broad, and have a shining appearance like sattin. The flowers come out at the footstalks of the leaves, sometimes singly, at other times two, and sometimes three, at the same place. The outside of the empalement is silvery and studded; the inside of a pale yellow, and having a very strong scent. The flowers appear in July, and are sometimes succeeded by fruit. 3. The latifolia, with oval leaves, is a native of Ceylon, and some other parts of India. In this country it rises with a woody stem to the height of eight or nine feet, dividing into many crooked branches, garnished with oval and silvery leaves, which have several irregular spots of a dark colour on the surface. They are placed alternately on the branches, and continue all the year.

Culture, &c. The two first may be propagated by laying down the young shoots in autumn. They will take root in one year; when they may be cut off from the old trees, and either transplanted into a nursery for two or three years to be trained up, or into places where they are to remain. The proper time for this is in the beginning of March or early in the autumn. They should be placed where they may be screened from high winds; for they grow very freely, and are apt to be split by the wind if they are too much exposed. The third sort is too tender to endure the open air of this country; and therefore must be kept in a warm stove, except during a short time in the warmest part of summer.

From the flowers of these plants an aromatic and cordial water has been drawn, which is said to have been successfully used in putrid and pestilential fevers. The genus elæagnus is not to be confounded with the oleaster or wild olive of Gerard, Parkinson, and Ray. The last is only a particular species of olive, called by Tournefort and Caspar Bauhine, *olea sylvestris.* See OLEA.

ELÆOCARPUS, in botany: A genus of the monogynia order, belonging to the polyandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is pentapetalous and lacerated; the calyx is pentaphyllous; and the fruit is a plum, with a wrinkled kernel.

ELÆOTHESIUM, in antiquity, the anointing room, or place where those who were to wrestle or had bathed anointed themselves. See GYMNASIUM.

ELAIS, in botany; a genus belonging to the natural order of *Palmae.* The male calyx is hexaphyllous; the corolla sexfid; the stamina six: The female calyx is hexaphyllous; the corolla hexapetalous; the stigmata three; the fruit a fibrous plum, with a three-valved nut or kernel.

ELAM (anc. geog.), a country frequently mentioned in Scripture, and lying to the south-east of Shinar. In the time of Daniel (viii. 2.), Susiana seems to have been part of it; and before the captivity, it does not appear that the Jews called Persia by any other name. Elymæ and Elymais are often mentioned by the ancients. Ptolemy, though he makes Elymais a province of Media, yet he places the Elymæ in Susiana, near the sea-coast. Stephanus takes it to be a part of Assyria; but Pliny and Josephus more properly of Persia, whose inhabitants this latter tells us sprang from the Elamites. The best commentators agree, that the Elamites, who were the ancestors of the Persians, were descended from Elam the son of Shem. It is likewise allowed, that the most ancient among the inspired writers constantly intend Persia, when they speak of Elam and the kingdom of Elam. Thus, not to detain the reader with unnecessary quotations, when the prophet Jeremiah (xlix. 39.), after denouncing many judgments against this country, adds these words, "But it shall come to pass in the latter days, that I will bring again the captivity of Elam, saith the Lord," he is always understood to mean the restoration of the kingdom of the Persians by Cyrus, who subdued the Babylonians, as they before had subdued the Persians.

ELAPHEBOLIA, in Grecian antiquity, a festival in honour of Diana the huntress. In the celebration a cake was made in the form of a deer (ἔλαφος), and offered to the goddess. It owed its institution to the following circumstance: When the Phocians had been severely

severely beaten by the Thessalians, they resolved, by the persuasion of one Deiphantus, to raise a pile of combustible materials, and burn their wives, children, and effects, rather than submit to the enemy. This resolution was unanimously approved by the women, who decreed Deiphantus a crown for his magnanimity. When every thing was prepared, before they fired the pile, they engaged their enemies, and fought with such desperate fury, that they totally routed them, and obtained a complete victory. In commemoration of this unexpected success, this festival was instituted to Diana, and observed with the greatest solemnity.

ELAPHEBOLIUM, in Grecian antiquity, the ninth month of the Athenian year, answering to the latter part of February and beginning of March. It consisted of 30 days; and took its name from the festival elaphebolia, kept in this month, in honour of Diana the huntress, as mentioned in the preceding article.

ELASMIS, in natural history, a genus of talcs, composed of small plates in form of spangles; and either single, and not farther fissile; or, if complex, only fissile to a certain degree, and that in somewhat thick laminæ.—Of these talcs there are several varieties, some with large and others with small spangles, which differ also in colour and other peculiarities.

ELASTIC, in natural philosophy, an appellation given to all bodies endowed with the property of elasticity. See ELASTICITY.

ELASTIC Fluids. See AIR, ELECTRICITY, GAS, and *ELASTIC Vapours* below.

ELASTIC Resin. See CAOUTCHOUC.

ELASTIC Vapours are such as may, by any external mechanical force, be compressed into a smaller space than what they originally occupied; restoring themselves, when the pressure is taken off, to their former state with a force exactly proportioned to that with which they were at first compressed. Of this kind are all the aerial fluids without exception, and all kinds of fumes raised by means of heat whether from solid or fluid bodies.

Of these, some retain their elasticity only when a considerable degree of heat is applied to them or the substance which produces them; while others remain elastic in every degree of cold, either natural or artificial, that has yet been observed. Of the former kind are the vapours of water, spirit of wine, mercury, sal ammoniac, and all kinds of sublimable salts; of the latter, those of spirit of salt, mixtures of vitriolic acid and iron, nitrous acid, and various other metals, and in short the different species of aerial fluids indiscriminately.

The elastic force with which any one of these fluids is endowed has not yet been calculated, as being ultimately greater than any obstacle we can put in its way. Thus, if we compress the atmospherical air, we shall find that for some little time it will easily yield to the force we apply; but every succeeding moment the resistance will become stronger, and a greater and greater force must be applied in order to compress it farther. As the compression goes on, the vessel containing the air becomes hot; but no power whatever has yet been able to destroy the elasticity of the contained fluid in any degree; for upon removing the pressure, it is always found to occupy the very same space that it did before. The case is the same with aqueous steam, to which a sufficient heat is applied to keep it from condensing into water. This will yield to a certain degree; but every moment the resistance becomes greater, until at last it will overcome any obstacles whatever. An example of the power of this kind of steam we have every day in the steam engine; and the vapours of other matters, both solid and fluid, have frequently manifested themselves to be endowed with an equal force. Thus the force of the vapours of spirit of wine has occasioned terrible accidents when the worm has been stopped, and the head of the still absurdly tied down to prevent an explosion; the vapours of mercury have burst an iron box; and those of sal ammoniac, volatile salts, nitrous acid, marine acid, phosphorus, &c. have all been known to burst the chemical vessels which confined them with great force, in such a manner as to endanger those who stood near them. In short, from innumerable observations, it may be laid down as an undoubted fact, that there is no substance whatever capable of being reduced into a state of vapour, but what in that state is endowed with an elastic force ultimately superior to any obstacle we can throw in its way.

It hath been a kind of desideratum among philosophers to give a satisfactory reason for this astonishing power of elasticity in vapour, seemingly so little capable of accomplishing any great purpose when in an unconfined state. As air is that fluid in which, from the many experiments made upon it by the air-pump and otherwise, the elastic property has most frequently been observed, the researches of philosophers were at first principally directed towards it. The causes they assigned, however, were very inadequate; being founded upon an hypothesis concerning the form of the particles of the atmosphere itself, which they supposed to be either rolled up like the springs of watches, or that they consisted of a kind of elastic flakes. This was followed by another hypothesis concerning their substance, which was imagined to be perfectly elastic, and so strong that they could not be broken by any mechanical power whatever; and thus they thought the phenomenon of the elasticity of the air might be explained. But an insuperable difficulty still attended their scheme, notwithstanding both these suppositions; for it was observed, that the elastic power of the air was augmented not only in proportion to the quantity of pressure it was made to endure, but in proportion to the degree of heat applied to it at the time. Sir Isaac Newton was aware of this difficulty; and justly concluded, that the phenomena of the air's elasticity could not be solved on any other supposition but that of a repulsive power diffused all around each of its particles, which became stronger as they approached, and weaker as they removed from each other. Hence the common phenomena of the air pump and condensing-engine received a satisfactory explanation; but still it remained to account for the power shown in the present case by heat, as it could not be denied that this element had a very great share in augmenting the elasticity of the atmosphere, and seemed to be the only cause of elasticity in other vapours. It does not appear that Sir Isaac entered into this question, but contented himself with attributing to heat the property of in-

increasing repulsion, and ascribing this to another unexplored property called *rarefaction*. Thus matters stood till the great discovery made by Dr. Black, that some bodies have the power of absorbing in an unknown manner the element in question, and parting with it afterwards, so that it flows out of the body which had absorbed it with the very same properties that it had before the absorption. Hence many phenomena of heat, vapour, and evaporation, were explained in a manner much more satisfactory than had ever been attempted or even expected before. One of these was that remarkable property of metals becoming hot by hammering; during which operation, in the Doctor's opinion, the element of heat is squeezed out from between the particles of the metal as water is from the pores of a sponge by pressing it between the fingers. Of the same nature is the phenomenon abovementioned, that air when violently compressed becomes hot, by reason of the quantity of more subtle element squeezed out from among the particles. In this manner it appears that heat and the repulsive power of Sir Isaac Newton are the very same; that by diminishing the heat of any quantity of air, its elasticity is effectually diminished, and it will of itself shrink into a smaller space as effectually as by mechanical pressure. In one case we have what may be called ocular demonstration of the truth of this doctrine, viz. that by throwing the focus of a strong burning lens upon a small quantity of charcoal *in vacuo*, the whole will be converted into inflammable air, having even a greater power of elasticity than common air in an equal degree of heat. Here there is nothing else but heat or light to produce the elastic power, or cause the particles of charcoal which before *attracted* now to repel each other. In another case we have evidence equally strong, that the element of heat by itself, without the presence of that of light, is capable of producing the same effect. Thus when a phial of ether is put into the receiver of an air-pump, and surrounded by a small vessel of water, the ether boils violently, and is dissipated in vapour, while the water freezes, and is cooled to a great degree. The dissipation of this vapour shows that it has an elastic force; and the absorption of the heat from the water shows, that this element not only *produces* the elasticity, but actually enters into the substance of the vapour itself; so that we have not the least reason to conclude that there is any other repulsive power by which the particles are kept at a distance from one another than the substance of the heat itself. In what manner it acts we cannot pretend exactly to explain, without making hypotheses concerning the form of the minute particles of matter, which must always be very uncertain. All known phenomena, however, concur in rendering the theory just now laid down extremely probable. The elasticity of the steam of water is exactly proportioned to the degree of heat which flows into it from without; and if this be kept up to a sufficient degree, there is no mechanical pressure which can reduce it into the state of water. This, however, may very easily be done by abstracting a certain portion of the latent heat it contains when the elastic vapour will become a dense and heavy fluid. The same thing may be done in various ways with the permanently elastic fluids. Thus the purest dephlogisticated air, when made to part with its latent heat by burning with iron, is converted into a gravitating substance of an unknown nature, which adheres strongly to the metal. If the decomposition is performed by means of inflammable air, both together unite into an heavy, aqueous, or acid fluid: if by mixture with nitrous air, still the heat is discernible, though less violent than in the two former cases. The decomposition indeed is slower, but equally complete, and the dephlogisticated air becomes part of the nitrous acid, from which it may be again expelled by proper means: but of these means heat must always be one; for thus only the elasticity can be restored, and the air be recovered in its proper state. The same thing takes place in fixed air, and all other permanently elastic fluids capable of being absorbed by others. The conclusion therefore which we can only draw from what data we have concerning the composition of elastic vapours is, that all of them are formed of a terrestrial substance, united with the element of heat in such a manner that part of the latter may be squeezed out from among the terrestrial particles; but in such a manner, that as soon as the pressure is taken off, the surrounding fluid rushes in, and expands them to their original bulk: and this expansion or tendency to it will be increased in proportion to the degree of heat, just as the expansion of a sponge would be exceedingly augmented, if we could contrive to convey a stream of water into the heart of it, and make the liquid to flow out with violence through every pore in the circumference. In this case, it is evident that the water would act as a *power of repulsion* among the particles of the sponge, as well as the fire does among the particles of the water, charcoal, or whatever other substance is employed. Thus far we may reason from analogy; but in all probability the internal and essential texture of these vapours will for ever remain unknown. Their obvious properties, as well as some of their more latent operations in many cases, are treated of under a variety of articles in this work, as AEROLOGY, EVAPORATION, VOLCANO, &c.

It has been imagined by some, that the artificial elastic fluids have not the same mechanical property with common air, viz. that of occupying a space inversely proportional to the weights with which they are pressed: but this is found to be a mistake. All of them likewise have been found to be non-conductors of electricity, though probably not all in the same degree. Even aqueous vapour, when intimately mingled with any permanently elastic fluid, refuses to conduct this fluid, as is evident from the highly electrical state of the atmosphere in very dry weather, when we are certain that aqueous vapour must abound very much, and be intimately mixed with it. The colour of the electric spark, though it may be made visible in all kinds of permanently elastic vapours, is very different in different fluids. Thus in inflammable and alkaline air it is red or purple, but in fixed air it appears white.

ELASTICITY, or ELASTIC *Force*, that property of bodies wherewith they restore themselves to their former figure, after any external pressure.

The cause or principle of this important property elasticity, or springiness, is variously assigned. The Cartesians account for it from the materia subtilis making an effort to pass through pores that are too nar-

Elasticity. row for it. Thus, say they, in binding, or compressing a hard elastic body, *e. gr.* a bow, its parts recede from each other on the convex side, and approach on the concave: consequently the pores are contracted or straitened on the concave side; and if they were before round, are now, for instance, oval: so that the materia subtilis, or matter of the second element, endeavouring to pass out of those pores thus straitened, must make an effort, at the same time, to restore the body to the state it was in when the pores were more patent and round, *i. e.* before the bow was bent: and in this consists its elasticity.

Other later and more wary philosophers account for elasticity much after the same manner as the Cartesians; with this only difference, that in lieu of the subtile matter of the Cartesians, these substitute ETHÆR, or a fine etherial medium that pervades all bodies.

Others, setting aside the precarious notion of a materia subtilis, account for elasticity from the great law of nature, ATTRACTION, or the cause of the COHESION of the parts of solid or firm bodies. Thus, say they, when a hard body is struck or bent, so that the component parts are moved a little from each other, but not quite disjointed or broke off, or separated so far as to be out of the power of that attracting force whereby they cohere; they must certainly on the cessation of the external violence, spring back to their former natural state.

Others resolve elasticity into the pressure of the atmosphere: for a violent tension, or compression, tho' not so great as to separate the constituent particles of bodies far enough to let in any foreign matter, must yet occasion many little vacuola between the separated surfaces; so that upon the removal of the force they will close again by the pressure of the aerial fluid on the external parts. See ATMOSPHERE.

Lastly, others attribute the elasticity of all hard bodies to the power of resilition in the air included within them: and so make the elastic force of the air the principle of elasticity in all other bodies.

The ELASTICITY *of Fluids* is accounted for from their particles being all endowed with a centrifugal force: when Sir Isaac Newton, prop. 23. lib. 2. demonstrates, that particles, which naturally avoid or fly off from one another, by such forces as are reciprocally proportioned to the distances of their centre, will compose an elastic fluid, whose density should be proportioned to its compression; and *vice versa*, if any fluid be composed of particles that fly off and avoid one another, and hath its density proportional to its compression, then the centrifugal forces of those particles will be reciprocally as the distances of their centres.

ELASTICITY *of the Air*, is the force wherewith that element dilates itself, upon removing the force whereby it was before compressed. See AIR and ATMOSPHERE.

The elasticity or spring of the air was first discovered by Galileo. Its existence is proved by this experiment of that philosopher: An extraordinary quantity of air being intruded by means of a syringe into a glass or metal ball, till such time as the ball, with this accesion of air, weigh considerably more in the balance than it did before; upon opening the mouth thereof, the air rushes out, till the ball sink to its former weight. From hence we argue, that there is just as much air gone out, as compressed air had been crowded in. Air, therefore returns to its former degree of expansion, upon removing the force that compressed or resisted its expansion; consequently it is endowed with an elastic force. It must be added, that as the air is found to rush out in every situation or direction of the orifice, the elastic force acts every way, or in every direction. Elasticity.

The elasticity of the air makes a considerable article in PNEUMATICS.

The cause of the elasticity of the atmosphere hath been commonly ascribed to a repulsion between its particles; but this can give us only a very slight idea of the nature of its elasticity. The term *repulsion*, like that of *attraction*, requires to be defined; and in all probability will be found in most cases to be the effect of the action of some other fluid. Thus, we find, that the elasticity of the atmosphere is very considerably affected by heat. Supposing a quantity of air heated to such a degree as is sufficient to raise Fahrenheit's thermometer to 212, it will then occupy a considerable space. If it is cooled to such a degree as to sink the thermometer to 0, it will shrink up into less than half the former bulk. The quantity of repulsive power therefore acquired by the air, while passing from one of these states to the other, is evidently owing to the heat added to or taken away from it. Nor have we any reason to suppose, that the quantity of elasticity or repulsive power it still possesses is owing to any other thing than the fire contained in it. The supposing repulsion to be a primary cause independent of all others, hath given rise to many erroneous theories, and been one very great mean of embarrasing philosophers in their accounting for the phenomena of ELECTRICITY.

ELATE, in botany, a genus belonging to the natural order of *Palmæ*. There is no male calyx; the corolla is tripetalous, with three stamina. There is no female calyx; the corolla is tripetalous, with one pistil; the fruit is an oval acuminated plum. Plate CLXXIII.

ELATER, in zoology; a genus of insects, belonging to the order of coleoptera. The antennæ are setaceous; and an elastic spring or spine projects from the hinder extremity of the breast or under side of the thorax. By means of this kind of spring, the animal when turned upon his back, contrives to leap up into the air, and so turn itself. It varies in size; and when the insect is young and newly metamorphosed, its elytra are of a beautiful deep red; but in a few days they change to a much darker hue; and are nearly of a chesnut colour. In the state of larvæ it inhabits the trunks of decayed trees, and is there transformed. With the help of its wings it issues from its prison, flutters upon flowers, wanders over the fields, and conceals itself in thickets or under the bark of trees.

ELATERIUM, in botany: a genus of the monandria order, belonging to monæcia class of plants; and in the natural method ranking under the 34th order, *Cucurbitaceæ*. There is no male calyx; the corolla is salver-shaped; there is no female calyx; the corolla salver-shaped; the capsule inferior, unilocular, and bivalved.

ELATERIUM, Ελατηριον, in pharmacy, a violent purgative

gative medicine, prepared from the wild cucumber.

ELATH, or ELOTH, a part of Idumæa, situated upon the Red Sea, which David in his conquest of Edom took (2 Sam. viii. 14.), and there established a trade to all parts of the world. His son, we see, built ships in Elath, and sent them from thence to Ophir for gold, 2 Chr. viii. 17, 18. It continued in the possession of the Israelites about 150 years, till in the time of Joram, the Edomites recovered it (2 Kings viii. 20.); but it was again taken from them by Azariah, and by him left to his son, 2 Kings xiv. 22. His grandson Ahaz, however, lost it again to the king of Syria (*ib.* xvi. 6.); and the Syrians had it in their hands a long while, till after many changes under the Ptolemies, it came at length into the possession of the Romans.

ELATINE, in botany: A genus of the tetragynia order, belonging to the octandria class of plants; and in the natural method ranking under the 15th order, *Inundatæ*. The calyx is tetraphyllous; the petals four; the capsule quadrilocular, quadrivalved, and depressed.

ELATOSTEMA, in botany: A genus of the pentandria order, belonging to the monœcia class of plants. The male flowers have no calyx; the corolla is quinquepartite; the stamina are five filaments. There are female flowers on the same plant; these have no calyx nor corolla; the pericarpium is a very small oblong, bivalve, monospermous capsule: the seeds single and egg-shaped.

ELBE, a large river in Germany, which, rising on the confines of Silesia, runs through Bohemia, Saxony, and Brandenburg; and afterwards dividing the duchy of Luxenburg from that of Mecklenburg, as also the duchy of Bremen from Holstein, it falls into the German ocean, about 70 miles below Hamburg. It is navigable for great ships higher than any river in Europe.

ELBING, a city of Polish Prussia, in the palatinate of Marienburg, situated in E. Long. 20. 0. N. Lat. 54, 15, on a bay of the Baltic sea, called the *Frischaff*, near the mouth of the Vistula. The town is large, populous, and very well built. It is divided into two parts, called the old and new town, which are both of them very well fortified. The old town has a handsome tower, with a good college. The stadthouse and the academy are good buildings, with pleasant gardens, which are worth seeing. The place has a considerable trade, especially in sturgeon, mead, cheese, butter, and corn. It is seated in a champaign level like Holland, very fruitful and populous. The inhabitants are partly Lutherans and partly Roman Catholics. The Boors in the neighbourhood have as good houses and apparel almost as the nobility of Courland.

ELBOW, the outer angle made by the flexure or bend of the arm. That eminence whereon the arm rests, called by us *elbow*, is by the Latins called *cubitus*, and the Greeks αγκων, and by others ολεκρανον.

ELBOW is also used by architects, masons, &c. for an obtuse angle of a wall, building, or road, which diverts it from its right line.

ELCESAITES, in church history, ancient heretics, who made their appearance in the reign of the emperor Trajan, and took their name from their leader

Elcesai. The Elcesaites kept a mean between the Jews, Christians, and Pagans; they worshipped but one God, observed the Jewish sabbath, circumcision, and the other ceremonies of the law. They rejected the Pentateuch, and the prophets; nor had they any more respect for the writings of the apostles, particularly those of St Paul.

ELDERS, or SENIORS, in Jewish history, were persons the most considerable for age, experience, and wisdom. Of this sort were the 70 men whom Moses associated to himself in the government of his people; such, likewise, afterwards were those who held the first rank in the synagogue, as presidents.

In the first assemblies of the primitive Christians, those who held the first place were called *elders*. The word *presbyter*, often used in the New Testament, is of the same signification: hence the first councils of Christians were called *presbyteria*, or *councils of elders*.

ELDERS is also a denomination still retained in the Presbyterian discipline. The elders are officers, who, in conjunction with the pastors, or ministers, and deacons, compose the consistories or kirk-sessions, meeting to consider, inspect, and regulate, matters of religion and discipline. They are chosen from among the people, and are received publicly with some degree of ceremony. In Scotland, there is an indefinite number of elders in each parish; generally about 12. See *KIRK-Sessions*, and PRESBYTERY.

ELDER, in botany. See SAMBUCUS.

ELEA, or ELIS, (anc. geog.), a district of Peloponnesus, situated between Achaia and Messenia, reaching from Arcadia quite to the west or Ionian sea: so called from ELIS, a cognominal town. See ELIS.

ELEATIC PHILOSOPHY, among the ancients; a name given to that of the STOICS, because taught at Ἐλεα, in Latin Velia, a town of the Lucani.

The founder of this philosophy, or of the Eleatic sect, is supposed to have been Xenophanes, who lived about the 56th Olympiad, or between 500 or 600 years before Christ. This sect was divided into two parties, which may be denominated *metaphysical* and *physical*; the one rejecting, and the other approving, the appeal to fact and experiment. Of the former kind were Xenophanes, Parmenides, Melissus, and Zeno, of Elea. They are supposed to have maintained principles not very unlike those of Spinoza; they held the eternity and immutability of the world; that whatever existed was only one being; that there was neither any generation nor corruption; that this one being was immoveable and immutable, and was the true God; and whatever changes seemed to happen in the universe, they considered as mere appearances and illusions of sense. However, some learned men have supposed, that Xenophanes and his followers, speaking metaphysically, understood by the universe, or the one being, not the material world, but the originating principle of all things, or the true God, whom they expressly affirm to be incorporeal. Thus Simplicius represents them as merely metaphysical writers, who distinguished between things natural and supernatural; and who made the former to be compounded of different principles. Accordingly, Xenophanes maintained, that the earth consisted of air and fire, that all things were produced out of the earth, and the sun and stars out of clouds, and that there were four elements. Parmenides

menides also distinguished between the doctrine concerning metaphysical objects, called *truth*, and that concerning physical or corporeal things, called *opinion*; with respect to the former there was one immoveable principle, but in the latter two that were moveable, viz. fire and earth, or heat and cold; in which particulars Zeno agreed with him. The other branch of the Eleatic sect were the atomic philosophers, who formed their system from an attention to the phenomena of nature; of these the most considerable were Leucippus, Democritus, and Protagoras.

ELECAMPANE, in botany. See INULA.

ELECT, (from *eligo*, "I choose") CHOSEN, in the Scriptures, is applied to the primitive Christians; in which sense, the elect are those chosen and admitted to the favour and blessing of Christianity.

ELECT, in some systems of theology, is a term appropriated to the saints, or the predestinated: in which sense the elect are those persons who are said to be predestinated to glory as the end, and to sanctification as the means.

ELECT is likewise applied to archbishops, bishops, and other officers, who are chosen, but not yet consecrated, or actually invested with their office or jurisdiction.

The emperor is said to be elect before he is inaugurated and crowned; a lord mayor is elect, before his predecessor's mayoralty is expired, or the sword is put in his hands.

ELECTION, the choice that is made of any thing or person, whereby it is preferred to some other. There seems this difference, however, between choice and election, that election has usually a regard to a company or community, which makes the choice; whereas choice is seldom used but when a single person makes it.

ELECTION, in British polity, is the people's choice of their representatives in parliament. (See PARLIAMENT). In this consists the exercise of the democratical part of the British constitution: for in a democracy there can be no exercise of sovereignty but by suffrage, which is the declaration of the people's will. In all democracies, therefore, it is of the utmost importance to regulate by whom, and in what manner, the suffrages are to be given. And the Athenians were so justly jealous of this prerogative, that a stranger, who interfered in the assemblies of the people, was punished by their laws with death; because such a man was esteemed guilty of high treason, by usurping those rights of sovereignty to which he had no title. In Britain, where the people do not debate in a collective body, but by representation, the exercise of this sovereignty consists in the choice of representatives. The laws have therefore very strictly guarded against usurpation or abuse of this power, by many salutary provisions; which may be reduced to these three points, 1. The qualifications of the electors. 2. The qualifications of the elected. 3. The proceedings at elections.

Blackst. Comment.

(1.) As to the qualifications of the electors. The true reason of requiring any qualification, with regard to property, in voters, is to exclude such persons as are in so mean a situation, that they are esteemed to have no will of their own. If these persons had votes they would be tempted to dispose of them under some undue influence or other. This would give a great, an artful, or a wealthy man, a larger share in elections than is consistent with general liberty. If it were probable that every man would give his vote freely, and without influence of any kind; then, upon the true theory and genuine principles of liberty, every member of the community, however poor, should have a vote in electing those delegates to whose charge is committed the disposal of his property, his liberty, and his life. But since that can hardly be expected in persons of indigent fortunes, or such as are under the immediate dominion of others, all popular states have been obliged to establish certain qualifications; whereby some, who are suspected to have no will of their own, are excluded from voting, in order to set other individuals, whose will may be supposed independent, more thoroughly upon a level with each other.

And this constitution of suffrages is framed upon a wiser principle, with us, than either of the methods of voting, by centuries or by tribes, among the Romans. In the method by centuries, instituted by Servius Tullius, it was principally property, and not numbers, that turned the scale: in the method by tribes, gradually introduced by the tribunes of the people, numbers only were regarded, and property entirely overlooked. Hence the laws passed by the former method had usually too great a tendency to aggrandize the patricians or rich nobles: and those by the latter had too much of a levelling principle. Our constitution steers between the two extremes. Only such are entirely excluded as can have no will of their own: there is hardly a free agent to be found, but what is intitled to a vote in some place or other in the kingdom. Nor is comparative wealth, or property, entirely disregarded in elections; for though the richest man has only one vote at one place, yet, if his property be at all diffused, he has probably a right to vote at more places than one, and therefore has many representatives. This is the spirit of our constitution: not that we assert it is in fact quite so perfect as we have endeavoured to describe it; for if any alteration might be wished or suggested in the present form of parliaments, it should be in favour of a more complete representation of the people.

But to return to the qualifications; and first those of electors for knights of the shire. 1. By statute 8 Hen. VI. c. 7. and 10 Hen. VI. c. 2. (amended by 14 Geo. III. c. 58.) the knights of the shire shall be chosen of people, whereof every man shall have freehold to the value of forty shillings by the year within the county; which (by subsequent statutes) is to be clear of all charges and deductions, except parliamentary and parochial taxes. The knights of shires are the representatives of the landholders, or landed interest of the kingdom; their electors must therefore have estates in lands or tenements within the county represented. These estates must be freehold, that is, for term of life at least; because beneficial leases for long terms of years were not in use at the making of these statutes, and copyholders were then little better than villeins, absolutely dependent upon their lords. This freehold must be of 40 shillings annual value; because that sum would then, with proper industry, furnish all the necessaries of life, and render the freeholder, if he pleased, an independent man: For Bishop Fleetwood,

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in his *chronicon preciosum*, written at the beginning of the present century, has fully proved 40 shillings in the reign of Henry VI. to have been equal to 12 pounds *per annum* in the reign of queen Anne; and as the value of money is very considerably lowered since the bishop wrote, we may fairly conclude, from this and other circumstances, that what was equivalent to 12 pounds in his days, is equivalent to 20 at present. The other less important qualifications of the electors for counties in England and Wales may be collected from the statutes cited below (A); which direct, 2. That no person under 21 years of age shall be capable of voting for any member. This extends to all sorts of members as well for boroughs as for counties; as does also the next, viz. 3. That no person convicted of perjury, or subornation of perjury, shall be capable of voting in any election. 4. That no person shall vote in right of any freehold, granted to him fraudulently to qualify him to vote. Fraudulent grants are such as contain an agreement to reconvey, or to defeat the estate granted; which agreements were made void, and the estate is absolutely vested in the person to whom it is so granted. And to guard the better against such frauds, it is farther provided, 5. That every voter shall have been in the actual possession, or receipt of the profits, of his freehold to his own use for 12 kalendar months before; except it came to him by descent, marriage, marriage-settlement, will, or promotion to a benefice or office. 6. That no person shall vote in respect of annuity or rent-charge, unless registered with the clerk of the peace 12 kalendar months before. 7. That in mortgaged or trust-estates, the person in possession, under the abovementioned restrictions, shall have the vote. 8. That only one person shall be admitted to vote for any one house or tenement, to prevent the splitting of freeholds. 9. That no estate shall qualify a voter, unless the estate has been assessed to some land tax aid, at least 12 months before the election. 10. That no tenant by copy of court-roll shall be permitted to vote as a freeholder. Thus much for the electors in counties.

As for the electors of citizens and burgesses, these are supposed to be the mercantile part or trading interest of this kingdom. But as trade is of a fluctuating nature, and seldom long fixed in a place, it was formerly left to the crown to summon, *pro re nata*, the most flourishing towns to send representatives to parliament. So that as towns increased in trade, and grew populous, they were admitted to a share in the legislature. But the misfortune is, that the deserted boroughs continued to be summoned, as well as those to whom their trade and inhabitants were transferred, except a few which petitioned to be eased of the expence, then usual of maintaining their members: four shillings a-day being allowed for a knight of the shire, and two shillings for a citizen or burgess; which was the rate of wages established in the reign of Edward III. Hence the members for boroughs now bear above a quadruple proportion to those from counties; and the number of parliament men is increased since Fortescue's time, in the reign of Henry VI. from 300 to upwards of 500, exclusive of those for Scotland. The universities were, in general, not empowered to send burgesses to parliament; though once, in 28 Edw. I. when a parliament was summoned to consider of the king's right to Scotland, there were issued writs, which required the university of Oxford to send up four or five, and that of Cambridge two or three, of their most discreet and learned lawyers for that purpose. But it was king James I. who indulged them with the permanent privilege to send constantly two of their own body; to serve for those students who, though useful members of the community, were neither concerned in the landed nor the trading interest; and to protect in the legislature the rights of the republic of letters. The right of election in boroughs is various, depending entirely on the several charters, customs, and constitutions of the respective places; which has occasioned infinite disputes: tho' now, by statute 2 Geo. II. c. 24. the right of voting for the future shall be allowed according to the last determination of the house of commons concerning it; and, by statute 3 Geo. III. c. 15. no freeman of any city or borough (other than such as claim by birth, marriage, or servitude) shall be intitled to vote therein, unless he hath been admitted to his freedom 12 kalendar months before.

(2.) Next, as to the qualifications of persons to be *elected* members of the house of commons. Some of these depend upon the law and custom of parliaments, declared by the house of commons; others upon certain statutes. And from these it appears, 1. That they must not be aliens born or minors. 2. That they must not be any of the 12 judges, because they sit in the lords' house; nor of the clergy, for they sit in the convocation; nor persons attainted of treason, or felony, for they are unfit to sit any where. 3. That sheriffs of counties, and mayors and bailiffs of boroughs, are not eligible in their respective jurisdictions, as being returning officers; but that sheriffs of one county are eligible to be knights of another. 4. That, in strictness, all members ought to have been inhabitants of the places for which they are chosen; but this having been long disregarded, was at length entirely repealed by statute 14 Geo. III. c. 58. 5. That no persons concerned in the management of any duties or taxes created since 1692, except the commissioners of the treasury; nor any of the officers following (viz. commissioners of prizes, transports, sick and wounded, wine-licences, navy, and victualling; secretaries or receivers of prizes; comptrollers of the army accounts; agents for regiments; governors of plantations, and their deputies; officers of Minorca and Gibraltar: officers of the excise and customs; clerks or deputies in the several offices of the treasury, exchequer, navy, victualling, admiralty, pay of the army or navy, secretaries of state, salt, stamps, appeals, wine licences, hackney-coaches, hawkers and pedlars), nor any persons that hold any new office under the crown created since 1705, are capable of being elected or sitting as members. 6. That no person having a pension under the crown during pleasure, or for any term of years, is capable of being elected or sitting. 7. That if any mem-

(A) 7 and 8 Will. III. c. 25. 10 Ann. c. 23. 2 Geo. II. c. 21. 18 Geo. II. c. 18. 31 Geo. II. c. 14. 3 Geo. III. c. 24.

Election. member accepts an office under the crown, except an officer in the army or navy accepting a new commission, his seat is void; but such member is capable of being re-elected. 8. That all knights of the shire shall be actual knights, or such notable esquires and gentlemen as have estates sufficient to be knights, and by no means of the degree of yeoman. This is reduced to a still greater certainty, by ordaining, 9. That every knight of a shire shall have a clear estate of freehold or copyhold to the value of 600l. *per annum*, and every citizen and burgess to the value of 300 l. except the eldest sons of peers and of persons qualified to be knights of shires, and except the members for the two universities: which somewhat balances the ascendant which the boroughs have gained over the counties, by obliging the trading interest to make choice of landed men: and of this qualification the member must make oath, and give in the particulars in writing, at the time of his taking his seat. But, subject to these standing restrictions and disqualifications, every subject of the realm is eligible of common right: though there are instances, wherein persons in particular circumstances have forfeited that common right, and have been declared ineligible *for that parliament*, by a vote of the house of commons; or *for ever*, by an act of the legislature. But it was an unconstitutional prohibition which was grounded on an ordinance of the house of *lords*, and inserted in the *king's* writs, for the parliament holden at Coventry, 6 Hen. IV. that no apprentice or other man of the law should be elected a knight for the shire therein: in return for which, our law-books and historians have branded this parliament with the name of *parliamentum indoctum*, or the lack-learning parliament: and Sir Edward Coke observes with some spleen, that there was never a good law made thereat.

(3.) The third point, regarding elections, is the method of proceeding therein. This is also regulated by the law of parliament, and the several statutes refered to in the margin below, (B); all which we shall blend together, and extract out of them a summary account of the method of proceeding to elections.

As soon as the parliament is summoned, the lord chancellor (or if a vacancy happens during the sitting of parliament, the speaker, by order of the house, and without such order if a vacancy happens by death in the time of a recess for upwards of 20 days) sends his warrant to the clerk of the crown in chancery; who thereupon issues out writs to the sheriff of every county, for the election of all the members to serve for that county, and every city and borough therein. Within three days after the receipt of this writ, the sheriff is to send his precept, under his seal, to the proper returning officers of the cities and boroughs, commanding them to elect their members: and the said returning officers are to proceed to election within eight days from the receipt of the precept, giving four days notice of the same; and to return the persons chosen, together with the precept, to the sheriff.

But elections of knights of the shire must be proceeded to by the sheriffs themselves in person, at the next county-court that shall happen after the delivery of the writ. The county-court is a court held every month or oftener by the sheriff, intended to try little causes not exceeding the value of 40 s. in what part of the county he pleases to appoint for that purpose: but for the election of knights of the shire, it must be held at the most usual place. If the county-court falls upon the day of delivering the writ, or within six days after, the sheriff may adjourn the court and election to some other convenient time, not longer than 16 days, nor shorter than 10; but he cannot alter the place without the consent of all the candidates: and, in all such cases, 10 days public notice must be given of the time and place of the election.

And, as it is essential to the very being of parliament that elections should be absolutely free, therefore all undue influences upon the electors are illegal, and strongly prohibited. For Mr. Locke ranks it among those breaches of trust, in the executive magistrate, which according to his notions, amount to a dissolution of the government, "if he employs the force, "treasure, and offices of the society to corrupt the "representatives, or openly to pre-engage the electors, "and prescribe what manner of persons shall be cho-"sen: For thus to regulate candidates and electors, "and new-model the ways of election, what is it (says "he) but to cut up the government by the roots and "poison the very fountain of public security?" As soon therefore, as the time and place of election, either in counties or boroughs, are fixed, all soldiers quartered in the place are to remove, at least one day before the election, to the distance of two miles or more; and not to return till one day after the poll is ended. Riots likewise have been frequently determined to make an election void. By vote also of the house of commons, to whom alone belongs the power of determining contested elections, no lord of parliament, or lord-lieutenant of a county, hath any right to interfere in the election of commoners; and, by statute, the lord warden of the cinque-ports shall not recommend any members there. If any officer of the excise, customs, stamps, or certain other branches of the revenue, presumes to intermeddle in elections, by persuading any voter, or disuading him, he forfeits L. 100, and is disabled to hold any office.

Thus are the electors of one branch of the legislature secured from any undue influence from either of the other two, and from all external violence and compulsion. But the greatest danger is that in which themselves co-operate, by the infamous practice of bribery and corruption. To prevent which it is enacted, that no candidate shall, after the date (usually called the *teste*) of the writs, or after the vacancy, give any money or entertainment to his electors, or promise to give any, either to particular persons, or to the place in general, in order to his being elected; on

(B) 7 Hen. IV. c. 15. 8 Hen. 6. c. 7. 23 Hen. VI. c. 14. 1 W. & M. st. 1. c. 2. 2 W. & M. st. 1. c. 7. 5 & 6 W. & M. c. 20. 7 W. III. c. 4. 7 & 8 W. III. c. 7. and c. 25. 10 & 11 W. III. c. 7. 12 & 13 W. III c. 10. 6 Ann. c. 23. 9 Ann. c. 5. 10 Ann. c. 19. and c. 33. 2 Geo. II. c. 24. 8 G. II. c. 30. 18 Geo. II. c. 18. 19 Geo. II. c. 28. 10 Geo. III. c. 16. 11 Geo. III. c. 42. 14 Geo. III. c. 15.

on pain of being incapable to serve for that place in parliament. And if any money, gift, office, employment, or reward be given, or promised to be given, to any voter, at any time, in order to influence him to give or with-hold his vote, as well he that takes as he that offers such bribe forfeits L. 500, and is for ever disabled from voting and holding any office in any corporation; unless, before conviction, he will discover some other offender of the same kind, and then he is indemnified for his own offence. The first instance that occurs of election bribery, was so early as 13 Eliz. when one Thomas Longe (being a simple man, and of small capacity to serve in parliament) acknowledged that he had given the returning officer and others of the borough for which he was chosen four pounds to be returned member, and was for that premium elected. But for this offence the borough was amerced, the member was removed, and the officer fined and imprisoned. But as this practice hath since taken much deeper and more universal root, it hath occasioned the making of these wholesome statutes; to complete the efficacy of which, there is nothing wanting but resolution and intregrity to put them in strict execution.

Undue influence being thus guarded against, the election is to be proceeded to on the day appointed; the sheriff or other returning officer first taking an oath against bribery, and for the due execution of his office. The candidates likewise, if required, must swear to their qualification, and the electors in counties to theirs; and the electors both in counties and boroughs are also compellable to take the oath of abjuration, and that against bribery and corruption. And it might not be amiss, if the members elected were bound to take the latter oath as well as the former; which, in all probability, would be much more effectual than administering it only to the electors.

The election being closed, the returning officer in boroughs returns his precept to the sheriff, with the persons elected by the majority: and the sheriff returns the whole, together with the writ for the county and the knights elected thereupon, to the clerk of the crown in chancery; before the day of meeting, if it be a new parliament, or within 14 days after the election, if it be an occasional vacancy; and this under penalty of L.500. If the sheriff does not return such knights only as are duly elected, he forfeits, by the old statutes of Henry VI. L. 100; and the returning officer in boroughs, for a like false return, L.40; and they are besides liable to an action, in which double damages shall be recovered, by the later statutes of king William: and any person bribing the returning officer shall also forfeit L.300. But the members returned by him are the sitting members, until the house of commons, upon petition, shall adjudge the return to be false and illegal. The form and manner of proceeding upon such petition are now regulated by statute 10 Geo. III. c. 16. (amended by 11 Geo. III. c. 42. and made perpetual by 14 Geo. III. c. 15.), which directs the method of choosing by lot a select committee of 15 members, who are sworn well and truly to try the same, and a true judgment to give, according to the evidenee.

Election of Scots Peers. See Lords.

Election of Ecclesiastical Persons. Elections for the dignities of the church ought to be free, according to the stat. 9 Ed. II. cap. 14. If any persons, that have a voice in elections, take any reward for an election in any church, college, school, &c. the election shall be void. And if any persons of such societies resign their places to others for reward, they incur a forfeiture of double the sum; and both the parties are rendered incapable of the place. Stat. 31 Eliz. cap. 6.

Election of a Verderor of the Forest (electione viridariorum forestæ), in law, a writ that lies for the choice of a verderor, where any of the verderors of the forest are dead, or removed from their offices. This writ is directed to the sheriff, and the verderor is to be elected by the freeholders of the county, in the same manner as coroners. New. Nat. Brev. 366.

Election is also the state of a person who is left to his own free will, to take or do either one thing or another, which he pleases. See Liberty.

Election, in theology, signifies the choice which God, of his good pleasure, makes of angels or men, for the objects of mercy and grace.

The election of the Jews was the choice God made of that people to be more immediately attached to his worship and service, and for the Messiah to be born of them. And thus particular nations were elected to the participation of the outward blessings of Christianity.

Election also, in the language of some divines, signifies a predestination to grace and glory, and sometimes to glory only. And it has been enjoined as an article of faith, that predestination to grace is gratuitous, merely and simply so; *gratia, quia gratis data*. But the divines are much divided as to the point, whether election to glory be gratuitous, or whether it supposes obedience and good works, *i. e.* whether it be before or after the provision of our obedience. See Grace, and Reprobation.

ELECTIVE, something that is done, or passes, by election. See Elector.

Some benefices are elective, others collative. Municipal offices in England are generally elective; in Spain, venal. Poland is an elective kingdom.

Elective Attraction. See *Chemistry-Index*.

ELECTOR, a person who has a right to elect or choose another to an office, honour, &c. See Election.

Elector is particularly, and by way of eminence, applied to those princes of Germany in whom lies the right of electing the emperor; being all sovereign princes, and the principal members of the empire.

The electoral college, consisting of all the electors of the empire, is the most illustrious and august body in Europe. Bellarmine and Barronius attribute the institution of it to pope Gregory V. and the emperor Otho III. in the tenth century; of which opinion are the generality of historians, and particularly the canonists: however, the number of electors was unsettled, at least, till the 13th century. In 1356 Charles IV. by the golden bull, fixed the number of electors to seven; three ecclesiastics, *viz.* the archbishops of Mentz, Treves, and Cologne; and four seculars, viz. the king of Bohemia, count Palatine, of the Rhine, duke of Saxony, and marquis of Brandenburgh. In 1648 this order was changed, the duke of Bavaria being put in the place of the count Palatine, who having accepted the crown of Bohemia was outlawed by the emperor; but

but being at length restored, an eighth electorate was erected for the duke of Bavaria. In 1692, a ninth electorate was created, by the emperor Leopold, in favour of the duke of Hanover, of the house of Brunswic Lunenburg.

There is this difference between the secular and ecclesiastical electors, that the first have an active and passive voice, that is, may choose and be chosen; the last, an active only. The three archbishops are to be 30 years old, before they can be advanced to the dignity; the seculars, 18, before they can perform the office themselves. These last have each their vicars, who officiate in their absence.

Besides the power of choosing an emperor, the electors have also that of capitulating with and deposing him; so that, if there be one suffrage wanting, a protest may be entered against the proceedings. By the right of capitulation, they attribute to themselves great privileges, as making of war, coining, and taking care of the public interest and security of the states; and the emperor promises, upon oath, to receive the empire upon these conditions.

The electors have precedence of all other princes of the empire, even of cardinals and kings; and are addressed under the title of *electoral highness*.

Their several functions are as follow. The elector of Mentz is chancellor of Germany, convokes the states, and gives his vote before any of the rest. The elector of Cologne is grand chancellor of Italy, and consecrates the emperor. The elector of Treves is chancellor of the Gauls, and confers imposition of hands upon the emperor. The count Palatine of the Rhine is great treasurer of the empire, and presents the emperor with a globe at his coronation. The elector of Bavaria is great master of the imperial palace, and carries the golden apple. The marquis of Brandenburgh is grand chamberlain, and puts the ring on the emperor's finger. The elector of Saxony is grand marshal, and gives the sword to the emperor. The king of Bohemia is grand butler, and puts Charlemagne's crown on the emperor's head. Lastly, the elector of Hanover, now king of Great Britain, is arch-treasurer, tho' first erected under the title of *standard-bearer* of the empire.

ELECTORATE, a term used as well to signify the dignity of, as the territories belonging to, any of the electors of Germany; such are Bavaria, Saxony, &c. See Elector.

ELECTRIC, derived from ηλεκτρον, "amber," in physics, is a term applied to those substances, in which the electric fluid is capable of being excited, and accumulated without transmitting it, and therefore called *non-conductors*. See Electricity.

ELECTRICITY,

In general, signifies the operations of a very subtile fluid, in most cases invisible, but which sometimes becomes the object of our sight and other senses, discovering itself to be one of the chief agents employed in producing the phenomena of nature.

Sect. I. *Definitions of Terms used in the Science.*

Before we can enter upon this science with propriety, even so far as to give an history of its rise and progress, it seems necessary to give some explanation of the terms made use of by writers on electricity, that the reader may not be embarrassed with words whose meaning he cannot perhaps easily comprehend.

1. The foundation of all that is known upon this subject, is the difference between electric bodies and such as are not. The former may generally be distinguished by their attracting and repelling light substances, which the latter cannot be made to do. The principal electric bodies are glass, amber, sealing-wax, gum-lac, sulphur, rosin, &c. They are often called *non-conductors*, or *electrics per se*.

2. The usual way in which the electric power of any body can be discovered, is by rubbing it with some soft substance, generally woollen, silk, or fur; and, according to the strength of the electric virtue, the former body will attract and repel light substances presented to it at a greater or less distance. If the virtue is very strong, the electric body will emit sparks, or even strong flashes of fire, to a considerable distance. In some cases electricity discovers itself by heating the body, or blowing air upon it; but in both these ways it is much weaker than that produced by rubbing. In whatever way this power is made to show itself, the substance possessed of it is said to be *excited*.

3. *Conductors*, called also *non-electrics*, are such substances as, though incapable of being excited, can yet in certain circumstances convey the electric power from one body to another, and that to any imaginable distance. The best conductors are metals of all kinds, charcoal, and water.

4. Electrics, we have already observed, are also called *non-conductors*; and this name they have from their power of stopping the communication of the electric virtue from one body to another. Thus, tho' any conductor be placed properly for receiving the virtue from an excited electric, none will pass to it if any electric substances be interposed; or, if the conductor be terminated by an electric, none will pass beyond the place where the electric substance begins.

5. Insulation is when a conducting substance is placed upon an electric, so that any power communicated to it cannot pass off. It must be remembered, however, that all this is to be understood with some degree of limitation; for there is no substance either a perfect electric, or a perfect conductor; the best conductors making a sensible resistance to the passage of the fluid through them when they are very long; and the most perfect electrics transmitting some of the fluid over or through them. Indeed, though these two different kinds of substances seem to be so far removed from one another, they in reality approach to a surprising degree, insomuch that there are many substances which can be excited as electrics, and yet have a very considerable conducting power.

6. The effects of the electric fluid discovering themselves

History. selves either by attraction and repulsion, or by emitting streams, or pencils as they are called, of blue light, are all classed under the general word *electricity*; and any body to which that power of attraction and repulsion, &c. is communicated, is said to be *electrified*. If its virtue is inherent in itself, it is said to be *excited*.

7. Electricity is found to be of two kinds; the one called *negative*, and the other *positive*. It is uncertain in what the difference betwixt these two consists. Dr Franklin is of opinion that the former consists in a superabundance of the fluid, or when more is thrown upon any substance than it can conveniently contain; the other, when a part of it is abstracted, and the body contains less than it naturally ought to do. Other theorists suppose, that when the fluid is directed outwards from any substance, that substance will in all cases be electrified positively; and that when the fluid is either entering or has a tendency to enter into any substance, it will then be electrified negatively.—This question will be discussed in the course of the treatise.—The most remarkable differences we can perceive between the positive and negative electricities are that they attract each other, though strongly repulsive of themselves; that is, two bodies positively electrified, or negatively electrified, repel each other; but one body positively electrified will attract another negatively so; and if the electricities are very strong, a spark will be observed between them at meeting. These electricities are produced naturally by exciting different substances, or by using a different rubber to the same substance. Thus, glass usually produces the positive electricity; but by using a certain kind of rubber, or altering the smoothness of its surface, it may be made to produce the negative kind. The two electricities are sometimes called the *vitreous* and *resinous*, as well as positive and negative.

Sect. II. *History of electricity.*

Though it is certain that, ever since the creation of the world, the fluid we speak of hath had the same share in all the natural operations that it hath just now; yet the discovery of its action, and even of its existence, is, comparatively speaking, of a very late date.

1 Electricity when first mentioned.

Thales the Milesian, who lived about 600 years before Christ, was the first that observed the electrical properties of amber. Of these, indeed, he knew no more than that this substance would attract light bodies when it was rubbed. For 300 years after his time, we hear nothing farther concerning this subject. Theophrastus then tells us, that the *lyncurium* (the same substance now called the *tourmalin*), has the property of attracting light bodies, as well as amber. From this time, there is a chasm in the history of electricity for no less than 1900 years. Indeed, it is scarce to be supposed that during this long interval any person applied himself to the investigation of the subject; as, for the greatest part of it, science of every kind was almost totally extinguished. The electrical properties of jet, however, and, according to Mr Bose, of the agate, were some way or other discovered during the abovementioned period. But it was not till the beginning of the 17th century, that the subject of electricity became properly a distinct science, and the foundation was laid of those discoveries which have since taken place.

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2 Discoveries of Dr Gilbert.

The first who can properly be called an *electrician*, was Dr William Gilbert, who, in the year 1600, wrote a book *de Magnete*, which contains a variety of electrical experiments. All these, however, considered only the attractive property of certain substances, which from their agreement in this respect with amber (in Latin *electrum*), were called *electric*. Dr Gilbert's merit consists in his having been at great pains to find out a number of such substances, and thus considerably enlarging the number of electrics.

Till the year 1670, it doth not appear that any farther discoveries were made; except some trifling additions to the catalogue of electrics. About this time, Mr Boyle applied himself to the study of electricity. He enlarged the catalogue of electrics; and found that their electric properties were increased by wiping and warming them before they were rubbed. He observed also, that all kinds of bodies were attracted promiscuously; and imagined that they were attracted *in vacuo* as well as in air. This last position, however, is denied by Mr Beccaria; and we shall afterwards show that Mr Boyle must necessarily have been mistaken He also observed the electric light, though only in the instance of some diamonds.

3 Discoveries of Otto Guericke and Sir Isaac Newton.

Otto Guericke, however, who was cotemporary with Mr Boyle, improved the science much farther. He made use of a sulphur globe, whirled on an axis much in the same way with our present glass globes. Thus he could excite a vastly greater power of electricity than any of his predecessors, and try all their experiments to much more advantage. He discovered electric repulsion; and not only saw the electric light more clearly than Mr Boyle, but heard the hissing sound with which it is emitted. He also made another remarkable discovery, but which has since been very generally overlooked; namely, that a feather, when repelled by an excited electric, always keeps the same face towards the body which repels it, as the moon does to the earth.

The next discovery of any moment was made by Sir Isaac Newton; who observed, that the electric attraction and repulsion penetrated through glass; and it is much to be regretted that this accurate philosopher did not apply himself to the study of electricity with greater assiduity.

4 Remarkable discovery by Mr Hauksbee.

In 1709, a treatise was written on electricity by Mr Hauksbee; who not only far excelled all his predecessors and cotemporaries, but also made some discoveries which well deserve the attention of the most expert electricians at this day. Besides a variety of new experiments made upon electric attraction and repulsion, as well as the light emitted by electric bodies; he found a method of rendering opaque bodies transparent by means of electricity. He lined more than half the inside of a glass globe with sealing-wax; and having exhausted the globe, he put it in motion; when applying his hand to excite it, he saw the shape and figure of all the parts of his hand distinctly and perfectly, on the concave superficies of the wax within, just as if only pure glass without any wax at all had been interposed between his eye and his hand. The lining of wax, where it was spread the thinnest, would but

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but just allow the sight of a candle through it in the dark; but in some places the wax was at least an eighth part of an inch thick. Yet, even in these places, the light and figure of his hand were as distinguishable through it as any where else. The sealing-wax did not adhere to the glass in all places; but this made no difference with regard to the transparency. Pitch answered the purpose equally well with sealing-wax.

M. Hauksbee also made a farther improvement, by using a glass globe, which acts much more powerfully than a sulphur one. After his death, however, not only the use of glass globes, but even the study of electricity itself, seems to have been pretty generally laid aside for some time. The reason of this was, that the recent discoveries of Sir Isaac Newton engrossed the attention of philosophers to such a degree, that they had no leisure for any thing else. After the death of that great man, however, the science of electricity began to revive; and, in 1729, a capital discovery was made by Mr Stephen Grey. This was the distinction between conductors and non-conductors of electricity. As the discovery was entirely accidental, and attended with several curious circumstances, we shall here give some account of it. In the month of February 1729, Mr Grey, after some fruitless attempts to excite an electric power in metals, recollected a suspicion he had for some time entertained, that as a glass tube, when excited in the dark, communicated its light to various bodies, it might at the same time possibly communicate to them an electricity; that is, a power of attracting light bodies; which, as yet, was all that was understood by the word *electricity*. For this purpose he provided himself with a glass tube, three feet five inches long, and near one inch and two-tenths in diameter. To each end was fitted a cork; to keep the dust out when the tube was not in use. His first experiments were made with a view to determine whether the tube would attract equally well with the ends shut as with them open. In this respect there was no difference; but he found that the corks attracted and repelled light substances as well, and rather better, than the tube itself. He then fixed an ivory ball upon a stalk of fir about four inches long, and thrusting the end of the stalk into one of the corks, he found the ball endowed with a strong attractive and repulsive virtue. This experiment he repeated in many different ways; fixing the ball upon long sticks, and upon pieces of brass and iron wire, always with the same success; but he constantly observed, that the ball at the end attracted more vigorously than that part of the wire nearest the tube.

5 Difference between electrics and conductors discovered by Mr Grey.

The inconvenience of using long wires in this manner, put Mr Grey upon trying whether the ball might be suspended by a pack-thread with a loop on the tube, with equal success; and the event fully answered his expectation. Having thus suspended bodies of the greatest length he conveniently could, to his tube, he ascended a balcony 26 feet high, and fastening a string to his tube, found that the ball would attract light bodies on the ground below. This experiment succeeded in the greatest heights to which he could ascend; after which, he attempted to carry the electricity horizontally. His first attempt miscarried, because he suspended his line, which was intended to carry the electricity horizontally, by a pack-thread; and thus the fluid got off from it: but though Mr Grey knew this was the case, he could not at any time think of any method to prevent it.

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On the 30th of June 1729, Mr Grey paid a visit to Mr Wheeler, in order to give him a specimen of his experiments; but told him of the unsuccessful attempt he had made to carry the electric fluid horizontally. Mr Wheeler proposed to suspend the conducting line by *silk* instead of *pack-thread*. For this advice he could give no reason, but that the silk thread was *smaller* than the other: however, with it they succeeded perfectly well. Their first experiment was in a matted gallery at Mr Wheeler's house, on the 2d of July 1729. About four feet from the end of the gallery they fastened a line across the place. The middle of this line was silk, the rest pack-thread. Over the silken part they laid one end of the conducting line, to which was fastened the ivory ball, and which hung down about nine feet below the line stretched across the gallery. The conducting line was 80½ feet in length, and the other end of it was fastened by a loop to the electric tube. Upon rubbing the tube, the ivory ball attracted and repelled light substances as the tube itself would have done. They next contrived to return the line, so that the whole length of it amounted to 147 feet; which also answered pretty well. But, suspecting that the attraction would be stronger without doubling or returning the line, they made use of one carried straight forward for 124 feet; and, as they expected, found the attraction in this manner stronger than when the line had been doubled. Thus they proceeded with their experiments; still adding more conducting line, till at last their silk-string broke with the weight. This they endeavoured to supply, first with a small iron-wire, and then with a brass one. The result of these experiments, however, soon convinced them that the silk refused to conduct the electric fluid, not on account of its *smallness*, as they had supposed, but on account of some difference in the matter. The wires were smaller than the silk-thread, yet the electricity was effectually carried off by them. They had recourse, therefore, to thicker lines of silk; and thus conveyed the electric matter to the distance of 765 feet; nor did they perceive the virtue to be at all diminished by the distance to which it was carried.

This discovery of the non-conducting power of silk was quickly followed by a discovery of the same power in many other substances: and thus, in fact, the foundation of almost all the subsequent improvements in electricity was laid; though in the sciences, as well as in most others, few discoveries have been made by reasoning, but many by accident. Mr Grey continued to study electricity as long as he lived; and has given a set of experiments, of which Dr Priestley says, "It is not easy to know what to make of them." He imagined that he had discovered in all electric substances a *perpetual attractive power*, which required no kind of excitation either by heating, rubbing, or any kind of attrition. He took 19 different substances, which were either rosin, gum-lac, shell-lac, bees-wax, sulphur, pitch, or two or three of these differently compounded. These he melted in a spherical iron ladle; except the sulphur, which was best done in a glass vessel. When these were taken out of the ladle, and their spherical surface hardened, he says they would

6 He discovers a perpetual attractive power in electrics.

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would not attract till the heat was abated, or till they came to a certain degree of warmth; that there was then a small attraction, which increased till the substance was cold, when it was very considerable. The manner in which he kept these substances in a state of attraction was, by wrapping them in any thing which would preserve them from the external air. At first, for the smaller bodies he used white paper, and for the larger ones white flannel; but afterwards, he found that black worsted stockings would do as well. When thus wrapped up, they were put into a large firm box, where they remained till he had occasion to use them. Thus prepared, they retained their attractive virtue for four months. These experiments are similar to some others lately made and published as new discoveries.

Some other experiments were made by Mr Grey, with regard to the attraction of electric bodies *in vacuo;* and in this he determined with Mr Boyle against the opinion of Mr Beccaria abovementioned. But the most remarkable experiments mentioned by Mr Grey,

7
Imagines he can imitate the planetary motions.

are his imitations of the planetary motions. "I have lately made (says he) several new experiments upon the projectile and pendulous motions of small bodies by electricity; by which small bodies may be made to move about large ones, either in circles or ellipses; and those either concentric or eccentric to the centre of the large body about which they move, so as to make many revolutions about them. And this motion will constantly be the same way that the planets move about the sun, viz. from the right hand to the left, or from west to east. But these little planets, if I may so call them, move much faster in their apogeon than in the perigeon parts of their orbits; which is directly contrary to the motion of the planets about the sun." The manner in which these experiments were made, as delivered by him on his death-bed to Dr Mortimer, was as follows: "Place a small iron globe (said he), of an inch or an inch and an half in diameter, on the middle of a circular cake of rosin, seven or eight inches in diameter, greatly excited; and then a light body suspended by a very fine thread, five or six inches long, held in the hand over the centre of the cake, will, of itself, begin to move in a circle round the iron globe, and constantly from west to east. If the globe is placed at any distance from the centre of the circular cake, it will describe an ellipse, which will have the same eccentricity as the distance of the globe from the centre of the cake. If the cake of rosin be of an elliptical form, and the iron globe be placed in the centre of it, the light body will describe an elliptical orbit of the same eccentricity with the form of the cake. If the globe be placed in or near one of the foci of the elliptical cake, the light body will move much swifter in the apogee than in the perigee of its orbit. If the iron globe is fixed on a pedestal an inch from the table, and a glass hoop, or a portion of a hollow glass cylinder excited, be placed round it, the light body will move as in the circumstances mentioned above, and with the same varieties." He said, moreover, that the light body would make the same revolutions, only smaller, round the iron globe placed on the bare table, without any electrical body to support it: but he acknowledged that he had not found the experiment succeed if the thread was supported by any thing but a human hand, though he imagined any other animal substance would have answered the purpose.

These experiments occasioned a great deal of speculation. Dr Mortimer was the only person who was able to repeat them with success, and he only when nobody but himself was present. It was therefore generally supposed that both he and Mr Grey had been deceived: but from some experiments to be related hereafter, it seems probable that the success of Mr Grey and Dr Mortimer was owing to their having performed their experiments with candle-light; and the failure of the others to their having attempted them by day-light. Notwithstanding which, it is more than probable that Mr Grey has been deceived in a number of particulars; for no motion can be performed by an artificial excitation of the electric fluid, but what is attended with much irregularity.

8
Vitreous and resinous electricity discovered by Mr Du Fay.

Soon after Mr Grey's discovery of the difference between conductors and non-conductors of electricity, Mr Du Fay discovered the difference between positive and negative, or, as they were for some time called, the *vitreous* and *resinous* electricities. This discovery was quite accidental. It was made in consequence of his casually observing, that a piece of leaf-gold, repelled by an excited glass tube, and which he meant to chase about the room with a piece of excited gum copal, instead of being repelled by it as it was by the glass tube, it was eagerly attracted. The same was the case with sealing-wax, sulphur, rosin, and a number of other substances. He discovered also, that it was impossible to excite a tube in which the air was condensed.

In the year 1742, the use of glass globes was again introduced by Mr Bose, professor of philosophy at Wittemburgh; though some attribute this to Christian Augustus Hansen, professor of mathematics at Leipsic. He added also a prime conductor, which consisted of a tube of iron or tin. It was at first supported by a man standing upon cakes of rosin; but afterwards suspended by silk lines horizontally before the globe. A bundle of thread was put into the end next to the globe, which not only prevented any injury to the glass, but rendered the electricity stronger.

9
Electrical shock discovered.

The most remarkable discovery that hath yet been made in the science of electricity, was in the end of the year 1745, and beginning of 1746. This was the method of giving the electric shock, or the accumulation of the power of electricity in a vial. This had its name of the *Leyden vial*, from Mr Cunæus, a native of Leyden, who exhibited it as he was repeating some experiments made by Messrs Muschenbroek and Allamand, professors in the university of that city. He was not, however, the inventor. The merit of this discovery (if any merit can arise from a discovery made by accident) belongs to Mr Van Kleist, dean of the cathedral at Camin. On the 4th of November 1745, he sent the following account of it Dr Leiberkuhn at Berlin: "When a nail, or a piece of thick brass wire, &c. is put into a small apothecary's vial, and electrified, remarkable effects follow: but the vial must be very dry, or warm. I commonly rub it over before-hand with a finger, on which I put some pounded chalk. If a little mercury or a few drops of spirit of wine are put into it, the experiment succeeds the better. As soon as this phial and nail are removed from the

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the electrifying glaſs, or the prime conductor to which it hath been expoſed is taken away, it throws out a pencil of flame ſo long, that with this burning machine in my hand, I have taken above 60 ſteps in walking about my room. When it is electrified ſtrongly, I can take it into another room, and there fire ſpirits of wine with it. If while it is electrifying, I put my finger, or a piece of gold which I hold in my hand, to the nail, I receive a ſhock which ſtuns my arms and ſhoulders.

"A tin tube, or a man placed upon electrics, is electrified much ſtronger by this means than in the common way. When I preſent this vial and nail to a tin tube, which I have 15 feet long, nothing but experience can make a perſon believe how ſtrongly it is electrified. Two thin glaſſes have been broken by the ſhock of it."

Soon after this, a method of giving the ſhock was diſcovered in Holland by Mr Cunæus, in the following manner: M. Muſchenbroek and his friends, obſerving that electrified bodies expoſed to the common atmoſphere, which is always replete with conducting particles of various kinds, ſoon loſt their electricity, and were capable of retaining but a ſmall quantity of it; imagined, that, were the electrified bodies terminated on all ſides by original electrics, they might be capable of receiving a ſtronger power and retaining it for a longer time. Glaſs being the moſt convenient electric for this purpoſe, and water the moſt convenient non-electric, they firſt made theſe experiments with water in glaſs bottles: but no conſiderable diſcovery was made, till Mr Cunæus, happening to hold his glaſs veſſel in one hand, and endeavouring to diſengage it from the conductor with the other (when he imagined the water had received as much electricity as the machine could give it), was ſurpriſed with a ſudden ſhock in his arms and breaſt, which he had not in the leaſt expected.

10 Behaviour of different philoſophers on this occaſion.

The diſcovery of ſuch a terrible effect of the electric power immediately raiſed the attention of all the philoſophers in Europe. Many of them greatly exaggerated their accounts; either from a natural timidity, or their love of the marvellous. Mr Muſchenbroek, who tried the experiment with a very thin glaſs bowl, told Mr Reaumur in a letter wrote ſoon after the experiment, That he felt himſelf ſtruck in his arms, ſhoulder, and breaſt, ſo that he loſt his breath; and was two days before he recovered from the effects of the blow and the terror. He added, that he would not take a ſecond ſhock for the whole kingdom of France. Mr Allamand, who made the experiment, with a common beer-glaſs, ſaid, that he loſt his breath for ſome moments; and then felt ſuch an intenſe pain all along his right arm, that he was apprehenſive of bad conſequences, but it ſoon after went off without any inconvenience, &c. Other philoſophers, on the contrary, ſhowed their heroiſm and magnanimity, by receiving a number of electric ſhocks as ſtrong as they could poſſibly make them. Mr Boſe abovementioned, wiſhed that he might die by the electric ſhock, in order to furniſh, by his death, an article for the memoirs of the academy of ſciences at Paris. "But (adds Dr Prieſtley, from whom this account is taken), *it is not given* to every electrician to die in ſo glorious a manner as the juſtly envied Richman."

From the time of this diſcovery, electricity became the general ſubject of converſation. A great number of people all over Europe got their livelihood by going about and ſhowing the phenomena of it; and, at the ſame time, the paſſion for the marvellous ſtrongly diſcovered itſelf in ſome effects of electricity, pretended to be found out in Italy and Germany. It was aſſerted by Signior Pivati at Venice, and after him by Verati at Bologna, Mr Blanchi at Turin, and Mr Winckler at Leipſic, that if odoriferous ſubſtances were confined in glaſs veſſels, and the veſſels excited, the odours and other medicinal virtues would tranſpire through the glaſs, infect the atmoſphere of the conductor, and communicate the virtue to all perſons in contact with it; alſo, that thoſe ſubſtances, held in the hands of perſons electrified, would communicate their virtues to them; ſo that the medicines might be made to operate without being taken into the ſtomach. They even pretended to have wrought many cures by the help of electricity applied in this way. To ſee the wonderful effects of theſe *medicated tubes*, as they were called, Mr Nollet travelled into Italy, where he viſited all the gentlemen who had publiſhed any account of theſe experiments. But tho' he engaged them to repeat their experiments in his preſence, and upon himſelf; and though he made it his buſineſs to get all the information he could concerning them; he returned fully convinced, that in no inſtance had odours been found to tranſpire through the pores of excited glaſs, and that no drugs had ever communicated their virtues to people who had only held them in their hands while they were electrified. He was convinced, however, that by continued electrification without drugs, ſeveral perſons had found conſiderable relief in various diſorders; particularly, that a paralytic perſon had been cured at Geneva, and that one who was deaf of an ear, another who had a violent pain in his head, and a woman with a diſorder in her eyes, had been cured at Bologna: ſo that from this time we may date the introduction of electricity into the medicinal art. See MEDICINE-*Index*.

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11 Incredible powers attributed to electricity.

Another wonderful experiment was the *beatification* of Mr Boze; which other electricians, for a long time endeavoured to repeat after him, but to no purpoſe. His deſcription of this remarkable experiment was, that if, in electrifying, large globes were employed, and the electrified perſon ſtood upon large cakes of pitch, a lambent flame would by degrees ariſe from the pitch, and ſpread itſelf around his feet; that from thence it would be propagated to his knees and body, till at laſt it aſcended to his head; that then, by continuing the electrification, the perſon's head would be ſurrounded by a glory ſuch as is in ſome meaſure repreſented by painters in their ornamenting the heads of ſaints. Dr Watſon took the utmoſt pains to repeat this experiment. He underwent the operation ſeveral times, and was ſupported during the time of it by ſolid electrics three feet high. Being electrified very ſtrongly, he felt a kind of tingling on the ſkin of his head and many other parts of his body. The ſenſation reſembled what would ariſe from a vaſt number of inſects crawling over him at the ſame time. He conſtantly obſerved the ſenſation to be the greateſt in thoſe parts of his body which were neareſt to any non-electric; but no light appeared upon his head, though the experiment was ſeveral times made in the dark, and with ſome continuance. At laſt the Doctor

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tor wrote to Mr Boze himself, and his answer showed that the whole had been a trick. Mr Boze acknowledged that he had made use of a suit of armour, which was decked with many bullions of steel, some pointed like nails, others like wedges, and some pyramidal; and that when the electrisation was very vigorous, the edges of the helmet would dart forth rays something like those which are painted on the heads of saints.

12 Identity of electric fluid with lightning suspected by Dr Franklin.

The identity of the electrical matter with lightning is a discovery that hath been of more practical use to mankind than any other. From almost the first discovery of the electric light, and the crackling with which it is emitted, a similarity between it and the phenomena of thunder and lightning had been observed. This is taken notice of by Dr Wall, one of the first who viewed the electric light in any perfect manner. The Abbé Nollet, Mr Winckler, and others, also enumerated many resemblances between the phenomena of electricity and those of thunder; but they did not think of any method by which their suspicions could be brought to the test of experience. This was first proposed by Dr Franklin in 1750. He had before discovered the effects of pointed bodies in drawing off the electric matter more powerfully than others. This was suggested to him by one Mr Thomas Hopkinson, who electrified an iron ball of three or four inches diameter with a needle fastened to it, expecting to draw a stronger spark from the point of it; but was surprised to find little or none. Dr Franklin, improving on this hint, supposed that pointed rods of iron, fixed in the air when the atmosphere was loaded with lightning, might draw from it the matter of the thunder-bolt, without noise or danger, into the body of the earth. His account of this supposition is given by himself in the following words. "The electric fluid is attracted by points. We do not know whether this property be in lightning; but since they agree in all the particulars in which we can already compare them, it is not improbable, that they agree likewise in this; let the experiment be made."

13 His suspicion verified.

This suspicion of Dr Franklin's was verified in 1752, and the discovery is perhaps the only one in the whole science that hath not been the result of accident. The most active persons were two French gentlemen, Messrs Dalibard and Delor. The former prepared his apparatus at Marly la Ville, situated five or six leagues from Paris; the other at his own house, on some of the highest ground in that capital. Mr Dalibard's machine consisted of an iron rod 40 feet long, the lower extremity of which was brought into a centry-box, where the rain could not come; while on the outside it was fastened to three wooden posts by long silken strings defended from the rain. This machine happened to be the first that was favoured with a visit of the etherial fire. Mr Dalibard himself was not at home; but, in his absence, he had entrusted the care of his apparatus to one Coissier a joiner, who had served 14 years among the dragoons, and on whose courage and understanding he could depend. This artisan had all the necessary instructions given him; and was desired to call some of his neighbours, particularly the curate of the parish, whenever there should be any appearance of a thunder storm. At length the long expected event arrived. On Wednesday the 10th of May 1752, between two and three in the afternoon, Coissier heard a pretty loud clap of thunder. Immediately he ran to the machine, taking with him a phial furnished with a brass wire; and presenting the wire to the end of the rod, a small spark issued from it with a snap like that which attends a spark from an electrified conductor. Stronger sparks were afterwards drawn in the presence of the curate and a number of other people. The curate's account of them was, that they were of a blue colour, an inch and an half in length, and smelled strongly of sulphur. In making them, he received a stroke on his arm a little below the elbow; but he could not tell whether it came from the brass wire inserted into the phial, or from the bar. He did not attend to it at the time; but the pain continuing, he uncovered his arm when he went home in the presence of Coissier. A mark was perceived round it, such as might have been made by a blow with the wire on his naked skin.

About a month after this, Dr Franklin himself had an opportunity of verifying his own hypothesis. He was waiting for the erection of a spire in the city of Philadelphia, not imagining that a pointed rod of a moderate height could answer the purpose. At last it occurred to him, that by means of a common kite he could have a readier access to the higher regions of the atmosphere than any other way whatever. Preparing, therefore, a large silk handkerchief and two cross sticks of a proper length on which to extend it, he took the opportunity of the first approaching thunderstorm to take a walk into a field where there was a shed convenient for his purpose. But dreading the ridicule which too commonly attends unsuccessful attempts in science, he communicated his intention to nobody but his son, who assisted him in rising the kite. A considerable time elasped before there was any appearance of success. One very promising cloud had passed over the kite without any effect; when, just as he was beginning to despair, he observed some loose threads of the hempen string to stand erect and avoid one another, just as if they had been suspended by the conductor of a common electrical machine. On this he presented his knuckle to a key which was fastened to the string, and thus obtained a very evident electric spark. Others succeeded even before the string was wet; but when the rain had begun to descend, he collected electric fire pretty copiously. He had afterwards an insulated iron rod to draw the lightning into his house; and performed almost every experiment with real lightning that had before been done with the artificial representations of it by electrical machines.

14 Danger of making experiments with lightning.

Thus a new field was opened for philosophers; but it was soon found, that experiments of this kind were not always to be made without danger. This very year, 1752, the Abbe Nollet published some cautions to those who tried experiments on lightning. He had been informed by letters from Florence and Bologna, that some people there had received violent shocks while they drew sparks from an iron bar electrified by thunder. One of his correspondents informed him, that once, as he was endeavouring to fasten a small chain with a copper ball at one of its extremities to a great chain which communicated with the bar at the top of the building, there came a flash of lightning which he did not see, but which affected the chain with a noise like that of wild-fire. The observer instantly

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stantly received such a shock, that the ball fell out of his hands, and he was struck backwards four or five paces.

15 Professor Richman killed by lightning.

The greatest instance of the danger of these experiments, however, was the death of Mr Richman professor at Petersburgh abovementioned. This happened on the 6th of August 1753, as he was making experiments on lightning drawn into his own room. He had provided himself with an instrument for measuring the quantity of electricity communicated to his apparatus; and as he stood with his head inclined to it, Mr Solokow an engraver, who was near him, observed a globe of blue fire, as big as his fist, jump from the instrument, which was about a foot distant, to Mr Richman's head. The professor was instantly dead, and Mr Solokow was also much hurt. The latter, however, could give no particular account of the way in which he was affected; for, at the time the professor was struck, there arose a sort of steam or vapour, which entirely benumbed him, and made him sink down to the ground, so that he could not even remember to have heard the clap of thunder, which was a very loud one. The globe of fire was attended with an explosion like that of a pistol; the instrument for measuring the electricity (called by the professor an *electrical gnomon*), was broken to pieces, and the fragments thrown about the room. Upon examining the effects of the lightning in the professor's chamber, they found the door-case half split through, and the door torn off and thrown into the room. They opened a vein in the body twice, but no blood followed; after which, they endeavoured to recover life by violent friction, but in vain: upon turning the corpse with the face downwards during the rubbing, an inconsiderable quantity of blood ran out of the mouth. There appeared a red spot on the forehead, from which spirted some drops of blood through the pores, without wounding the skin. The shoe belonging to the left foot was burst open, and uncovering the foot at that part, they found a blue mark; from whence it was concluded, that the electric matter having entered at the head, made its way out again at the foot. Upon the body, particularly on the left side, were several red and blue spots resembling leather shrunk by being burnt. Many more also became visible over the whole body, and particularly over the back. That upon the forehead changed to a brownish red, but the hair of the head was not singed. In the place where the shoe was unripped, the stocking was entire; as was the coat every where; the waistcoat only being singed on the foreflap where it joined the hinder: but there appeared on the back of Mr Solokow's coat long narrow streaks, as if red-hot wires had burned off the nap, and which could not well be accounted for.

When the professor's body was opened next day, the cranium was very entire, having neither fissure nor contra-fissure: the brain was found; but the transparent pellicles of the wind-pipe, were excessively tender, and easily rent. There was some extravasated blood in it, as also in the cavities below the lungs. Those of the breast were quite sound; but those towards the back of a brownish black colour, and filled with more of the blood abovementioned. The throat, the glands, and the small intestines, were all inflamed. The singed leather-coloured spots penetrated the skin only. In 48 hours the body was so much corrupted that they could scarce get it into a coffin.

Apparatus.

16 Conductors used for preserving houses.

Since the discovery of the identity of lightning and the electric matter, long rods of iron or other metal have been made use of with a view to protect buildings from the danger of strokes of lightning. A considerable dispute has been carried on whether these rods ought to be pointed or not; but a committee of the royal society have very lately determined it in favour of the former.

For some time, the science of electricity seems to have been at a stand. Numberless improvements indeed have been made upon what was before discovered, but scarce any thing new hath been added. The only thing which can properly be reckoned a new discovery is that of the *electrophorus* by Signior Volta an Italian; which on many accounts may be reckoned the most surprising machine hitherto invented.

Sect. III. *Of the Apparatus, necessary for exciting Electricity, and communicating it to other Bodies, &c.*

The instruments most in use for this purpose are those called *electrical machines*, of which there has been so many different forms, that it would be tedious and difficult to give only a very short description of them all. We shall therefore first lay down the most necessary rules for constructing electrical machines in general; and then give a particular description of those machines which are most generally useful, and contain all the improvements hitherto made.

§ 1. *Of the Construction of Electrical Machines.*

The principal parts of the machine are the electric, the moving engine, and the prime conductor, *i. e.* an insulated conductor, which immediately receives the electricity from the excited electric.

17 What substances are most proper.

Formerly, different kinds of electrics were used, as glass, rosin, sulphur, sealing-wax, &c. Their forms were also various, as globes, cylinders, spheroids, &c. The reason of this variety was, in the first place, that it was not then ascertained what substance acted most powerfully; and secondly, in order to produce a positive or negative electricity at pleasure. At present smooth glass only is used; for when the machine has an insulated rubber, the operator may produce positive or negative electricity at his pleasure, without changing the electric. In regard to the form of the glass, those commonly used at present are globes and cylinders. The most convenient size for a globe, is from nine to twelve inches diameter. They are made with one neck, which is cemented to a strong brass cap in order to adapt them to a proper frame. The best cement for electrical purposes is made with two parts of rosin, two of bees-wax, and one of the powder of red ochre. These ingredients are melted, and mixed together in any vessel over the fire; and afterwards kept for use. This kind of cement sticks very fast; and is much preferable to rosin only, as it is not so brittle, and at the same time insulates equally well. The cylinders are made with two necks; they are used to the greatest advantage without any axis; and their common size is from four inches diameter and eight inches long, to twelve

Apparatus. twelve inches diameter and two feet long, which are perhaps as large as the workmen can conveniently make them. The glass generally used is the best flint; though it is not absolutely determined which kind of metal is the best for electrical globes or cylinders. The thickness of the glass seems immaterial, but perhaps the thinnest is preferable. It has often happened, that glass globes and cylinders, in the act of whirling, have burst in innumerable pieces with great violence, and with some danger to the by-standers. Those accidents are supposed to happen when the globes or cylinders, after being blown, are suddenly cooled. It will therefore be necessary to enjoin the workmen to let them pass gradually from the heat of the glass-house to the atmospherical temperature.

It has been long questioned, whether a coating of some electric substance, as rosin, turpentine, &c. on the inside surface of the glass, has any effect to increase its electrical power; but now it seems pretty well determined, that if it does not increase the power of a good glass globe or cylinder, at least it does considerably improve a bad one.

18 Composition for coating globes.

The most approved composition for lining glass globes or cylinders, is made with four parts of Venice turpentine, one part of rosin, and one part of bees-wax. This composition must be boiled for about two hours over a gentle fire, and stirred very often: afterwards it is left to cool, and reserved for use. When a globe or cylinder is to be lined with this mixture, a sufficient quantity of it is to be broken into small pieces, and introduced into the glass; then, by holding the glass near the fire, the mixture is melted, and equally spread over all its internal surface to about the thickness of a sixpence. In this operation, care must be taken that the glass be made hot gradually, and be continually turned, so that it may be heated equally in all parts, otherwise it is apt to break in the operation.

19 How the machine is to be set in motion.

In respect to the engine which is to give motion to the electric, multiplying wheels have been generally used, which, properly adapted, might give the electric a quick motion, while they are conveniently turned by a winch. The usual method is, to fix a wheel on one side of the frame of the machine, which is turned by a winch, and has a groove round its circumference. Upon the brass cap of the neck of the glass globe, or one of the necks of the cylinder, a pulley is fixed, whose diameter is about the third or fourth part of the diameter of the wheel: then a string or strap is put over the wheel and the pulley; and, by these means, when the winch is turned, the globe or cylinder makes three or four revolutions for one revolution of the wheel. There is an inconvenience generally attending this construction, which is, that the string is sometimes so very slack, that the machine cannot work. To remedy this inconvenience, the wheel should be made moveable with respect to the electric, so that by means of a screw it might be fixed at the proper distance; or else the pulley should have several grooves of different radiuses on its circumference.

It has been customary with some, to turn the cylinder simply with a winch, without any accelerated motion; but that seems not sufficient to produce the greatest electric power the glass is capable of giving; for the globe or cylinder should properly make about six revolutions in a second, which is more than can be conveniently done with the winch only. This method, however, on account of its simplicity and easy construction, should not be disregarded, and it may be conveniently used when no very great power is required.

Instead of the pulley and the string as above described, a wheel and pinion, or a wheel and an endless screw, has been also used. This construction may answer tolerably well for small table machines; but it must be constructed with great nicety; otherwise it is apt to make a disagreeable rattling, and, without frequent oiling, soon wears away by the great friction of its parts.

20 Construction of the rubber.

The next thing belonging to the electrical machine necessary to be described, is the rubber which is to excite the electric. The rubber, as it is now made, consists of a cushion of red Basil skin stuffed with hair or flannel, and fastened to a piece of wood well rounded at the edges. To this is glued a flap of Persian black silk, which nearly goes over one half of the cylinder. The method of using the amalgam is by spreading it on a separate piece of leather, and applying it occasionally to the under part of the cylinder while turning. Thus only a very small part of the amalgam is consumed, at the same time that the glass is very strongly excited. The most powerful composition for exciting an electrical cylinder is found to be an amalgam of mercury and zinc, in the proportion of one part of the former to five of the latter. The mercury ought to be previously triturated with some melted grease or bees-wax, by which means the amalgam will be the finer. The composition called *Aurum Mosaicum*, *Aurum musivum*, or *Mosaic gold*,* will answer very near as well, though somewhat less cleanly and agreeable. The rubber itself should be supported by a spring; by which means it will easily suit any inequalities that may be on the surface of the glass; and by a screw, it may be made to press more or less as occasion requires. It should likewise be insulated in the most perfect manner; as, when insulation is not required, it may be easily taken off by a chain or wire hung upon it, and thus communicate with the earth or with any unelectrified body; but where there is no contrivance for insulating the rubber, it is impossible to perform many of the most curious electric experiments. In short, to construct the rubber properly, it must be made in such a manner, that the side it touches in whirling may be as perfect a conductor as it can be made, in order to supply electricity as quick as possible; and the opposite part should be as perfect a non-conductor as possible, in order that none of the fluid accumulated upon the glass may return back to the rubber; which has been found to be the case when the rubber was not made in a proper manner.

21 Best kind of amalgam.

* See *Chemistry*, n° 1224.

22 How to support and insulate the rubber.

23 Mr Jones's improvement on the spring of the rubber.

Mr William Jones of Holborn, London, instrument-maker, has made a considerable improvement on this part of electrical machines by a very simple contrivance. It consists in a spring placed within the rubber itself; the action of which is found to be better suited for adapting the rubber to the inequalities of the glass, than that placed entirely without the rubber. It consists of a piece of flexible iron or brass, represented edgeways by *A* fig. 1.; and it is evident that it acts in a much more parallel and uniform manner than the former,

Plate CLXXIII.

Apparatus. former, which is constantly changing the pressure of the line of contact betwixt the rubber and cylinder while it passes from the under to the upper side, and thus rendering the effect inconstant and uncertain.

24 Prime conductor, &c. We come now to consider the prime conductor, or first conductor; which is nothing more than an insulated conducting substance, furnished with one or more points at one end, in order to collect the electricity immediately from the electric. When the conductor is of a moderate size, it is usual to make it of hollow brass; but when it is very large, then, on account of the price of the materials, it is made of pasteboard covered with tin-foil or gilt paper. The conductor is generally made cylindrical; but let the form be what it will, it should always be made perfectly free from points or sharp edges: and if holes are to be made in it, which on many accounts are very convenient, they should be well rounded, and made perfectly smooth. Further, that end of the prime conductor which is at the greatest distance from the electric ought to be made larger than the rest, as the strongest exertion of the electric fluid in escaping from the conductor is always at that end.

It has been constantly observed, that the larger the prime conductor is, the longer and denser spark can be drawn from it; and the reason of this is, that the quantity of electricity discharged in a spark, is nearly proportional to the size of the conductor: on this account, the prime conductor is now made much larger than what was formerly used. Its size, however, may be so large, that the dissipation of the electricity from its surface, may be greater than what the electric can supply; in which case, so large a conductor would be nothing more than an unwieldy and disagreeable incumbrance.

Before we quit the electrical machine, it should be observed, that, besides the abovementioned parts, it is necessary to have a strong frame to support the electric, the rubber, and the wheel. The prime conductor should be supported by stands, with pillars of glass or baked wood, and not by silk strings, which admit of continual motion. In short, the machine, the prime conductor, and any other apparatus actually used, should be made to stand as steady as possible, otherwise many inconveniences will arise.

Besides the electrical machine, the electrician should be provided with glass tubes of different sizes, a pretty large stick of sealing wax, or a glass tube covered with sealing-wax, for the negative electricity. He should, at least, not be without a glass tube about three feet long and one inch and a half in diameter. This tube should be closed at one end, and at the other end should have fixed a brass cap with a stop-cock; which is useful in case it should be required to condense or rarify the air within the tube.

The best rubber for a tube of smooth glass is the rough side of black oiled silk, especially when it has some amalgam rubbed upon it; but the best rubber for a rough glass tube, a stick of baked wood, sealing-wax, or sulphur, is soft new flannel.

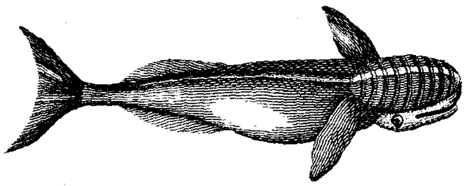
25 Directions for coating jars, &c. The instruments necessary for the accumulation of electricity are coated electrics; among which, glass coated with conductors obtains the principal place: on account of its strength, it may be formed into any shape, and it will receive a very great charge. The form of the glass is immaterial with respect to the charge it will contain; its thickness only is to be considered: for the thinner it is, the more easily will it receive the utmost charge it can bear; but it is at the same time more subject to be broken: for this reason, therefore, a thin coated jar or plate may be used very well by itself, and it is very convenient for many experiments; but when large batteries are to be constructed, then it is necessary to use glass a little thicker, and care should be taken to have them perfectly well annealed. If a battery is required of no very great power, as containing about eight or nine square feet of coated glass, common pint or half-pint phials may be made use of. They may be easily coated with tin-foil, sheet-lead, or gilt-paper, on the outside, and brass-filings on the inside: they occupy a small space, and, on account of their thinness, hold a very good charge. But when a large battery is required, then these phials cannot be used, for they break very easily; and for that purpose, cylindrical glass jars of about 15 inches high, and four or five inches in diameter, are the most convenient.

When glass plates or jars, having a sufficiently large opening, are to be coated, the best method is to coat them with tin-foil on both sides, which may be fixed upon the glass with varnish, gum-water, bees-wax, &c. but in case the jars have not an aperture large enough to admit the tin-foil, and an instrument to adapt it to the surface of the glass, then brass-filings, such as are sold by the pin-makers, may be advantageously used; and they may be stuck on with gum-water, bees-wax, &c. but not with varnish, for this is apt to be set on fire by the discharge. Care must be taken that the coatings do not come very near the mouth of the jar, for that will cause the jar to discharge itself. If the coating is about two inches below the top, it will in general do very well: but there are some kinds of glass, especially tinged glass, that when coated and charged, have the property of discharging themselves more easily than others, even when the coating is five or six inches below the edge. There is another sort of glass, like that of which Florence flasks are made, which, on account of some unvitrified particles in its substance, is not capable of holding the least charge. On these accounts, therefore, whenever a great number of jars are to be chosen for a large battery, it is advisable to try some of them first, so that their quality and power may be ascertained.

26 Another substance capable of answering the purpose of glass. Electricians have often endeavoured to find some other electric, which might answer better than glass for this purpose, at least be cheaper; but, except Father Beccaria's method, which may be used very well, no remarkable discovery has been made relating to this point. He took equal quantities of very pure colophonium, and powder of marble sifted exceedingly fine, and kept them in a hot place a considerable time, where they became perfectly free from moisture: he then mixed them, and melted the composition in a proper vessel over the fire; and, when melted, poured it upon a table, upon which he had previously stuck a piece of tin-foil, reaching within two or three inches of the edge of the table. This done, he endeavoured with a hot iron to spread the mixture all over the table as equally as possible, and to the thickness of one-tenth of an inch: he afterwards coated it with another piece of tin-foil reaching within about two inches of the edge.

Plate CLXXIII.

Echeneis.



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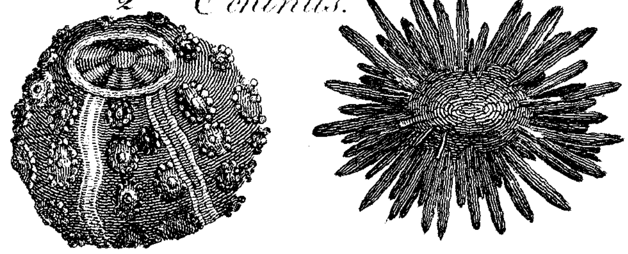
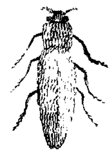


Elater.



ELECTRICITY.

Fig. 2.

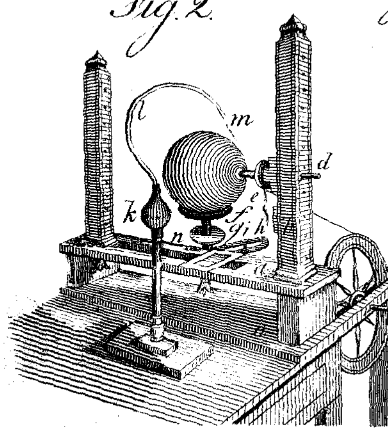


Fig. 1.

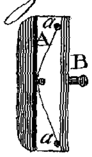


Fig. 3.

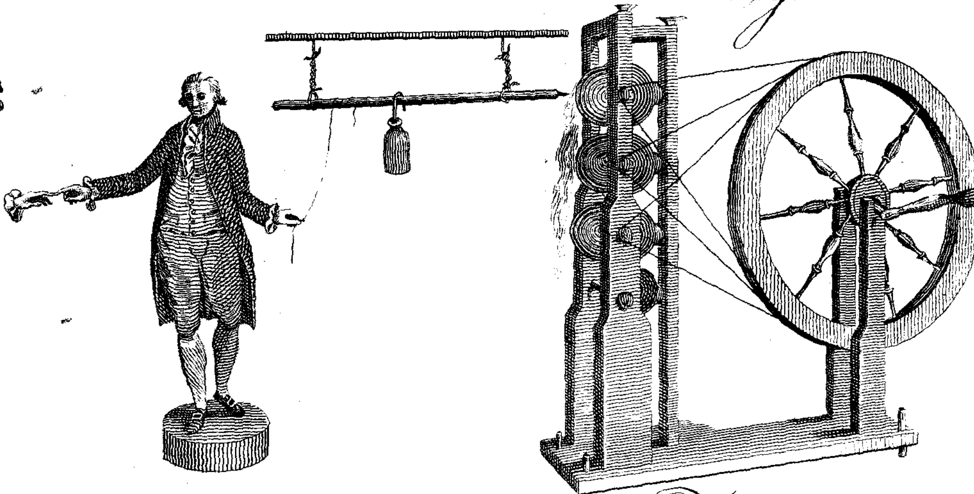


Fig. 4.

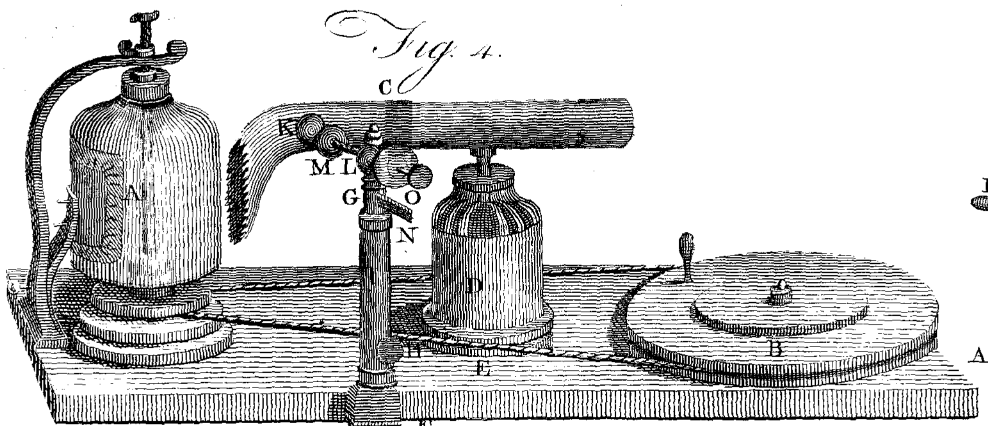


Fig. 5.

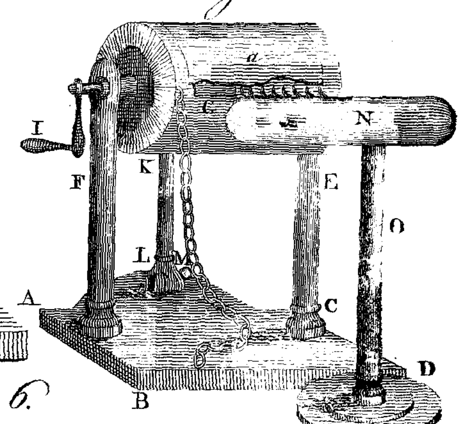


Fig. 7.

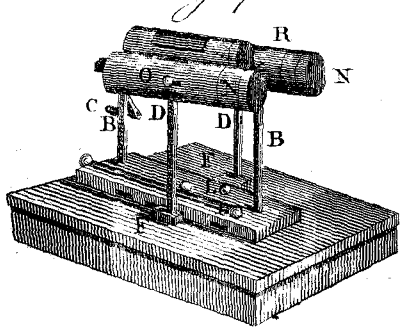
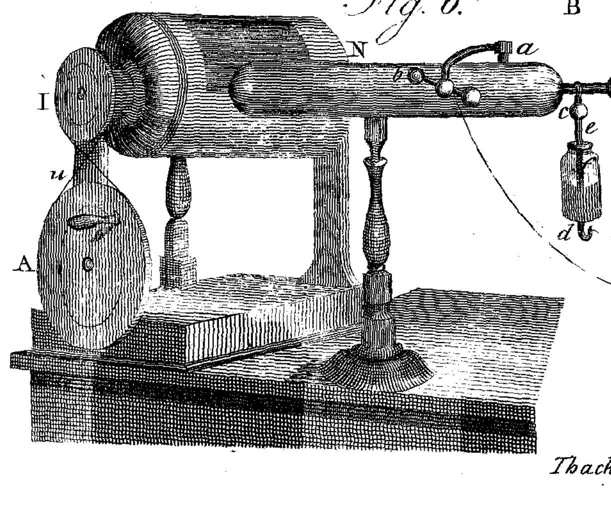
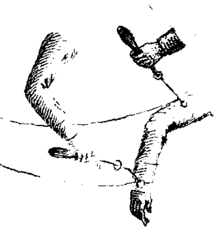


Fig. 6.





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edge of the mixture: in short, he coated a plate of this mixture like a plate of glass. This coated plate, from what he says, seems to have had a greater power than a glass plate of the same dimensions, even when the weather was not very dry: and if it is not subject to break very easily by a spontaneous discharge, it may be very conveniently used; for it doth not very readily attract moisture, and consequently may hold a charge of electricity better, and longer, than glass: besides, if broken, it may be repaired by a hot iron; but glass, when broken, cannot so easily be repaired.

27 Discharging rod, electrometers, &c.

When a jar, a battery, or in general a coated electric, is to be discharged, the operator should be provided with an instrument called the *discharging rod*, which consists of a metal rod sometimes straight, but more commonly bended in the form of a C: they are made also of two joints, so as to open like a kind of compasses. This rod is furnished with metal knobs at its extremities, and has a non-conducting handle, generally of glass or baked wood, fastened to its middle. When the operator is to use this instrument, he holds it by the handle; and touching one of the coated sides of the charged electric with one knob, and approaching the other knob to the other coated side, or some conducting substance communicating with it, he completes the communication between the two sides, and discharges the electric.

The instruments to measure the quantity, and ascertain the quality, of electricity, are commonly called *electrometers*, and they are of four sorts: 1. The single thread; 2. the cork or pith balls; 3. the quadrant; and, 4. the discharging electrometer. The second sort of electrometer, *i. e.* the cork-ball electrometer, was invented by Mr Canton; the discharging electrometer was invented by Mr Lane, and hath been improved by Mr Henley; another on a different principle by Mr Kinnersley; and the quadrant electrometer, which is of latest invention, is a contrivance of Mr Henley.

Besides the apparatus above described, there are several other instruments useful for various experiments; but these will be described occasionally. The electrician, however, ought to have by him, not only a single coated jar, a single discharging rod, or, in short, only what is necessary to perform the common experiments; but he should provide himself with several plates of glass, with jars of different sizes, with a variety of different instruments of every kind, and even tools for constructing them; in order that he may readily make such new experiments as his curiosity may induce him to try, or that may be published by other ingenious persons who are pursuing their researches in this branch of philosophy.

§ 2. *Description of the most useful Electrical Machines.*

28 Description of Doctor Priestley's machine.

Fig. 2.

The first which may be mentioned is that described by Dr Priestley in his history of electricity; which on account of its extensive use, may be deservedly called a *universal electrical machine*.—The basis consists of two oblong boards *a a*, which are placed in a situation parallel to one another, about four inches asunder, and kept in that position by two pieces of wood adapted for the purpose. These boards, when set horizontally on a table, and the lowermost of them fixed with iron cramps, form the support of two perpendicular pillars of baked wood, and of the rubber of the machine. One of the pillars, together with the spring supporting the rubber, slides in a groove *a*, which reaches almost the whole length of the upper board; and, by means of a screw, many be placed at any required distance from the pillar *b*, which is fixed, being put through a mortise in the upper board, and fastened to the lower. In these two pillars are several holes for the admittance of the spindles of different globes; and as they may be situated at any distance from one another, they may be adapted to receive not only globes, but cylinders and spheriods of different sizes. "In this machine (says Dr Priestley), more than one globe or cylinder may be used at once, by fixing one above the other in the different holes of the pillars; and by adapting to each a proper pulley, they may be whirled all at once, to increase the electricity." But this construction has one capital defect, that rubbers cannot be conveniently applied; so that the power of several globes put together in this manner, though greater than one, is by no means equal to what it would be if the power of them all taken singly were united. Fig. 3. shows a machine of this kind contrived by Dr Watson.

29 Several globes may be made to unite their power in this machine.

The rubber ought to be made as above directed. It is supported by a socket which receives the cylindrical axis of a round and flat piece of glass or baked wood *g*, the opposite part of which is inserted into the socket of a bent steel spring *h*. These parts are easily separated, so that the rubber, or the piece of wood that serves to insulate it, may be changed at pleasure. The spring admits of a twofold alteration of position; being capable of either slipping along the groove, or moving in the contrary direction, the groove being wider than the screw that fastens the spring, so as to give it every desirable position with regard to the globe or cylinder; and it is besides furnished with a screw which makes it press harder or lighter as the operator chooses. The wheel of this machine is fixed to the table at *e*, and has several grooves for admitting more strings than one, in case that two or three globes or cylinders are used at a time; and as it is disengaged from the frame of the machine, the latter may be screwed at different distances from the former, and so would be suited to the variable length of the string. The chain connected with the rubber at *n* is for making a communication with the table, when insulation is not wanted. The prime conductor is made of copper, hollow, and in the form of a pear; having its neck placed upwards, and its bottom, or rounded part *k*, placed on a stand of glass or baked wood. An arched wire *l* proceeds from its neck, having an open ring at its end, in which some small pointed wires *m* are hung, that by playing lightly on the globe or cylinder collect the electric fluid from it.

30 Of Dr Ingenhousz's.

Next to Dr Priestley's machine is one invented by Dr Ingenhousz, and which for its simplicity and concisenefs makes a fine contrast with the former.—This machine consists of a circular glass-plate about one foot diameter, which is turned vertically by a winch fixed to the iron axis that passes through its middle; and it is rubbed by four cushions, each about two inches long, situated at the opposite ends of the vertical diameter. The frame consists of a bottom board, about a foot square, or a foot long and six inches broad, which when the machine is to be used, may be fastened by an iron crank to the table. Upon this board two other slender and smaller ones are raised, which lie parallel to

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to one another, and are fastened together at their top by a small piece of wood. These upright boards support in their middle the axis of the plate, and to them the rubbers are fastened. The conductor is of hollow brass; and from its extremities branches are extended, which, coming very near the extremity of the glass, collect the electricity from it.

The power of this machine is perhaps more than a person would imagine by looking at it. It may be objected, that this construction will not easily admit of the rubbers being insulated, nor consequently be adapted to a great variety of experiments: but at the same time it must be allowed, that it is very portable, that it is not very liable to be out of order, and that it has a power sufficiently strong for physical purposes; on which account it may be conveniently used.

31 Mr Reid's portable machine.

Fig. 4. represents a very portable electrical machine invented by Mr Reid, and improved by Mr Lane. *A* is the glass cylinder, moved vertically by means of the pulley at the lower end of the axis. This pulley is turned by a large wheel *B* which lies parallel to the table. There are three pulleys of different dimensions marked in the figure; one of which revolves four times for every revolution of the large wheel *B*. The conductor *C* is furnished with points to collect the fluid, and is screwed to the wire of a coated jar *D*, which stands in a socket between the cylinder and the wheel. The figure also represents the manner of applying Mr Lane's electrometer to this machine; of which an account shall be given afterwards.

Electrical machines have of late years undergone some very essential alterations and improvements; both from the suggestions of private electricians and the inventions of Messrs Adams, Nairne, and Jones, instrument makers of London. We shall subjoin a description of the most approved ones.

32 A machine proper for philosophical purposes.

Fig. 5. represents a most convenient machine for philosophical purposes, and whose power is equal to that of much larger ones of the old construction. The frame of this machine consists of the bottom board *A B C D*; which, when the machine is to be used, must be fastened to the table by two brass or iron cramps made for that purpose. Upon the bottom board there are two round pillars *E F* perpendicularly raised; which will best answer the purpose if made of baked wood. These serve to support the cylinder *G* by the axles of the brass or wood caps *H*. From one of these proceeds the long axle *H*, going through an hole in the pillar *F*; having a simple winch *I* fixed on its square end; or sometimes, as in fig. 6. below a pulley *I*. On the circumference of this pulley are several grooves in order to suit the variable length of the string *u*, which goes round one of them, as well as round the large multiplying wheel *A*. The other cap of the clynder has a small cavity which fits the conical extremity of a strong screw proceeding from the pillar. The wheel *A*, which is moved by the handle, turns round a strong axle proceeding from about the middle of the same pillar. In small machines the simple winch may be adopted with great advantage, as is represented fig. 5. as not being liable to disorder; but in large ones the multiplying wheel is indispensibly necessary.

Fig. 6.

In all these machines the rubber is composed of a cushion stuffed with horse-hair or flannel, fastened to a board behind. It is covered with red Basil leather; and from its under edge a piece of black Persian silk is glued, which goes over the cylinder as at *a*, fig. 5. to near the points of the collector fixed in the conductor. Thus a greater power of electricity is excited than what could have been done by the former machines. In them a piece of leather was fastened to the lower edge of the cushion, bearing against the cushion itself. To this piece of leather another of oiled silk was sewed, covering the cylinder as above described. In this way some of the amalgam above described was to be laid upon the piece of leather, and worked into its substance as much as possible; but in the present method nothing more is necessary than to hold an amalgamated piece of leather once or twice to the cylinder while turning. The rubber is fixed to a glass pillar *K* (fig. 5.) which is fastened into a wooden basis *L* at the bottom. This turns on an hinge; and by means of a screw at *M*, going through the basis to a fixed block on the frame, the pressure of the cushion may be augmented or diminished at pleasure; at the same time that it is rendered much more steady and uniform than by a flat sliding board and tightening screw as formerly used.

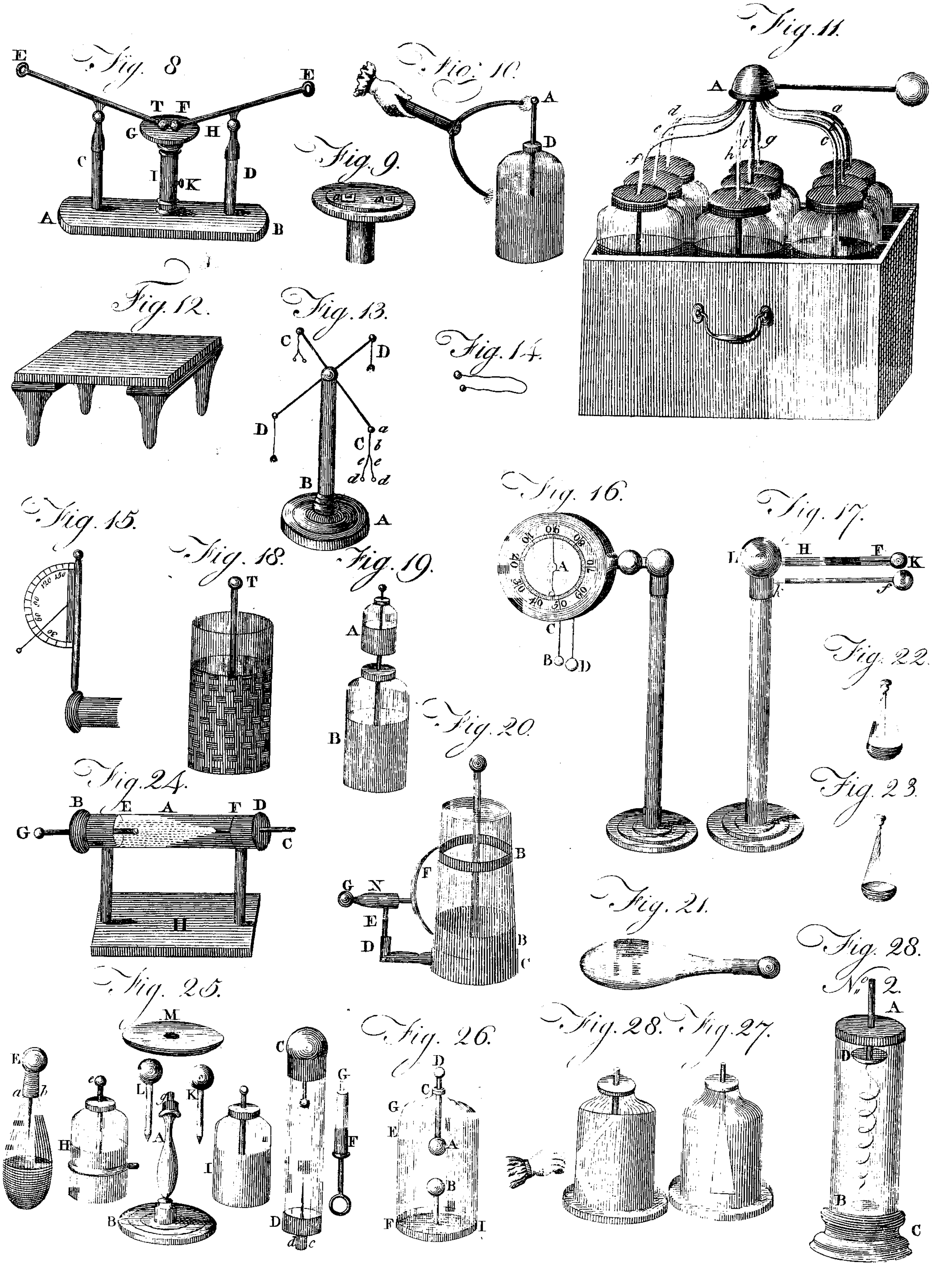
The glass pillar *K*, as well as all other glass pillars, the glass feet of insulating stools, &c. should be covered with varnish or rather sealing-wax; otherwise they will insulate very imperfectly on account of the moisture they attract from the air in damp weather. It was usual to support the rubber upon two springs screwed to its back, and which proceeded from the wooden cap of the pillar, in order to give way to and suit the inequalities of the glass; but by this contrivance the line of contact with the cylinder was not always the same, nor its pressure uniform, as already observed: But Mr William Jones has removed this difficulty by the bent spring represented fig. 1. It is fixed by a screw at *B*, and gives way by sliding notches at *a a*: its length and breadth are equal to that of the cushion, and its thickness proportional to the diameter and action of the cylinder upon it. In the machine above described, the rubber is well insulated, which is a great advantage when it is necessary to connect with the cushion a conductor, called the *negative conductor*; and when this happens not to be the case, which it usually is in making the common experiments, a chain with a small hook and ring may be hung to one end of the conductor, the other falling upon the table as in fig. 5.

The prime conductor belonging to this machine is represented by *N* in the same figure. It receives the electric fluid from the cylinder, and is usually made of brass or tin japanned. It is insulated by the glass pillar that supports it, and which is screwed into a wooden basis or foot. It is found more convenient to place the conductor parallel to the cylinder than with one of its ends towards it as was formerly done.

The handle of the wheel *A*, fig. 6. or the simple winch *I*, fig. 5. should be so turned, that the excited part of the cylinder may revolve from the rubber to the collecting points on the conductor; the prime conductor, standing then as in the figures, will be electrified positively, or overcharged with the electric fluid: for by the action of rubbing, the cylinder pumps, as it were, the fluid from the rubber, and every other body properly connected with it, and gives it to the

prime

ELECTRICITY. Plate CLXXIV.



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prime conductor. But if negative electricity be required, the chain must be removed from the rubber, and hung to the prime productor: for in this case, the electricity of the prime conductor will be communicated to the ground, and the rubber remaining insulated will appear strongly negative. If another conductor, equal in size to N, be connected with the rubber, as strong negative electricity may be obtained from the one as positive electricity from the other.

33 Medical apparatus.

Fig. 6. represents an electrical machine with a conductor in the shape of a *T*; and an improved medical apparatus, where it is necessary to give the shock in the arms, will be more particularly explained afterwards, under the article *Medical Electricity*.

34 Mr Nairn's patent machine.

Fig. 7. shows Mr Nairne's patent electrical machine for medical purposes. Its principal parts are the glass cylinder, generally about 7 inches in diameter and 12 in length, with the two conductors parallel to it. It is furnished with wooden caps, and turns in two wooden pieces cemented on the top of two strong glass pillars *B B*. These pillars are made fast into the bottom board of the machine, which is fastened to the table by means of a crank. There are grooves made in the under part of the bottom of the crank, through which the pieces *F F* slide. On these pieces the pillars stand by which the two conductors are supported; and in order to place these conductors nearer to the cylinder, or remove them farther from it, the pieces on which they stand are moveable outwards or inwards, and may be fixed by the two screw-nuts *L L*. The rubber is fastened to the conductor *R*: and consists of a cushion of leather stuffed, having a piece of silk glued to its under part. This last being turned over the surface of the cushion, and thus interposed between it and the glass, goes over the cylinder, and almost touches the pointed wires which are fixed on the other conductors for the purpose of collecting the electric fluid from the cylinder. The conductors are of tin covered with black lacker, each of them containing a large coated glass jar, and likewise a smaller one, or a coated tube, which are visible when the caps *N N* are removed. To each conductor is fixed a knob *O*, for the occasional suspension of a chain to produce positive or negative electricity. That part of the winch *C* which acts as a lever in turning the cylinder, is of glass. Thus every part of the machine is insulated, the cylinder itself and its brass caps not excepted; by which means the least quantity possible of electric fluid is dissipated, and hence of course the effects are likely to be the more powerful. And to this the inventor has adapted some flexible conducting joints, a discharging electrometer, and other utensils necessary for the practice of medical electricity.

35 Great machine at Teyler's museum.

To these descriptions of electrical machines, we shall add that of a very large and powerful one in Teyler's Museum at Haarlem, and which was constructed by one Mr John Cuthbertson, an English mathematical instrument-maker. It consists of two circular plates of glass, each 65 inches in diameter, and made to turn upon the same horizontal axis, at the distance of 7½ inches from one another. These plates are excited by eight rubbers, each 15½ inches long. Both sides of the plates are covered with a resinous substance to the distance of 16½ inches from the centre, both to render the plates stronger, and likewise to prevent any of the electricity from being carried off by the axis. The prime conductor consists of several pieces, and is supported by three glass pillars 57 inches in length. The plates are made of French glass, as this is found to produce the greatest quantity of the electricity next to English flint, which could not be produced of sufficient size. The conductor is divided into branches which enter between the plates, but collect the fluid by means of points only from one side of the plate. The force of two men is required to work this machine; but when it is required to be put in action for any length of time, four are necessary. At its first construction nine batteries were applied to it, each having 15 jars, every one of which contained about a foot square of coated glass; so that the grand battery formed by the combination of all these contained 135 square feet. The effects of this machine were astonishing, as shall be mentioned in its proper place: but Dr Van Marum, who principally made experiments with it, imagining that it was still capable of charging an additional quantity of coated glass, afterwards added to it 90 jars of the same size with the former; so that it now contains a coated surface of 225 feet, and the effects are found to be proportionable.

We come now to describe some of the other parts of an electrical apparatus, and which, though not essentially necessary for exciting the property called *electricity*, are absolutely so for communicating it from one body to another, and performing many experiments which the machines themselves, however powerful, could not accomplish. Of these, the first we shall describe is that called the *discharger*; by which the electricity, whether positive or negative, collected upon one body, may be suddenly transferred from it to another, which is called *discharging* the electricity of the former, if only one body be perceptibly electrified; or of both, if the one contain positive and the other negative electricity.

36 Discharger of electricity described.

Plate CLXXIV.

Fig. 8. represents Mr Henley's universal discharger; an instrument of very extensive use in forming communications between jars or directing the shock through any particular substance. *AB* is a flat board 15 inches long, 4 broad, and 1 thick, and forming the basis of the instrument. *D C* are two glass pillars cemented in two holes upon the board *AB*, and furnished at their tops with brass caps; each of which has a turning joint, and supports a spring tube, through which the wires *E F* and *E T* slide. Each of these caps is composed of three pieces of brass, connected with each other in such a manner, that the wire *EF*, besides its sliding through the socket, has two other motions, viz. an horizontal one and a vertical one. Each of the wires is furnished with an open ring at one end, and at the other has a brass ball; which, by a short spring socket, is slipped upon its pointed extremity, and may be removed from it at pleasure. *HG* is a strong circular piece of wood five inches diameter, having a slip of ivory inlaid on its surface, and furnished with a strong cylindric foot, which fits the cavity of the socket *I*. This socket is fixed in the middle of the bottom board, and has a screw at *K*; by which the foot of the circular board is made fast at any required height.

Fig. 9. is a small press belonging to this instrument. It consists of two oblong pieces of wood, which

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which are forced together by the two screws *a a*. The lower end has a cylindrical foot equal to that of the circular table *H*. When this press is to be used, it must be fixed into the socket *I*, in place of the circular board *HG*; which in that case is to be removed.

37 Electrical jar or Leyden phial.

Fig. 10. shows an electrical jar or Leyden vial, for the purposes chiefly of giving a shock, or of accumulating a quantity of electricity in such a manner as could not be done in any other way, without using an immense extent of electrified surface. It is coated on the inside with tin-foil to the height of about three inches below the top of the cylindrical part of the glass; and having a wire with a round brass knob at its extremity, which passes through the middle of a piece of wood *D*, is used as a stopper for the bottle. Its lower end is usually connected with the inside coating by means of a piece of chain or slender wire.

38 Electrical battery.

Fig. 11. shows the most approved construction of an *electrical battery*; a part of the apparatus which takes its name from its construction and formidable effects. It consists of a number of coated jars, placed in such a manner that they may all be charged at the same time, and discharged in an instant; so that the whole power of electricity accumulated in them may be at once exerted upon the substance exposed to the shock. The battery represented in the figure consists of nine jars connected together by the wires *a, b, c, d, e, f, g, h, i*; all of which are fastened into the wood-stoppers of the bottles, and meet at top in the brass ball. Thus a communication is made between all the inside coatings of the jars, while their outside coatings are connected by the bottom of the box on which they stand; and which, that it may conduct the better, is covered with tin-foil. In one side of the box near the bottom is an hole through which a brass hook passes, and which communicates with the metallic lining of the box, and consequently with the outside coating of the jars. To this hook a wire or chain is occasionally connected when a discharge is made; and for the more convenient making of this discharge, a ball and wire *B* proceed to a convenient length from the centre ball *A*. When the whole force of the battery is not required, one, two, or three jars may be removed only by pressing down the wires belonging to them, until their extremities can slip out of their respective holes in the brass ball, and then turning them into such a posture that they cannot have any communication with the battery. The number of jars represented in this figure is rather small for some purposes; but it is better to join two or three small batteries together rather than have a single large one, which is inconvenient on account of its weight and unwieldiness.

The construction of jars and batteries is part of the business of an electrician; and he ought to be expert in coating the vials himself, not only because of the expence attending the employment of others, but because he may sometimes be at too great a distance from workmen who are accustomed to operations of this kind. A considerable difficulty arises with respect to the size of the jars and the kind of glass they are to be made of. Fine flint or crystal glass may probably be made use of with greater advantage than any other; but the expence here becomes a very considerable object, especially as the jars of a battery are very apt to break by reason of the inequality of their strength; for it would seem that the force of the fluid in a battery is equally distributed among all the bottles, without any regard to their capacities of receiving a charge singly considered. Thus, if we express the quantity of charge which one jar can easily receive by the number 10, we ought not to combine such a jar in a battery with another whose capacity is only 8; because the whole force of electricity expressed by 10 will be directed also against that whose capacity is only 8; so that the latter will be in danger of being broken. It will be proper, therefore, to compare the bottles with one another in this respect before putting them together in a battery. Besides the consideration of the absolute capacity which each bottle has of receiving a charge, the time which is taken up in charging it must also be attended to; and the jars of a battery ought to be as equal as possible in this respect as well as in the former. The thinner a glass is, the more readily it receives a charge, and *vice versa*; but it doth not follow from thence, as electricians in general imagined till lately, that, on account of its thinness, it is capable of containing a greater charge than a thicker one. The reverse is actually the case: and though a thick glass cannot be charged in such a short time as a thin one, it is nevertheless capable of containing a greater power of electricity. If the thickness of the glass be very great, no charge can indeed be given it; but experiments have not yet determined how great the thickness must be which will prevent any charge. Indeed it is observed, that though a thick glass cannot be charged by a weak electric machine, it may be so by a more powerful one: whence it seems reasonable to suppose that there is no real limit of this kind: but that if machines could be made sufficiently powerful, glasses of any thickness might be charged. Mr Brookes, an ingenious electrician of Norwich, constructed his batteries, which appear to have been very powerful, of green-glass bottles. Some of them, like that represented in the figure, had only nine of these bottles; but when a greater power was wanted, more were added. Jars would have been preferred to bottles on account of their being more easily coated by reason of their wide mouths; but being less easily procured, he was content to put up with this inconvenience. The mean size of these bottles were about eight inches in diameter; they were coated 10 inches high, and made of the thickest and strongest glass that could be procured, weighing from five pounds and an half to seven pounds each. In the construction of a battery of 27 bottles, he disposed of them in three rows; nine of the stoutest and best composing the first row, nine of the next in strength being disposed of in the second, and the third containing the nine weakest. All of these were of green glass, but not of the same kind. Some which stood in the foremost row were composed of a kind very like that of which Frontiniac wine-bottles are made: and our author remarks, that this kind of glass seems to be by much the best, as being both harder and stronger, and less liable to break by an high charge. The second and third rows of the battery consisted of bottles whose diameter was from six and an half to ten inches, and which were coated from eight and an half to eleven inches high; none of their mouths being larger than an

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39 Why the jars of a battery are sometimes apt to break.

40 Mr Brookes's method of constructing batteries.

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an inch and an half, nor less than three quarters of an inch. In case any of the bottles being broken by the discharge of the battery, Mr Brooks found that it could be mended in such a manner as to become serviceable by a cement made according to the following receipt: "Take of Spanish-white eight ounces; heat it very hot in an iron ladle, to evaporate all the moisture; and when cool, sift it through a lawn sieve: add three ounces of pitch, three quarters of an ounce of rosin, and half an ounce of bees-wax: heat them all together over a gentle fire, stirring the whole frequently for near an hour; then take it off the fire, and continue the stirring till it is cold and fit for use." The bottles cemented with this composition, however, were not judged to be sufficiently strong to stand in their original place, but were removed to the second or third row, as it was apprehended they could best sustain the charge. All the bottles of this battery, as well as the single ones he commonly made use of in his experiments, were coated both on the inside and outside with slips of tin-foil from three-eighths to three-fourths of an inch wide, laid on with paste of flour and water, at the distance of about the breadth of a slip between each.

41 His method of mending bottles when broken by a discharge.

Fig. 12. represents the insulating stool, a very useful part of the apparatus, especially for medical purposes, where it is often necessary to insulate the human body. In these cases it is proper to have it of a magnitude sufficient to hold a chair or other seat, on which the patient may sit during the operation. The stool itself may be conveniently constructed of a mahogany board with glass feet varnished, as already directed. When in use, the insulation will be the more perfect that a piece of dry paper be put upon it.

These are the parts of the electrical apparatus essentially necessary for exhibiting the ordinary experiments; but as many very curious phenomena are to be observed in different substances, without using any part of the apparatus above described, we shall next proceed to give an account of those bodies which naturally exhibit signs of electricity, with the various phenomena attending them.

Sect. IV. *A Catalogue of the different Electric Substances, with the general Phenomena attending their Excitation.*

The list of substances by which electric phenomena may be produced, is so very extensive, that it may perhaps be doubted whether all terrestrial matters, metals and charcoal only excepted, may not be included in the number. Some, however, have the property much more, or exhibit particular phenomena more obviously, than others; and according to this we may divide them into classes, as shall afterwards be more particularly noticed. The following catalogues enumerate those in which the property in general has been discovered.

Cavallo's Electricity, p. 17.

42 Catalogue of electric substances, with their different powers.

Electric substances.	Quality of electricity.	Substances with which the electric is rubbed.
The back of a cat.	Positive	Every substance hitherto tried.
Smooth glass	Positive	Every substance, except the back of a cat.
Rough glass	Positive	Dry oiled silk, sulphur, or metals.
	Negative	Woollen-cloth, quills, wood, paper, sealing-wax, white-wax, the human hand.
Tourmalin	Positive	Amber, or air blown upon it.
	Negative	Diamond, the human hand.
Hare's skin	Positive	Metals, silk, loadstone, leather, hand, paper, baked wood.
	Negative	Other finer furs.
Black silk	Positive	Sealing-wax.
	Negative	Hare's, weasel's, and ferret's skin, loadstone, brass, silver, iron, hand.
White silk	Positive	Black silk, metals, black cloth.
	Negative	Paper, hand, hare's, weasel's skin.
Sealing-wax	Positive	Metals.
	Negative	Hare's, weasel's, and ferret's skin, hand, leather, woollen-cloth, paper.
Baked wood	Positive	Silk.
	Negative	Flannel.

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This table contains most of those substances that exhibit the strongest marks of electricity. The following is composed by Mr Henley, and contains a great number of substances whose electricity is much more equivocal. They were fixed or tied on the end of a stick of sealing-wax; and excited by friction against a woollen garment, or a piece of soft black silk, by which means they became electrified as below. The strongest in power are distinguished by the letter s, and the weakest by the letter w.

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Metals.

	Wool.	Silk.
A new guinea; a smooth sixpence; a brass ferule; tin, and tin-foil; enamelled copper, s; gilding on leather, s; lead ore; copper ore; iron ore; stream tin.	Neg.	Neg.
Milled lead; copper, s; a polished steel button, s; a new silver ditto; a metal button gilt, s; tutenague ditto, s; iron.	Pos.	Pos.
Lead from a tea-chest, in which there is a mixture of tin, w.	Neg.	Pos.
A gilt button, basket-pattern; the juncture at the end of a brass ferule.	Pos.	Neg.

Animal Substances.

Tortoise-shell, w; ivory, s; bone, s; horn; lamb's tooth; horse's hoof; deer's hoof; muscle of the leg of a deer, s; cartilage, s; spur of a young cock; bill, claw, and scale from the leg

of

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	Wool.	Silk.
of a turkey, s; scale of a carp; the *chrysalis* of a moth, recent from the earth, cleansed; *crassamentum* of the human blood exsiccated, w; quills; claw of an unboiled lobster; cowrie and several other smooth shells, s; shell of a hen's egg; tail of a small fish; thigh of the elephant beetle; a small beetle, smooth surface; human hair; red and white horse's and bullock's hair, s; hog's bristles, s; wool; silk from the worm, w; oyster-shell, smooth surface;	Pos.	Pos.
Mother of pearl, and several other shells.	Neg.	Pos.
Muscle and cockle-shells, recent; a recent snail-shell, rough surface; *elytra* of the stag-beetle; oyster-shell, rough surface.	Neg.	Neg.

Vegetables.

Rind of chesnut, s; Barcelona nut-shell, s; cashew nut, s; cocoa nut-shell polished; Brazil; *lignum vitæ*; black ebony, s; box, w; cane, s; *quinquina*, or Peruvian bark, s; tamarind stone; coffee-berry roasted, s; nutmeg, s; ginger, s; white pepper, freed from the husk, s; cinnamon, s; cloves, s; mace, s; all-spice, s; capsicum, both sides of the pod, s; hemlock, s; a clove of garlic; ditto of eschalot, freed from the husk, s; a green onion, s; rue, s; cork, s; leaves of laurel, bay, yew, holly, rosemary, with their berries, s; parsley, s; leaf of turnip; ditto of Savoy cabbage, s; celery, s; sago, s; thime, s; carrot; turnip; potato; an acorn, s; rind of Seville orange, s; a large Windsor bean, s; a white pea; root of the white lily; snow-drop root: seeds of gourd, melon, cucumber, w; a species of long moss, w; an apple, s; down of the cotton-rush, w; sea-flag; leaf of the American aloe, s; cotton, w.	Neg.	Neg.
Hemp; flax; stalk of the tobacco-leaf: spike, from the leaf of the American aloe; *palma-christi* nut; horse radish.	Neg.	Pos.
A white kidney-bean, smooth surface; black negroe of the same; scarlet of the same.	Pos.	Pos.

Corallines.

Sea-fan, the horny part, w; rough coral, w.	Neg.	Pos.
Spunge, w; coral polished, w.	Neg.	Pos.

Salts.

Alum, w.	- -	Neg.	Neg.
Borax, Nitre purified,	Smooth surfaces;	Pos.	Pos.

Fossil and Mineral Substances.

	Wool.	Silk.
Common pebble stones of all colours, s; marble, s; pit-coal, s; black lead, w; jet, s; *asbestos*; mineralized sulphur; thunder-bolt stone; *cornu-ammonis*; shark's tooth; coat of petrifaction.	Neg.	Neg.
Several smooth native chrystals; brown Iceland ditto; *talc*, s; Ceylon pebble, smooth and transparent; agate, s; cornelian; amethyst, s.	Pos.	Pos.
A specimen of *gypsum*.	Neg.	Pos.

Artificial Substances.

Staffordshire ware glazed; China ware, s; Wedgwood's ware glazed, s; whale's fin prepared w; writing-paper; parchment, s; sheep's gut.	Pos.	Pos.
Tobacco-pipe, s; Wedgwood's ware unglazed; elastic gum, s; hard under-crust of a leaf; a tallow-candle, w: oiled silk; painted paper, s; silver, burnt into glass, unburnished; pearl-barley, w; Indian ink, w; blue vitriol, s.	Neg.	Neg.
Dr Lewis's glass porcelain.	Neg.	Pos.

Here it must be observed, that a great number of the substances in Mr Henley's table, particularly metals, would have been totally incapable of excitation had they not been insulated; and as they were rubbed against electrics *per se*, it is by no means fair to conclude that the metal was *excited*. It seems much more likely that the rubber only was excited, and communicated its electricity to the metal. It must also be observed, that though there is a very remarkable difference between substances with regard to their non-electric or conducting power, yet there seems not to be a perfect electric in nature: for heat will destroy the electric power of glass, and every other substance; and, on the contrary, cold, if not attended with moisture, renders every electric substance more electric than before. The use of warming an electric therefore, before excitation, is only to free it from the moisture which may adhere to it.

From the above catalogues it will readily be apprehended, that the powers of the electric substances not only vary prodigiously from one another, but likewise according to the circumstances in which they are placed. Thus also we find, that, according to the different substances made use of, we may sometimes produce one phenomenon and sometimes another, in a manner exclusive of all the rest. Hence we have a foundation for classing electric substances according to the various powers they occasionally exhibit, and which we shall do in the following manner.

1. Those which exhibit a strong and permanent attractive and repulsive power; of which the most remarkable is silk.

2. For exhibiting the electric light, attraction and repulsion, and all the other phenomena of electricity in a very vigorous though not durable manner, glass is preferable to all other bodies.

3. Those which exhibit electric appearances for a great length of time, and which communicate to conducting bodies the greatest electric power. Of these the substances called *negative electrics* are the most remarkable;

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markable; such as amber, gum-lac, rosin, sulphur, &c. on the properties of which depend the phenomena of the electrophorus, to be afterwards described.

4. Those which readily exhibit electrical phenomena by heating and cooling, of which the principal is the tourmalin.

§ 1. *Of the Electrical Phænomena from Silk.*

This substance was first discovered to be an electric by Mr Grey, in the manner we have already related*; but as it was by no means remarkable for emitting sparks, which most commonly engages the attention, its electric virtues were almost entirely overlooked till the year 1759. At that time Mr Symmer presented to the royal society some papers, containing a number of very curious experiments made with silk stockings, in substance as follows.

* See n° 5.

He had been accustomed to wear two pairs of silk stockings; a black and a white. When these were put off both together, no signs of electricity appeared; but on pulling off the black ones from the white, he heard a snapping or crackling noise, and in the dark perceived sparks of fire between them. To produce this and the following appearances in great perfection, it was only necessary to draw his hand several times backward and forward over his leg with the stockings upon it.

43
Strong attraction and repulsion between electrified stockings.

When the stockings were separated and held at a distance from each other, both of them appeared to be highly excited; the white stocking positively, and the black negatively. While they were kept at a distance from each other, both of them appeared inflated to such a degree, that they exhibited the entire shape of the leg. When two black or two white stockings were held in one hand, they would repel one another with considerable force, making an angle seemingly of 30 or 35 degrees. When a white and black stocking were presented to each other, they were mutually attracted; and if permitted, would rush together with surprising violence. As they approached, the inflation gradually subsided, and their attraction of foreign objects diminished, but their attraction of one another increased; when they actually met, they became flat, and joined close together like as many folds of silk. When separated again, their electric virtue did not seem to be in the least impaired for having once met; and the same appearances would be exhibited by them for a considerable time. When the experiment was made with two black stockings in one hand, and two white ones in the other, they were thrown into a strange agitation, owing to the attraction between those of different colours, and the repulsion between those of the same colour. This mixture of attractions and repulsions made the stockings catch at each other at greater distances than otherwise they would have done, and afforded a very curious spectacle.

When the stockings were suffered to meet, they stuck together with considerable force. At first Mr Symmer found they required from one to 12 ounces to separate them. Another time they raised 17 ounces, which was 20 times the weight of the stocking that supported them; and this in a direction parallel to its surface. When one of the stockings was turned inside out, and put within the other, it required 20 ounces to separate them; though at that time 10 ounces were sufficient when applied externally. Getting the black stockings new dyed, and the white ones washed, and whitened in the fumes of sulphur, and then putting them one within the other, with the rough sides together, it required three pounds three ounces to separate them. With stockings of a more substantial make, the cohesion was still greater. When the white stocking was put within the black one, so that the outside of the white was contiguous to the inside of the black, they raised nine pounds wanting a few ounces; and when the two rough surfaces were contiguous, they raised 15 pounds one pennyweight and a half. Cutting off the ends of the thread and the tufts of silk which had been left in the inside of the stockings, was found to be very unfavourable to these experiments.

Mr Symmer also observed, that pieces of white and black silk, when highly electrified, not only cohered with each other, but would also adhere to bodies with broad and even polished surfaces, though these bodies were not electrified. This he discovered accidentally; having, without design, thrown a stocking out of his hand, which stuck to the paper-hangings of the room. He repeated the experiment, and found it would continue hanging near an hour. Having stuck up the black and white stockings in this manner, he came with another pair highly electrified; and applying the white to the black, and the black to the white, he carried them off from the wall, each of them hanging to that which had been brought to it. The same experiments held with the painted boards of the room, and likewise with the looking-glass, to the smooth surface of which both the white and the black silk appeared to adhere more tenaciously than to either of the former.

44
Experiments on ribbons by Mr Cigna.

Similar experiments, but with a greater variety of circumstances, were afterwards made by Mr Cigna of Turin, upon white and black ribbons. He took two white silk ribbons just dried at the fire, and extended them upon a smooth plain, whether a conducting or electric substance was a matter of indifference. He then drew over them the sharp edge of an ivory ruler, and found that both ribbons had acquired electricity enough to adhere to the plain; though while they continued there, they showed no other sign of it. When taken up separately, they were both negatively electrified, and would repel each other. In their separation, electric sparks were perceived between them; but when again put on the plain, or forced together, no light was perceived without another friction. When by the operation just now mentioned they had acquired the negative electricity, if they were placed, not upon the smooth body on which they had been rubbed, but on a rough conducting substance, they would, on their separation, show contrary electricities, which would again disappear on their being joined together. If they had been made to repel each other, and were afterwards forced together, and placed on the rough surface abovementioned, they would in a few minutes be mutually attracted; the lowermost being positively, and the uppermost negatively electrified.

If the two white ribbons received their friction upon the rough surface, they always acquired contrary electricities. The upper one was negatively, and the lower one positively electrified, in whatever manner they were taken off. The same change was instantaneously done by any pointed conductor. If two ribbons, for instance, were made to repel, and the point of

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of a needle drawn opposite to one of them along its whole length, they would immediately rush together.

The same means which produced a change of electricity in a ribbon already electrified, would communicate electricity to one which had not as yet received it; viz. laying the unelectrified ribbon upon a rough surface, and putting the other upon it; or by holding it parallel to an electrified ribbon, and presenting a pointed conductor to it. He placed a ribbon that was not quite dry under another that was well dried at the fire, upon a smooth plain; and when he had given them the usual friction with his ruler, he found, that in what manner soever they were removed from the plain, the upper one was negatively and the lower one positively electrified.—If both ribbons were black, all these experiments succeeded in the same manner as with the white. If, instead of the ivory ruler, he made use of any skin, or a piece of smooth glass, the event was the same; but if he made use of a stick of sulphur, the electricities were in all cases the reverse of what they had been before the ribbons were rubbed, having always acquired the positive electricity. When he rubbed them with paper either gilt or not gilt, the results were uncertain. When the ribbons were wrapped in paper gilt or not gilt, and the friction was made upon the paper laid on the plain abovementioned, the ribbons acquired both of them the negative electricity. If the ribbons were one black and the other white, whichever of them was laid uppermost, and in whatever manner the friction was made, the black generally acquired the negative and the white the positive electricity.

He also observed, that when the texture of the upper piece of silk was loose, yielding, and retiform like that of a stocking, so that it could move and be rubbed against the lower one, and the rubber was of such a nature as could communicate but little electricity to glass, the electricity which the upper piece of silk acquired did not depend upon the rubber, but upon the body on which it was laid. In this case, the black was always negative and the white positive. But when the silk was hard, rigid, and of a close texture, and the rubber of such a nature as would have imparted a great degree of electricity to glass, the electricity of the upper piece depended on the rubber. Thus, a white silk stocking rubbed with gilt paper upon glass became negatively, and the glass positively, electrified. But if a piece of silk of a firmer texture was laid upon a plate of glass, it was *always* electrified positively, and the glass negatively, if it was rubbed with sulphur, and for the most part if it was rubbed with gilt paper.

If an electrified ribbon was brought near an insulated plate of lead, it was attracted, but very feebly. On bringing the finger near the lead, a spark was observed between them, the ribbon was vigorously attracted, and both together showed no signs of electricity. On the separation of the ribbon, they were again electrified, and a spark was perceived between the plate and the finger.

When a number of ribbons of the same colour were laid upon a smooth conducting substance, and the ruler was drawn over them, he found, that when they were taken up singly, each of them gave sparks at the place where it was separated from the other, as did also the last one with the conductor; and all of them were negatively electrified. If they were all taken from the place together, they cohered in one mass, which was negatively electrified on both sides. If they were laid upon the rough conductor, and then separated singly, beginning with the lowermost, sparks appeared as before, but all the ribbons were electrified positively, except the uppermost. If they received the friction upon the rough conductor, and were all taken up at once, all the intermediate ribbons acquired the electricity either of the highest or lowest, according as the separation was begun with the highest or the lowest. If two ribbons were separated from the bundle at the same time, they clung together, and in that state showed no sign of electricity, as one of them alone would have done. When they were separated, the outermost one had acquired an electricity opposite to that of the bundle, but much weaker.

A number of ribbons were placed upon a plate of metal to which electricity was communicated by means of a glass globe, and a pointed conductor held to the other side of the ribbons. The consequence was, that all of them became possessed of the electricity opposite to that of the plate, or of the same, according as they were taken off; except the most remote, which always kept an electricity opposite to that of the plate.

§ 2. *Of the Phenomena produced by excited or electrified Glass.*

THAT glass is an electric substance, was first discovered by Mr Gilbert. It was for a long time, however, thought to possess but a very weak electric virtue; though now it is found to be one of the best, if not the very best, electric as yet known. Notwithstanding the many experiments made upon this substance, it is not yet ascertained what kind of glass is most proper for electrical purposes. It has been observed, that the hardest and most completely vitrified glass is often a very bad electric, being sometimes quite a conductor. Glass vessels made for electrical purposes are often rendered fit for them by use and time, though very bad electrics when new. Mr Bergman of Upsal says, that very often, when his glass globes could not be excited to a sufficient degree of strength, he lined them with a thin coating of sulphur, and that then they gave a much stronger positive electricity than before. In Italy, and other places, according to Mr Nollet, it is the custom of electricians to put a coating of pitch or other resinous matter on the inside of their globes, which they say always makes them work well. He gives the preference to the crystal glass of England, Bohemia, &c. It seems doubtful, however, whether the common bottle of glass does not answer equally well, or even better.

45 All kinds of glass not equally proper for electric experiments.

46 Leyden vial explained.

The most remarkable phenomenon producible by excited glass is that of the Leyden vial. It depends entirely upon the following property of glass, viz. that it is impossible to electrify the outside of a glass positively, at least to any considerable degree, without at the same time electrifying the inside of it negatively: in like manner, it is impossible to electrify the outside negatively; without at the same time electrifying the inside positively. It is also the nature of glass and all electric substances, when once electrified either by excitation or communication,

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munication, to part with their electricity very slowly and gradually. Thus, supposing a tube, cylinder, or plate of glass, to be highly electrified; if a finger is brought near any part of it, a spark will be felt to strike the finger with a snapping noise. Part of the electricity will then be discharged from the glass, but not all. If the finger is brought near another part of the glass, a similar spark will be again produced; and so on, by moving the finger to different parts of the glass, till all its electricity is exhausted. It is the nature of conducting substances to discharge all their electricity at once, by a single spark, if another conducting substance is brought near them. This being the case, therefore, it follows, that if every part of one side of a glass plate is covered over with a conducting substance, every point of the glass will give out its electricity to the conductor; and consequently, if another conducting substance is brought near to that by which the glass is covered, the whole electric power in the glass ought to be discharged in one single flash or large spark.

This would no doubt be the case, if it was possible to electrify the glass only on one side. But this is found to be impossible. No method hath yet been found of electrifying one side of a piece of glass positively, without electrifying the other negatively at the same time. There is therefore a necessity for taking off the electricity from both sides of the glass at the same time. This can only be done by covering both sides of the glass with a conducting substance, and presenting other conductors to both sides at the same time: then the electricity of both is discharged in an instant. A strong spark is perceived between both sides of the coated glass and the conducting substances; and if a person holds one in each hand, he will, at the instant of the discharge, feel a very disagreeable sensation, which cannot well be described, in his arms and breast; and this is said to be receiving the *electric shock*.

If, instead of presenting a conducting substance to both sides of the plate at once, a finger is presented to one side, suppose that which is positively electrified, and another substance very highly electrified positively is presented to the negative side of the glass, a like discharge will ensue, but the shock will be much gentler than in the former case, and probably the electricity of the glass will not be all discharged. If two conducting substances, insulated, suppose two cylinders of metal fixed upon sticks of sealing wax, or suspended by silk threads, are brought to the sides of the coated glass at the same time; each of them will receive a spark of positive or negative electricity, according as the side to which it was applied is positively or negatively electrified. When the metallic cylinders are taken away, they will communicate the electricity they have received to other bodies; and if again applied to the coated glass, they will receive sparks as before; and thus the electricity of both sides will be gradually discharged.

After the discharge has been once made, the glass is found in a short time to recover its electricity, tho' in a small degree. The side which was originally electrified positively, becomes electrified in the same manner the second time, and so of the negative side. This second electrification is called the *residuum* of a charge; and, where there is a large surface of coated glass, hath a very considerable degree of power. The same thing, which we have just now observed with regard to a flat surface of glass, takes place with tubes and vials, or glass vessels of any kind; and it is always observed, that the thinnest glass answers best for this purpose. The Leyden vial consists of a glass vial, jar, or bottle, covered on the outside and inside with tin-foil, yet leaving an interval of two or three inches at top without any metallic covering, that the electricity of the one side may not be communicated to the other as fast as it is collected. A more particular description of it will be given when we speak of the electric apparatus. The above will be sufficient to render the following experiments intelligible.

47 Experiments on glass plates by Mr Symmer.

Mr Symmer, when making the experiments we have already related, concerning the strong cohesive power of electrical silk, was induced to try the cohesive power of electrified glass. For this purpose, he got two panes of common window-glass, the thinnest and smoothest he could meet with. He coated one of the sides with tin-foil, leaving a space uncovered near the edges. The uncovered sides were then put together, and electricity communicated to one of the coatings by means of a machine. In consequence of this, the other side, which was also coated, became electrified with an electricity opposite to the first, and both panes were charged with the electric power, as if they had been but one. After they had received a considerable degree of electric power, they cohered pretty strongly together, but he had no apparatus by which the strength of their cohesion could be measured. He then turned the plates upside down; and discharging from his machine positive electricity upon the negative side of the glass, both panes were immediately discharged, and their cohesion ceased. Placing two panes of glass, each of them coated on both sides, one upon the other, each of them had a positive and negative side, by communicating electricity to one of them, and they did not cohere.

48 Experiments on glass plates by Mr Beccaria.

In consequence of these experiments made by Mr Symmer, and another (which we shall presently give an account of) made at Pekin, Mr Beccaria made the following ones. Having charged a coated plate of glass, he took off the coating from the negative side, and applied another uncoated and uncharged (or unelectrified) plate of glass close to it. After this, putting a coating upon the uncharged glass (so that the whole resembled one coated plate consisting of two laminæ), he made a communication between the two coatings. The consequence of this was an explosion, a discharge of the positive and negative electricity, and a cohesion of the plates. If the plates were separated before the explosion, after they had been in conjunction for some time, the charged plate was positive on both sides, and the uncharged one negative on both sides. If after the explosion he separated and joined them alternately, a small circle of paper, placed under the uncharged plate, adhered to it upon every separation, and was thrown off again upon every conjunction. This could be repeated even 500 times with once charging the plate. This is the experiment made at Pekin as abovementioned.

If, in these experiments, the charged plate was inverted, and the positive side applied to the uncharged plate, all the effects were exactly the reverse of the former. If it was inverted ever so often, after remain-

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ing some time in contact with the uncharged plate, it would produce a change in the electricity. In the dark, a light was always seen upon the separation of these plates. Laying the two plates together like one, and coating the outsides of them, he discharged them both together; and at the distance of about four feet he distinguished six of the coloured rings mentioned by Sir Isaac Newton, all parallel to one another, and nearly parallel to the edge of the coating. At the angles of the coatings the rings spread to a greater distance. Where the coatings did not quite touch the glass, the rings bent inwards; and where the coatings adhered very close, they retired farther from them. Upon discharging these two plates, the coloured rings vanished, and the electric cohesion ceased with them. On separating the plates before the explosion; that which had received the positive electricity was positive on both sides, and the other negative on both sides. If they were separated after the explosion, each of them was affected in a manner quite the reverse. Upon inverting the plates, that which was the thinner appeared to be possessed of the strongest electricity, and brought the other plate to correspond with it. Charging the two plates separately, and taking off two of the coatings, so that two positive or two negative sides might be placed together, there was no cohesion nor explosion. But joining a positive and a negative side, they immediately cohered; and a communication being formed on the outside, there was an explosion which increased the cohesion.

49 By Mr Henley.

Mr Henley repeated these experiments with success when he made use of plates of looking-glass, or window and crown glass; but when two plates of Nuremberg glass, commonly called *Dutch plates*, were used, the result was very different. Each of the plates, when separated after charging, had a positive and a negative surface. When they were replaced, and a discharge made, by forming a communication between the two coatings, the electricity of all the surfaces was changed. It appeared, however, still to be very strong, and the plates continued to give repeated flashes of light when they were alternately closed, touched, and separated, like the other plates abovementioned. If a clean, dry, uncoated plate of looking-glass was placed between the coated plates, either of looking-glass or crown-glass, before they were charged, that uncoated plate was always found, upon separating them after charging, to be electrified negatively on both sides; but if it was put between the Dutch plates, it acquired, like them, a positive and negative electricity.

The following observation of Mr Æpinus is very remarkable. He pressed close together two pieces of looking-glass, each containing some square inches; and found, that when they were separated, and not suffered to communicate with any conductor, they acquired a strong electricity, the one positive and the other negative. When put together again, the electricity of both disappeared; but not if either of them had been deprived of their electricity when they were asunder; for in that case, the two, when united, had the electricity of the other.

50 Conducting power of glass tubes.

These are the most remarkable experiments that have been made with electrified flat plates of glass. Tubes of the same matter, however, afford a variety of curious phenomena of a different nature. One very remarkable one is the conducting power of new flint-glass, which is most easily perceived in tubes, and on which Dr Priestley makes the following observations. He several times got tubes made two or three yards long, terminating in solid rods. These he took almost warm from the furnace, in the finest weather possible; and having immediately insulated them, perceived that the electricity of a charged vial would presently diffuse itself from one end to the other; and this he thought would have been the case at any distance at which the experiment could have been made. When the same tubes were a few months older, the electricity could not be diffused along their surface farther than half a yard.

The diffusive power of glass he thought proper to try in a different manner. A tube was procured of about three feet long, but of very unequal width. About three inches of the middle part of it were coated on both sides. This coated part was afterwards charged, by communicating electricity to the inside of it by means of a wire. The consequence of this was, that not only the part through which the wire was introduced became strongly electrical on the outside, but at the opposite end, where there was neither coating nor wire, the fire crackled under the fingers as the tube was drawn through the hand, and a flame seemed continually to issue out at both ends, while it was at rest and charged.—One end of this tube was broken and rough, the other was smooth.

Another tube was procured about three feet and an half in length, and very thin. It was about an inch in diameter, and closed at one end. Three inches of it were coated on both sides, about nine inches below the mouth. This part being charged, the whole tube, to the very extremity of it, was strongly electrical, crackling very loud when the hand was drawn along it, and emitting sparks at about an inch distance all the way. After drawing the whole tube through the hand, all the electricity on the outside was discharged; but, on putting a finger into the mouth, a light streamed from the coating, both towards the finger and towards the opposite end of the tube. After this, all the outside of the tube was become strongly electrical as before; and this electricity might be taken off and recovered many times without charging the tube anew, only it was weaker each time.—Holding this tube by the coated part, and communicating electricity to the uncoated outside, both sides became charged; and, upon introducing a wire, a considerable explosion was made. The discharge made the outside strongly electrical, and by taking off this electricity, the tube became sensibly charged. The residuum of these charges was very considerable; and, in one tube, there was a residuum after 20 or 30 discharges.

By being kept for six or seven months, most of the tubes employed in these experiments lost the abovementioned properties, and the electricity could no longer diffuse itself upon their surfaces. At length they were all broken except one, which had been the most remarkable of the whole. With this old tube, the Doctor tried to repeat the abovementioned experiments;

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ments; but to no purpose. He then took it to a glass-house; and having made it red all over, its diffusive property was restored as before.

He then tried two other tubes which had been made about six weeks, but without being used during all that time, and they answered exactly as if they had been quite new. The charge from a small coated part diffused itself all over the tube; so that, at the distance of a yard from the coating, it gave sparks to the finger of an inch long. On this occasion he observed, that when his finger was brought to the tube about two inches above the coating, a great quantity of the diffusing electricity was discharged; and his whole arm was violently shocked. The old tube, after being heated as abovementioned, showed a prodigious diffusive power. Upon charging a small coated part, the electricity was diffused to the end of the tube; and it gave sparks at the distance of an inch over every part of it. When it was drawn through the hand, in order to take off the diffused electricity, it instantly returned again, and the extremity of the tube would be highly electrified, even while its communication with the coating was cut off by the hand. The middle part of the tube also, which had been oftenest heated, had a much greater diffusive power than any other. It was no sooner taken off, than it appeared again; so that it gave a continual stream of fire. The quantity of residuum after a discharge of this tube was prodigious; so that the outside coating would immediately after give almost a constant stream of fire for some time to any conducting substance placed near it.

The Doctor also observed, that in all the tubes which had the diffusion, there was a considerable noise at the orifice when his hand was drawn from the extremity towards the coating, as if the tube had been gradually discharging itself. In the dark, the electric matter seemed perpetually to pour from the open end, or both ends if they were open; and whenever his hand was drawn over it, the fire streamed from the coating to his hand in a very beautiful manner. The first time he charged any of these tubes after they had stood a while, the diffusion was the most remarkable. It was lessened by every successive charge, and at last became exceedingly small; but after the tube had stood a few hours uncharged, it was as vigorous as ever.

51 Cavallo's experiments with glass tubes.

Mr Cavallo hath also made some curious discoveries concerning glass-tubes. He took the hint from observing accidentally, that by agitating quicksilver in a glass tube hermetically sealed, and in whose cavity the air was very much rarefied, the outside of the tube was sensibly electrified. The electricity, however, was not constant, nor in proportion to the agitation of the quicksilver. In order to ascertain the properties of these tubes, he constructed several of them, one of which is represented fig. 71. Its length was 31 inches, and its diameter something less than half an inch. The quicksilver contained in it was about three fourths of an ounce; and in order to exhaust it of air, one end of it was closed, while the quicksilver boiled in the other. Before this tube is used, it must be made a little warm and cleaned; then, holding it nearly horizontal, the quicksilver in it is suffered to run from one end to the other, by gently and alternately elevating and depressing its extremities. This operation immediately renders the outside electrical; but with the following remarkable property, *viz.* that the end of the tube where the quicksilver actually stands is always positive, and all the remaining part of it negative. If elevating this positive end of the tube a little, the quicksilver runs to the opposite end which was negative, then the former instantly becomes negative, and the latter positive. The positive end has always a stronger electricity than the negative. If when one end of the tube, for instance *A*, is positive, *i. e.* when the quicksilver is in it, that electricity is not taken off by touching it; then, on elevating this end *A*, so that the quicksilver may run to the opposite end *B*, it appears negatively electrified in a very small degree. If by depressing it again it is a second time rendered positive, and that positive electricity is not taken off, then, on elevating the end *A* again, it appears positive in a small degree. But if, whilst it is positive, its electricity is taken off, then on being elevated, it appears strongly negative. When about two inches of each extremity of this tube is coated with tin-foil, as represented in the figure, that coating renders the electricities at the extremities more perceptible, so that sometimes they will give sparks to a conductor brought near them. Tubes whose glass is about one-twentieth of an inch thick answer better for these experiments than any others.

Plate CLXXVII

52 Durability of the electric virtue in glass.

We shall close this account of the phenomena of excited glass, with some experiments which show the durability of the electric virtue in that substance in certain circumstances. Mr Canton procured some thin glass balls of about an inch and a half in diameter, with stems or tubes of eight or nine inches in length. He electrified them, some positively, and others negatively, on the inside, and then sealed them hermetically. Soon after, he found that they had lost all signs of electricity: but holding them to the fire at the distance of five or six inches, they became strongly electrical in a short time, and more so as they cooled. Heating them frequently he found would diminish their power; but keeping one of them under water a week did not appear in the least to impair it. That which he kept under water was charged on the 22d of September 1760, was heated several times before it was kept in water, and had been frequently heated afterwards; yet it still retained its virtue to a considerable degree till the 31st of October following. The breaking of two of his balls gave him an opportunity of observing their thickness, which he found to be between seven and eight parts of a thousand of an inch. The balls retained their virtue for six years, but in a less degree. Mr Lullin also found, that a glass tube charged and hermetically sealed, would show signs of electricity when heated.

The most remarkable instances of the continuance of this power in glass, however, are those given by Mr Henley in the 67th volume of the Phil. Trans. One is, of a small bottle, which showed signs of electricity for 70 days after it had been charged, and stood in a cupboard all that time. The other is of a glass cylinder, which after excitation continued to show very strong signs of electricity from the 5th day of February to the 10th of March, though various methods had been used during that time to destroy the electric virtue. These means always proved effectual when they were applied, and the cylinder for some time showed

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showed no signs of electricity. They never failed, however, to return without any fresh excitation; and became stronger and weaker, nay, sometimes quite vanished and returned, without any visible cause. In general, the electricity was weak when a fire was kept in the room, or when the door was kept open. When the wind blew from the north, the electricity was vigorous, and likewise after it had been for some time destroyed by flame. The cylinder, however, did not at all times retain its electric virtue for such a length of time without excitation. Very often it would lose all signs of electricity in 12 hours, and at other times in a fortnight, without returning till it was again excited.

§ 3. *The Phenomena of excited Sulphur, Gum-lac, Amber, Rosin, baked Wood*, &c.

The most remarkable property of these, as already mentioned, is the durability of their electric virtue when once excited. They are also capable of being excited by heat without any friction. This last property was discovered by Mr Wilcke, who distinguishes it by the name of *spontaneous electricity*. He melted sulphur in an earthen vessel, which he placed upon conductors: then, letting them cool, he took out the sulphur, and found it strongly electrical; but it was not so when it stood to cool upon electric substances. He then melted sulphur in glass vessels, whereby they both acquired a strong electricity whether placed upon electrics or not; but a stronger in the former case than in the latter: they acquired a stronger virtue still, if the glass vessel was coated with metal. In these cases, the glass was always positive and the sulphur negative. It was particularly remarkable, that the sulphur acquired no electricity till it began to cool and contract, and was the strongest in the greatest state of contraction; whereas the electricity of the glass was, at the same time, the weakest; and was the strongest of all when the sulphur was shaken out before it began to contract, and acquired any negative electricity.

53 Experiments by Mr Wilcke, Æpinus, &c.

Pursuing experiments of this kind, he found, that melted sealing-wax poured into glass acquired a negative electricity, but poured into sulphur a positive one, leaving the sulphur negative. Sealing-wax also, poured into wood, was negative, and the wood positive; but sulphur poured into sulphur, or into rough glass, acquired no electricity at all.

Similar experiments were also made by Mr Æpinus. He poured melted sulphur into metal cups; and observed, that, when the sulphur was cold, the cup and sulphur together showed no signs of electricity, but very strong signs of it the moment they were separated. The electricity always disappeared when the sulphur was replaced in the cup, and revived upon its being taken out. The cup had acquired a negative, and the sulphur a positive electricity; but if the electricity of either of them had been taken off while they were separate, they would both, when united show signs of that electricity which had not been taken off.

Mr Wilcke also made several curious experiments concerning the effects of different rubbers upon electric substances, the most remarkable of which is the following: viz. that sulphur rubbed against metals was always positive; and this was the only case in which it was so. But being rubbed against lead, it became negative; and the metal positive.

With regard to the perpetual attractive power of sulphur, &c. which Mr Grey fancied he had discovered *, the most remarkable example he gives is of a large cone of stone sulphur, covered with a drinking glass in which it was made. This he said would never fail to show an attractive power when the glass was taken off. In fair weather, the glass would attract also; but not so strongly as the sulphur, which never failed to attract, let the wind or weather be ever so variable. This experiment has been repeated by Mr Henley; who says he has never known the sulphur to fail of showing signs of electricity on the removal of the glass. Gum-lac, rosin, &c. agree in the same general properties with sulphur, but do not become so strongly electrified spontaneously, nor are they so easily excited.

* See n° 6.

§ 4. *Phenomena of the Tourmalin.*

These have been accurately observed by Dr Priestley, who gives the following account of the methods he made use of for that purpose.

54 Dr Priestley's method of observing its electricity.

1. To ascertain the kind of electricity produced, he had always at hand a stand of baked wood with four arms projecting from it. Three of these were of glass, having threads of fine silk as it comes from the worm fastened to them, and at the end of each thread a small piece of down. From the other arm hung a fine thread about 9 or 10 inches long, while a brass arm suspended a pair of pith-balls. At the other extremity of this arm, which was pointed, a jar could be placed, to receive the electricity, and by the repulsive power of it keep the balls equally diverging with positive or negative electricity; or sometimes he suspended the balls in an uninsulated state within the influence of large charged jars: and lastly, he had always a fine thread of trial at hand, by which he could discover whether the stone was electrical or not before he began his experiments.

2. Before he began any experiments on the stone, also, he never failed to try how long the fine threads, which he used as electrometers, would retain their virtue; and found this to be various in various cases. When the threads would retain their electric virtue for a few minutes, he preferred them; but when this was not the case, he had recourse to the feathers, which never failed to retain it for several hours. They might be touched without any sensible loss of power, though they received their virtue very slowly. In the experiments now to be related, he made use of Dr Heberden's large tourmalin, whose convex side became positive and the flat side negative in cooling; and in all of them, when the positive or negative side of the tourmalin is mentioned, it is to be understood that which is positive or negative in coooling.

3. From Mr Wilcke's experiments on the production of spontaneous electricity, by melting one substance within another, he first conjectured that the tourmalin might collect its electricity from the neighbouring air: To determine which the following experiment was made. Part of a pane of glass was laid on the standard bar of an excellent pyrometer, and upon that glass the tourmalin was placed. This bar was heated

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heated by a spirit lamp, so that the increase or decrease of heat in the tourmalin could thus be exactly determined. In this situation he observed, that whenever he examined the tourmalin, the glass had acquired an electricity contrary to that side of the stone which lay upon it, and equally strong with it. If, for example, the flat side of the stone had been presented to a feather electrified positively, as the heat was increasing, it would repel it at the distance of about two inches, and the glass would attract it at the same or a greater distance; and when the heat was decreasing, the stone would attract, and the glass repel it at the distance of four or five inches. The case was the same whichever of the sides was presented, as well as when a shilling was fastened with sealing-wax upon the glass; the electricity both of the shilling and glass being always opposite to that of the stone. When it came to the turn, the electricity was very quickly reversed; so that in less than a minute the electricity would be contrary to what it was before. In some cases, however, viz. where the convex surface of the tourmalin was laid upon the glass or shilling, both of these became positive as well as the stone. This he supposed to be owing to the stone touching the surface on which it lay only in a few points, and that its electricity was collected from the air; which supposition was verified: for, getting a mould of Paris plaster made for the tourmalin, and heating it in the mould, fastened to a slip of glass, he always found the mould and glass possessed of an electricity contrary to that of the stone, and equally strong with it. During the time of cooling, the mould seemed to be sometimes more strongly negative than the stone was positive; for once, when the stone repelled the thread at the distance of three inches, the mould attracted it at the distance of near six (A).

4. On substituting another tourmalin instead of the piece of glass; it was observed, that when one of the tourmalins was heated, both of them were electrified as much as the tourmalin and glass had been. If the negative side of a hot tourmalin was laid upon the negative side of a cold one, the latter became positive, as would have been the case with a piece of glass. On heating both the tourmalins, though fastened together by cement, they acquired the same power that they would have done in the open air.

5. As the tourmalins could not in this case touch in a sufficient number of points, it was now thought proper to vary the experiment by cooling the tourmalin in contact with sealing-wax, which would fit it with the utmost exactness. On turning the stone, when cold, out of its waxen cell, it was found positive, and the wax negative; the electricity of the stone being thus contrary to what would have happened in the open air. The other side, which was not in contact with the wax, acquired the same electricity that it would have done though the stone had been heated in the open air; so that both sides now became positive. In like manner the positive side of the stone, on being cooled in wax, became negative.

6. On attempting to ascertain the state of the different sides of the tourmalin during the time it was heating in wax, many difficulties occurred. It was found impossible in these cases to know actually when the stone begins to cool; besides, that in this method of treatment it must necessarily be some time in the open air before it can be presented to the electrometor; and the electricity of the sides in heating is by no means so remarkable as in cooling. In the experiments made with the tourmalin, when its positive side was buried in wax, it was generally found negative, though once or twice it seemed to be positive. On cooling it in quicksilver contained in a china cup, it always came out positive, and left the quicksilver negative; but this effect could not be concluded to be the consequence of applying the one to the other, because it is almost impossible to touch quicksilver without some degree of friction, which never fails to make both sides strongly positive though it be quite cold, and especially if the stone be dipped deep into it. At last, supposing that the stone would not be apt to receive any friction by simple pressure against the palm of the hand, he was induced to make the experiment, and found it fully to answer his expectations; for thus, each side of the stone was affected in a manner directly contrary to what would have happened in the open air.

7. Fastening the convex side of the large tourmalin to the end of a stick of sealing-wax, and pressing it against the palm of the hand, it acquired a strong negative electricity, contrary to what would have happened in the open air. Thus it continued till it had acquired all the power it could receive by means of the heat of the hand; after which it began to decrease, though it continued sensibly negative to the very last. On allowing the stone to cool in the open air, its negative power constantly increased till it became quite cold.

8. On heating the same flat side by means of a hot poker held near it, and then just touching it with the palm of the hand when so hot that it could not be borne for any length of time, it became positive. Letting it cool in the air it became negative, and on touching it again with the hand it became positive; and thus it might be made alternately positive and negative for a considerable time. At last, when it became so cool that the hand could bear it, it acquired a strong positive electricity, which continued till it came to the same degree of heat.

9. The wax was removed from the convex, and fastened to the flat side of the stone; in which circumstances it became weakly positive after receiving all the heat the hand could give it. On letting it cool in the open air it grew more strongly positive, and continued so till it was quite cold; and thus the same side became positive both with heating and cooling.

10. On heating the convex side by means of a poker, and pressing it against the palm of the hand as soon as it could be borne, it became pretty strongly negative; though it is extremely difficult to procure any appearance

(A) This would probably have been found always the case; for here the stone and mould acted in a manner similar to the electrophorus and its metal plate; the latter of which always discovers a greater electric power than the former.

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ance of negative electricity from this side; and care must be taken that a slight attraction of the electrified feather, by a body not electrified, be not mistaken for negative electricity.

11. On covering the tourmalin when hot with oil and tallow, no new appearances were produced; nor did the heating of it in boiling oil produce any other effect than lessening the electricity a little; and the event was the same when the tourmalin was covered with cement made of bees-wax and turpentine. On making a small tourmalin very hot, and dropping melted sealing-wax upon it, so as to cover it all over to the thickness of a crown piece, it was found to act through this coating nearly, if not quite, as well as if it had been exposed to the open air. Thus a pretty deception may be made; for if a tourmalin be inclosed in a stick of wax, the latter will seem to have acquired the properties of the stone.

12. On letting the stone cool in the vacuum of an air-pump, its virtues seemed to be diminished about one half, owing no doubt to the vacuum not being sufficiently perfect.

13. On fixing a thin piece of glass opposite and parallel to the flat side of the tourmalin, and about a quarter of an inch distance from it, in an exhausted receiver, the glass was so slightly electrified, that it could not be distinguished whether it was positive or negative.

14. On laying the stone upon the standard bar of the pyrometer, and communicating the heat to it by means of a spirit lamp, it was extremely difficult to determine the nature of the electricity while the heat was increasing to 70°; during which time the index of the pyrometer moved about one 7200th part of an inch. But if the stone was taken off the bar, and an electrified thread or feather presented to that side which had lain next it, the convex side was always negative, and the flat one positive.

15. To determine what would be the effect of keeping the tourmalin in the very same degree of heat for a considerable time together, it was laid upon the middle of the bar, to which heat was communicated by two spirit lamps, one at each extremity; and making the index move 45 degrees, it was kept in the same degree for half an hour without the least sensible variation; and it was observed, that the upper side, which happened to be the convex one, was always electrified in a small degree, attracting a fine thread at the distance of about a quarter of an inch. If in that time it was taken off the bar, though ever so quick, and an electrified feather presented to it, the flat side, which lay upon the bar, was negative, and the upper side very slightly positive, which appeared only by its not attracting the feather. On putting a piece of glass between the stone and standard bar, keeping it likewise in the same degree of heat, and for the same space of time as before, the result was the same; the glass was slightly electrified, and of a kind opposite to that of the stone itself. To avoid the inconvenience of making one side of the stone hotter than another, which necessarily took place when it was heated on the pyrometer, the following method was used. By means of two rough places which happened to be in the stone, it was tied with a silk thread which touched only the extreme edge of it; and thus being perfectly insulated, it might be held at any distance from a candle, and heated to what degree was thought necessary; while, by twisting the string, it was made to present its sides alternately, and thus the heat was rendered very equal in both. After being made in this manner so hot that the hand could scarce bear it, it was kept in that situation for a quarter of an hour. Then, with a bundle of fine thread held for some time before in the same heat, the electricity which it had acquired by heating was taken off, and it was found to acquire very little if any; whence appeared the justness of an observation of Mr Canton's, that it is the change of heat, and not the degree of it, that produces the electric property of this stone.

Phenomena.

16. On heating the stone suddenly, it may sometimes be handled and pressed with the fingers several times before any change takes place in the electricity which it acquires by heating, though it begins to cool the moment it is removed from the fire. In this case, however, the stone must be heated only to a small degree. When the heat is three or four times as great as is sufficient to change the electricity of the two sides, the virtue of the stone is the strongest, and appears to be so when it is tried in the very neighbourhood of the fire. In the very centre of the fire the stone never fails to cover itself with ashes attracted to it from every quarter; whence it acquired its name in Dutch.

17. The tourmalin often changes its electricity very slowly; and that which it acquires in cooling never fails to remain many hours upon it with very little diminution. It is even possible, that in some cases the electricity acquired by heating may be so strong as to overpower that which is acquired by cooling; so that both sides may show the same power in the whole operation. "I am very certain (says the Doctor), that in my hands both the sides of Dr Heberden's large tourmalin have frequently been positive for several hours together, without any appearance of either of them having been negative at all. At this time I generally heated the tourmalin, by presenting each side alternately to a red hot poker, or a piece of hot glass, held at the distance of about half an inch, and sometimes I held it in the focus of a burning mirror; but I have since found the same appearance when I heated it in the middle of an iron hoop made red hot. The stone in all these cases was fastened by its edge to a stick of sealing-wax. This appearance I have observed to happen the oftenest when the iron hoop has been exceedingly hot, so that the outside of the stone must have been heated some time before the inside; and I also think there is the greatest chance of producing this appearance, when the convex side of the stone is made the hotter of the two. When I heat the large tourmalin in this manner I seldom fail to make both sides of the stone positive till it be about blood-warm. I then generally observe a ragged part of the flat side towards one end of the stone become negative first, and by degrees the rest of the flat side; but very often one part of the flat side will, in this method of treatment, be strongly positive half an hour after the other part is become negative."

Sect. V. *Of the different Theories of Electricity, with the principal Experiments brought in favour of each, and which tend more particularly to show the Nature of the Electric Fluid.*

It is not to be supposed, that the phenomena of elec-

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electricity would long be observed without attempts to account for them. In fact, this was attempted by Thales, who first observed the attractive power of amber. At this property he was so much surprised, that he reckoned the amber to be *animated*. With regard to the sentiments of Theophrastus on this subject, we are entirely in the dark; but, among the succeeding electricians, all the phenomena were derived from *unctuous effluvia* emitted by the excited electric. These were supposed to fasten upon all bodies in their way, and to carry back with them all that were not too heavy. For, at that time, effluvia of every kind were supposed to return to the bodies from which they were emitted; since nobody could otherwise account for the substance not being sensibly wasted by the constant emission. When these light bodies on which the unctuous effluvia had fastened were arrived at the excited electric, a fresh emission of the effluvia was supposed to carry them back again. But this effect of the effluvia was not thought of till electric repulsion, as well as attraction, had been fully observed.

55 Electric phenomena ascribed to unctuous effluvia.

The discovery of a difference between conducting and non-conducting substances, threw considerable difficulties in the way of those who maintained the hypothesis of unctuous effluvia. When the Newtonian philosophy began to be pretty generally received, the terms *attraction* and *repulsion* were quickly introduced into electricity, as well as other branches of philosophy; and the electric effluvia, instead of being of an *unctuous* nature, were said to be of an attractive or repulsive one. At the same time, the apparent stop which is put to the progress of these effluvia by any electric substance, introduced a question not yet well decided, viz. Whether electric bodies are penetrable by the fluid or not?

56 Two electric fluids supposed by Mr du Fay.

When Mr Du Fay discovered the two opposite species of electricity, at that time distinguished by the names of *vitreous* and *resinous*, and afterwards by those of *plus* and *minus*, or positive and negative, he formed the idea of two distinct electric fluids. Both these were supposed to have a *repulsive* power with respect to themselves, but an *attractive* one with regard to one another.

As long as electrical attraction and repulsion were the only phenomena to be accounted for, this theory served the purpose well enough. To account for attraction and repulsion by an *attractive* and *repulsive* power, was indeed no explication at all; but it afforded a change of terms, which is too frequently mistaken for an explanation both in electricity and other parts of philosophy.—At last, however, Mr Du Fay dropped his opinion concerning the existence of two electric fluids, and thought that all the phenomena might be accounted for from the action of a single one. The vitreous or positive electricity, which was supposed to be the stronger, he thought might attract the negative, or weaker electricity.—It is indeed true, that, in many experiments, the positive electricity doth manifest a superiority in strength over the negative, something like that superior degree of vigour which is observed in one of the poles of a loadstone over the other. According to Mr Du Fay's own principles, however, had this been the case, a body positively electrified ought to have attracted one electrified negatively more weakly than one not electrified at all; which is contrary to experience.

57 Electric matter discovered to come from the earth.

During all this time, it was imagined, that the electric matter, whether it consisted of one or more fluids, was produced from the electric body by friction; but by a discovery of Dr Watson's, it became universally believed, that the glass globes and tubes served only to set the fluid in motion, but by no means to produce it. He was led to this discovery by observing, that, upon rubbing the glass tube, while he was standing upon cakes of wax or rosin (in order, as he expected, to prevent any discharge of the electric matter upon the floor), the power was, contrary to his expectation, so much lessened, that no snapping could be observed upon another person's touching any part of his body; but that, if a person not electrified held his hand near the tube while it was rubbed, the snapping was very sensible. The event was the same when the globe was whirled in similar circumstances. For, if the man who turned the wheel, and who, together with the machine, was suspended upon silk, touched the floor with one foot, the electric fire appeared upon the conductor; but if he kept himself free from any communication with the floor, little or no fire was produced.—He observed, that only a spark or two would appear between his hand and the insulated machine, unless he at the same time formed a communication between the conductor and the floor; but that then there was a constant and copious flux of the electric matter observed between them. From these, and some other experiments of a similar kind, the Doctor discovered what he called the *complete circulation* of the electric matter. When he found, that, by cutting off the communication of the glass globe with the floor, all electric operations were stopped, he concluded, that the electric fluid was conveyed from the floor to the rubber, and from thence to the globe. For the same reason, seeing the rubber, or the man who had a communication with it, gave no sparks but when the conductor was connected with the floor, he as naturally concluded, that the globe was supplied from the conductor, as he had before concluded that it was supplied from the rubber. From all this he was at last led to form a new theory of electricity, namely, that, in electric operations, there was both an *afflux* of electric matter to the globe and the conductor, and likewise an *efflux* of the same electric matter from them. Finding that a piece of leaf-silver was suspended between a plate electrified by the conductor, and another communicating with the floor, he reasons from it in the following manner. "No body can be suspended in equilibrio but by the joint action of two different directions of power: so here the blast of electric ether from the floor setting through it, drives the silver towards the plate electrified. We find from hence, likewise, that the draught of electric ether from the floor is always in proportion to the quantity thrown by the globe over the gun-barrel (the prime conductor at that time made use of), or the equilibrium by which the silver is suspended could not be maintained." Some time after, however, the Doctor retracted this opinion concerning the afflux and efflux, and supposed that all the electric phenomena might be accounted for from the excess or diminution of the quantity of electric matter

58 Dr Watson's theory of afflux and efflux.

Theory. contained in different bodies. This theory was afterwards adopted by Dr Franklin, and continues to be generally received.

59 Difficulty concerning the direction of the electric fluid.

One great difficulty with which the first electricians were embarrassed (and which is yet scarcely removed), was to ascertain the direction of the fluid. At first, all electric powers, as we have already observed, were supposed to reside in the excited globe or glass tube. The electric spark therefore was imagined to proceed from the electrified body towards any conductor that was presented towards it. It was never imagined there could be any difference in this respect, whether it was amber, glass, sealing-wax, or any thing else that was excited. This progress of the electric matter was thought to be quite evident to the senses; and therefore the observation of electric appearances at an insulated rubber occasioned the greatest astonishment.—In this case, the current could not be supposed to flow both from the rubber and the conductor, and yet the first appearances were the same. To provide a supply of the electric matter, therefore, philosophers were obliged to suppose, that, notwithstanding appearances were in both cases much the same, the electric fluid was really emitted in one case by the electrified body, and received by it in the other. But now being obliged to give up the evidence from sight for the manner of its progress, they were at a loss, whether, in the usual method of electrifying by excited glass, the fluid proceeded from the rubber to the conductor, or from the conductor to the rubber. It was, however, soon found, that the electricity at the rubber was the reverse of that at the conductor, and in all respects the same with that which had before been produced by the friction of sealing-wax, sulphur, rosin, &c. Seeing, therefore, that both the electricities were produced at the same time, by one and the same electric, and by the same friction, all philosophers were naturally led to conclude, that both were modifications of one fluid; though in what manner that fluid was modified throughout the immense variety of elerectric phenomena, was a matter not easy to be determined.

60 Abbe Nollet's theory.

On this subject, the Abbe Nollet adopted the doctrine of *afflux* and *efflux* already mentioned. He supposed, that, in all electrical operations, the fluid is thrown into two opposite motions; that the afflux of this matter drives all light bodies before it by impulse upon the electrified body, and its efflux carries them back again. He was, however, very much embarrassed in accounting for facts where both these currents must be considered; as in the quick alternate attraction and repulsion of light bodies by an excited glass tube, or other excited electric. To obviate this difficulty, he supposes that every excited electric, and likewise every body to which electricity is communicated, has two orders of pores, one for the emission of the effluvia, and another for the reception of them. Mr de Tour improved upon Nollet's hypothesis, and supposed that there is a difference between the affluent and effluent current; and that the particles of the fluid are thrown into vibrations of different qualities, which makes one of these currents more copious than the other, according as sulphur or glass is used. It is impossible, however, that suppositions so very arbitrary could be at all satisfactory, or received as proper solutions of the electric phenomena.

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61 Different opinions concerning the nature of the electric fluid.

No less difficult was it for philosophers to determine the nature of the electric fluid, than its manner of acting. It had been in a manner generally believed, that *fire* was not a distinct element, but arose from some violent repulsions, refractions, &c. among the particles of ignited bodies. The great resemblance of the electric fluid to elementary fire, however, seemed strongly to militate against this opinion. The hypothesis therefore of fire as a distinct principle or element began to revive. Some maintained, that the electric fluid was really this principle; others thought that it was a fluid *sui generis*, very much resembling that of fire; while others, with Mr Boulanger at their head, imagined that it was nothing more than the finer parts of the atmosphere, which crowded upon the surfaces of electric bodies, when the grosser parts had been driven away by the friction of the rubber.

This last opinion, however, soon received a full refutation from the experiments of Dr Watson abovementioned; by which it was proved, that the electric matter came not from the atmosphere, but from the earth. About the same time the Leyden phial was discovered; and the extraordinary effects of it rendered the inquiries into the nature of the electric fluid much more general than before. But still, the violent prejudice against the existence of fire as a real element or fluid distinct from terrestrial bodies, continued in its full vigour, and the most extravagant theories were acquiesced in, rather than the simple position abovementioned. It would be tedious, and indeed impossible, to give an account of all the theories which were now invented. One of the most remarkable, and most consistent, was that of Mr Wilson. According to this gentleman, the chief agent in all the operations of electricity, is Sir Isaac Newton's ether; which is more or less dense in all bodies in proportion to the smallness of their pores, except that it is much denser in sulphureous and unctuous bodies. To this ether are ascribed the principal phenomena of attraction and repulsion: the light, the sulphureous or rather phosphoreal smell with which violent electricity is always attended, and other sensible qualities, are ascribed to the grosser particles of bodies driven from them by the forcible action of this ether. He also endeavours to explain many electrical phenomena by means of a subtle medium at the surface of all bodies; which is the cause of the refraction and reflection of the rays of light, and also resists the entrance and exit of this ether. This medium, he says, extends to a small distance from the body, and is of the same nature with what is called the *electric fluid*. On the surface of conductors this medium is rare, and easily admits the passage of the electric fluid; whereas, on the surface of electrics, it is dense and resists it. The same medium is rarefied by heat, which thus changes conductors into non-conductors. By far the greater number of philosophers, however, rejected the opinion of Mr Wilson; and as they neither chose to allow the electric fluid to be *fire* nor *ether*, they were obliged to own that it was a fluid *sui generis*, i. e. one of whose nature they were totally ignorant.

62 Mr Wilson's theory.

But while philosophers were thus embarrassed in their electrical theories, a vast number of interesting phenomena were discovered by the assiduity of a number of different electricians in different countries. Mr Winckler observed, that if glass was rubbed on the inside,

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side, it would show strong appearances of electricity on the outside; which seemed to favour the opinion of the permeability of glass to the electric matter. Other German electricians used several globes at a time, and imagined they found effects proportionable; tho' this has since been found a mistake.

63 **Great power of electricity excited by some philosophers.**

Such a prodigious force, however, could they excite by means of these globes whirled by a large wheel, and rubbed by the hand or with woollen cloth, that, according to their own accounts, blood could be drawn from a finger by means of the electric spark, the skin would burst, and a wound appear as if made by a caustic. If several globes or tubes were used, they said, that the motion of the heart and arteries would be very perceptibly increased in such as were electrified; and that, if a vein was opened in these circumstances, the blood issuing from it would appear like lucid phosphorus, and run out faster than when the person was not electrified. Mr P. Gordon, a Scots Benedictine monk, and professor of philosophy at Erfurd, increased the electric sparks to such a degree, that they were felt from a man's head to his foot, so that he could hardly take them without falling down with giddiness, and small birds were killed by them. This was effected by conveying the electricity with iron wires to the distance of 200 ells from the place of excitation. He also found that the sparks were stronger when the wires were thick than when they were small.

64 **Electric fluid found to act according to the largeness of electrified surface.**

While the power of electricity was thus tried, another question of great importance was likewise decided, namely, Whether electricity acted according to the largeness of the surface of bodies? This was found to be in proportion to the surface, and not the solid contents. The magnetic effluvia also were found not to interfere in the least with the electrical ones. An electrified loadstone attracted light bodies of all kinds by its electric virtue, at the same time that it attracted iron and steel by its peculiar magnetic virtue. The attractive virtue of electricity was also found to pervade glass so powerfully, that a thread was attracted through five exhausted receivers, and seemingly with more vigour than it would have been by the excited tube alone in the open air.

65 **Dr Franklin's theory.**

Such was the state of philosophical opinions concerning electricity, when Dr Franklin first invented his theory concerning positive and negative, or *plus* and *minus*, electricity. This had been already suggested by Dr Watson, but was not so fully explained by him as by Dr Franklin; on which account the latter is generally reckoned to be the sole inventor. According to this theory, all the operations in electricity depend upon one fluid *sui generis*, extremely subtile and elastic. Between the particles of this fluid there subsists a very strong repulsion with regard to each other, and as strong an attraction with regard to other matter. Thus, according to Dr Franklin's hypothesis, one quantity of electric matter will repel another quantity of the same, but will attract and be attracted by any terrestrial matter that happens to be near it. The pores of all bodies are supposed to be full of this subtile fluid; and when its equilibrium is not disturbed, that is, when there is in any body neither more nor less than its natural share, or than that quantity which it is capable of retaining by its own attraction, the fluid does not manifest itself to our senses. The action of the rubber upon an electric disturbs this equilibrium, occasioning a deficiency of the fluid in one place, and a redundancy of it in another. This equilibrium being forcibly disturbed, the mutual repulsion of the particles of the fluid is necessarily exerted to restore it. If two bodies be both of them overcharged, the electric atmospheres repel each other, and both the bodies recede from one another to places where the fluid is less dense. For as there is supposed to be a mutual attraction between all bodies and the electric fluid, such bodies as are electrified must go along with their atmospheres. If both the bodies are exhausted of their natural share of this fluid, they are both attracted by the denser fluid existing either in the atmosphere contiguous to them, or in other neighbouring bodies; which occasions them still to recede from one another as if they were overcharged.

66 **Difficulty concerning the reason why bodies negatively electrified repel one another.**

This is the Franklinian doctrine concerning the cause of electric attraction and repulsion; but it is evident, that the reason just now given why bodies negatively Electrified ought to repel one another, is by no means satisfactory. Dr Franklin himself had framed his hypothesis before he knew that bodies negatively electrified would repel one another; and when he came afterwards to learn it, he was surprised, and acknowledged that he could not satisfactorily account for it *.

67 **Different solutions of this difficulty.**

Other philosophers therefore invented different solutions of this difficulty, of which that abovementioned is one. But by some this was rejected. They said, that as the denser electric fluid, surrounding two bodies negatively electrified, acts equally on all sides of those bodies, it cannot occasion their repulsion. The repulsion, according to them, is owing rather to an accumulation of the electric on the surfaces of the two bodies; which accumulation is produced by the attraction, and the difficulty the fluid finds in entering them. This difficulty is supposed chiefly to be owing to the air on the surface of bodies, which Dr Priestley says is probably a little condensed there. This he deduces from an experiment of Mr Wilson, corrected by Mr Canton. The experiment was made in order to observe the course of the electric light through a Torricellian vacuum. A singular appearance of light was observed upon the surface of the quicksilver, at which the fluid was supposed to enter. Mr Wilson supposed that this was owing to a subtile medium spread over the surface of the quicksilver, and which prevented the easy entrance of the electric fluid. But this was afterwards discovered by Mr Canton to be owing to a small quantity of air which had been left in the tube. It is plain, however, that as the attraction is equal all round, and likewise the difficulty with which the fluid penetrates the air, bodies negatively electrified ought not to repel one another on this supposition more than the former. Nay, they ought to attract each other; because, in the place of contact, the resistance of the air would be taken off, and the electric fluid could come from all other quarters by the attraction of the bodies.

68 **Mr Cavallo's solution.**

Mr Cavallo, who seems to have undertaken the defence of this hypothesis in all cases, gives another reason why bodies negatively electrified should repel each other. In a chapter intitled, "A Compendious View of the principal properties of Electricity," among others he gives the following: "No electricity can be ob-

* *Franklin's Letters.*

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observed upon the surface of any electrified body, except that surface is contiguous to an electric, which electric can some how or other acquire a contrary electricity at a little distance. Otherwise :—No electricity can appear upon the surface of any electrified body, except that surface is opposite to another body which has actually acquired the contrary electricity, and these contrarily electrified bodies are separated by an electric. On considering this principle (adds he), it may be asked, Why an electricity can be observed upon the surface of an electrified body that is insulated at a considerable distance from other conductors? Or, Which is the electric that is contiguous to the surface of an electrified conductor or excited electric, and which has actually acquired a contrary electricity at a little distance from the said surface? To this question it is answered, that the air is, in general, the electric which is opposite to the surface of any electrified body; which, not being a perfect conductor, does easily acquire a contrary electricity on a stratum of its substance that is at a little distance from the electrified body; and, in consequence of this stratum, it acquires another stratum contrarily electrified, and at a little distance from the former: to this other strata succeed, alternately possessed of positive and negative electricities, and decreasing in power till they vanish. This assertion is easily proved by several experiments, particularly the following. If the end of a pretty long glass tube be presented to a body electrified, for instance, positively, the tube will be found electrified positively also for the space of one or two inches at that end; but beyond that space, will be found two or three inches electrified negatively: after that another positive electricity will appear; and so alternately, a positive and a negative zone will follow one another, always weaker and weaker in power, till at last they quite vanish. This shows, that, in general, when an electric sufficiently dense is presented to an electrified body, it acquires successive zones or strata of positive and negative electricity."

From this fact (which, with the utmost impropriety, he terms a *law* of electricity, whereas it is most evidently the *effect* of a law, and not the law itself), Mr Cavallo gives the following reason why bodies negatively electrified repel one another: "As to the repulsion existing between bodies possessed of the same electricity; in order to understand its explanation thoroughly, the reader must be reminded of the principle abovementioned, which is, that no electricity, *i. e.* the electric fluid proper to a body, can either be augmented or diminished upon the surface of that body, except the said surface is contiguous to an electric, which can acquire a contrary electricity at a little distance: from whence it follows, that no electricity can be displayed upon the facing surfaces of two bodies that are sufficiently near to one another, and both possessed of the same electricity; for the air that lies between those contiguous surfaces has no liberty of acquiring any contrary electricity. This being premised, the explanation of electric repulsion becomes very easy. Suppose, for instance, that two small bodies are freely suspended by insulated threads; so that, when they are not electrified, they may hang contiguous to one another. Now suppose these bodies to be electrified either positively or negatively, and then they must repel one another: for either the increased or the diminished natural quantity of electric fluid in these bodies will endeavour to diffuse itself equally over every part of the surfaces of these bodies; and this endeavour will cause the said bodies to recede from each other, so that a quantity of air may be interposed between their surfaces, sufficient to acquire a contrary electricity at a little distance from the said surfaces. Otherwise: If the bodies possessed of the same electricity do not repel each other, so that a sufficient quantity of air may be interposed between their surfaces, the increased quantity of electric fluid when the bodies are electrified positively, or the remnant of it when they are electrified negatively, by the above principle cannot be diffused equally throughout or over the surfaces of these bodies; for no electricity can appear upon the surfaces of bodies in contact, or that are very near each other. But the electric fluid, by attracting the particles of matter, endeavours to diffuse itself equally throughout or over the surfaces of these bodies; therefore the said bodies are, by this endeavour, forced to repel one another."

69 Insufficient.

This theory is evidently no solution of the difficulty; seeing it is only explainng one fact by another, which requires explanation at least as much as the first. But though this should be overlooked, it is still insufficient; for, granting that bodies negatively electrified ought to repel one another till the electricity is equally diffused along their surfaces, yet when this is accomplished, the repulsion ought to cease. Now, there is no occasion for supposing the bodies to be electrified while they are in contact, or nearly so. One may be electrified negatively in one corner of a room, and another in the other. The electrification may also be continued for any length of time we please, so that it is not possible to suppose but the electric matter must have diffused itself equally along the surfaces of both: yet, if we attempt to bring these bodies together, we shall find that they will repel each other very violently; which ought not to be the case, according to Mr Cavallo's supposition.

70 Dr Franklin's explanation of the phenomena of the Leyden phial.

What gave the greatest reputation to Dr Franklin's theory, however, is the easy solution which it affords of all the phenomena of the Leyden vial. The fluid is supposed to move with the greatest ease in bodies which are conductors, but with extreme difficulty in *electrics per se*; insomuch that glass is absolutely impermeable to it. It is moreover supposed, that all electrics, and particularly glass, on account of the smallness of their pores, do at all times contain an exceeding great, and always an equal quantity of this fluid; so that no more can be thrown into any one part of any electric substance, except the same quantity go out at another, and the gain be exactly equal to the loss. These things being previously supposed, the phenomena of charging and discharging a plate of glass admit of an easy solution. In the usual manner of electrifying by a smooth glass globe, all the electric matter is supplied by the rubber from all the bodies which communicate with it. If it be made to communicate with nothing but one of the coatings of a plate of glass, while the conductor communicates with the other, that side of the glass which communicates with the rubber must necessarily be exhausted in order to supply the conductor, which must convey the whole of it to the side

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side with which it communicates. By this operation, therefore, the electric fluid becomes almost entirely exhausted on one side of the plate, while it is as much accumulated on the other; and the discharge is made by the electric fluid rushing, as soon as an opportunity is given it by means of proper conductors, from the side which was overloaded to that which is exhausted.

It is not, however, necessary to this theory, that the very same individual particles of electric matter which were thrown upon one side of the plate, should make the whole circuit of the intervening conductors, especially in very great distances, so as actually to arrive at the exhausted side. It may be sufficient to suppose, that the additional quantity of fluid displaces and occupies the space of an equal portion of the natural quantity of fluid belonging to those conductors in the circuit which lay contiguous to the charged side of the glass. This displaced fluid may drive forwards an equal quantity of the same matter in the next conductor; and thus the progress may continue till the exhausted side of the glass is supplied by the fluid naturally existing in the conductors contiguous to it. In this case, the motion of the electric fluid, in an explosion, will rather resemble the vibration of the air in sounds, than a current of it in winds.

It will soon be acknowledged (says Dr Priestley), that while the substance of the glass is supposed to contain as much as it can possibly hold of the electric fluid, no part of it can be forced into one of the sides without obliging an equal quantity to quit the other side: but it may be thought a difficulty upon this hypothesis, that one of the sides of a glass plate cannot be exhausted, without the other receiving more than its natural share; particularly, as the particles of this fluid are supposed to be repulsive of one another. But it must be considered, that the attraction of the glass is sufficient to retain even the large quantity of electric fluid which is natural to it, against all attempts to withdraw it, unless that eager attraction can be satisfied by the admission of an equal quantity from some other quarter. When this opportunity of a supply is given, by connecting one of the coatings with the rubber, and the other with the conductor, the two attempts to introduce more of the fluids into one of the sides are made, in a manner, at the same instant. The action of the rubber tends to disturb the equilibrium of the fluid in the glass; and no sooner has a spark quitted one of the sides, to go to the rubber, than it is supplied by the conductor on the other; and the difficulty with which these additional particles move in the substance of the glass, effectually prevents its reaching the opposite exhausted side. It is not said, however, but that either side of the glass may give or receive a small quantity of the electric fluid, without altering the quantity on the opposite side. It is only a very considerable part of the charge that is meant, when one side is said to be filled while the other is exhausted.

It is a little remarkable, adds Dr Priestley, that the electric fluid, in this and in every other hypothesis, should so much resemble the ether of Sir Isaac Newton in some respects, and yet differ from it so essentially in others. The electric fluid is supposed to be, like ether, extremely subtile and elastic, that is, repulsive of itself; but instead of being, like the ether, repelled by all other matter, it is strongly attracted by it: so that, far from being, like the ether, rarer in the small than in the large pores of bodies, rarer within the bodies than at their surfaces, and rarer at their surfaces than at any distance from them; it must be denser in small than in large pores, denser within the substance of bodies than at their surfaces, and denser at their surfaces than at a distance from them.

71 Attraction and repulsion thro' glass accounted for.

To account for the attraction of light bodies, and other electrical appearances, in air of the same density with the common atmosphere, when glass (which is supposed to be impermeable to electricity) is interposed; it is conceived, that the addition or subtraction of the electric fluid, by the action of the excited electric on one side of the glass, occasions, as in the experiment of the Leyden phial, a subtraction or addition of the fluid on the opposite side. The state of the fluid, therefore, on the opposite side being altered, all light bodies within the sphere of its action must be affected in the very same manner as if the effluvia of the excited electric had actually penetrated the glass, according to the opinions of all electricians before Dr Franklin.

This hypothesis has been in some measure improved by Mr Æpinus, in a treatise intitled, "Tentamen Theoriæ Electricitatis & Magnetismi." He extends the property of impermeability to air, and all electrics, as well as glass. He supposes *impermeability* to consist in the great difficulty with which electric substances admit the fluid into their pores, and the slowness with which it moves in them. In consequence of this impermeability of air to the electric fluid, he denies the existence of electric atmospheres, and thinks that Dr Franklin's theory will do much better without them. He also imagines, that all the particles of matter are repulsive of one another: for that otherwise (since all substances have in them a certain quantity of the electric fluid, the particles of which repel one another and are attracted by all other matter), it could not happen, that bodies in their natural state with respect to electricity, should neither attract nor repel one another. He also introduces a number of mathematical calculations, the result of which (says Dr Priestley, with a great deal of probability) cannot be depended upon.

72 Principles on which Dr Franklin's theory depends.

The above is a full explanation of the theory of electricity at present most generally received. It depends on the following principles. 1. All terrestrial substances, as well as the atmosphere which surrounds the earth, are full of electric matter. 2. Glass, and other electric substances, though they contain a great deal of electric matter, are never the less *impermeable* by it. 3. This electric matter violently repels itself, and attracts all other matter. 4. By the excitation of an electric, the equilibrium of the fluid contained in it is broken: and one part of it is overloaded with electricity, while the other contains too little. 5. Conducting substances are permeable to the electric matter through their whole substance, and do not conduct it merely over their surface. 6. Positive electricity is when a body has too much of the electric fluid, and negative electricity when it has too little. Of these positions we shall now adduce those proofs drawn from different

different facts, which seem in the strongest manner to confirm them.

I. "All terrestrial substances, as well as the atmosphere which surrounds the earth, are filled with electric fluid."—Of this the proofs are very easy. There is no place of the earth or sea, where the electric fire may not be collected by making a communication between it and the rubber of an electric machine. Therefore considering that the whole earth is moist, that moisture is a conductor of electricity, and that every part of the earth must thus communicate with another, it is certain that the electric matter must diffuse itself as far as the moisture of the earth reaches; and this we may reasonably suppose to be to the very centre.

73 Proofs of atmospherical electricity.

With regard to the atmosphere, the case is equally clear. We have formerly mentioned in general, that Dr Franklin, and others, had collected electricity from the atmosphere in great quantity during the time of thunder-storms; but it is now found that it may be collected from the air at any time. The best instrument for this purpose is the electrical kite. Mr Cavallo, who hath made a great many experiments in atmospherical electricity, observes that the whole power of this machine lies in the string. A common school-boy's kite answers the purpose as well as any other. The best method of making the string is by twisting two threads of common twine with one of that copper-thread which is used for trimmings. When a kite constructed in this manner was raised, he says, he always observed the string to give signs of electricity, except once. The weather was warm, and the wind so weak, that the kite was raised with difficulty, and could hardly be kept up for a few minutes. Afterwards, however, when the wind increased, he obtained, as usual, a pretty strong positive electricity. Concerning the management of this kite he gives the following directions.

74 Mr Cavallo's directions concerning the electrical kite.

"In raising the kite, when the weather is very cloudy and rainy, in which time their is danger of meeting with a great quantity of electricity, I generally use to hang upon the string *AB* (Plate CLXXVII. fig. 78.) the hook of a chain *C*, the other extremity of which falls on the ground. Sometimes I use another caution besides, which is to stand upon an insulated stool; in which situation, I think, that if any quantity of electricity, suddenly discharged by the clouds, strikes the kite, it cannot much affect any person. As to insulated reels, and other such like instruments that some gentlemen have used to raise the kite without any danger of receiving a shock; fit for the purpose as they may appear in theory, they are yet very inconvenient to be managed. Except the kite be raised in the time of a thunder-storm, there is no great danger for the operator to receive any shock. Although I have raised my electrical kite hundreds of times without any caution whatever, I have very seldom received a few exceedingly slight shocks in my arms. In time of a thunder-storm, if the kite has not been raised before, I would not advise a person to raise it while the stormy clouds are just overhead; the danger at such a time being very great, even with the precautions abovementioned: at that time the electricity of the clouds may be observed, without raising the kite, by a cork-ball electrometer held in the hand in an open place, or, if it rains, by the electrometer for rain, to be described hereafter.

"By making use of this instrument, I am obliged to keep the kite up no longer than it is necessary to charge the phial, in order to observe the quality of the electricity in the atmosphere; for after the kite has been drawn in, and brought home, I can then examine the electricity of the inside of the phial, which is the same as that of the kite. When the electricity of the kite is very strong, I fix a chain communicating with the ground, at about six inches distance from the string, which may carry off its electricity in case this should increase so much as to put the by-standers in danger."

75 Great quantity of electricity brought down from a cloud.

With all his caution, however, it seems Mr Cavallo could not always avoid danger, even when there was no thunder; as appears from the following account. "October 18. 1775. After having rained a great deal in the morning and night before, the weather became a little clear in the afternoon, the clouds appearing separated, and pretty well defined. The wind was west, and rather strong, and the atmosphere in a temperate degree of heat. In these circumstances, at three P. M. I raised my electrical kite with 360 feet of string. After the end of the string had been insulated, and a leather ball covered with tin-foil had been hanged to it, I tried the power and quality of the electricity, which appeared to be positive and pretty strong. In a short time, a small cloud passing over, the electricity increased a little; but the cloud being gone, it decreased again to its former degree. The string of the kite was now fastened by the silk lace to a post in the yard of the house, and I was repeatedly charging two coated phials and giving shocks with them. While I was so doing the electricity, which was still positive, began to decrease, and in two or three minutes it became so weak that it could hardly be perceived with a very sensible cork-ball electrometer. Observing at the same time, that a large and black cloud was approaching the zenith (which, no doubt, caused the decrease of electricity), indicating imminent rain, I introduced the end of the string through a window in a first-floor room, wherein I fastened it by the silk lace to an old chair. The quadrant electrometer was set upon the same window, and was by means of a wire connected with the string of the kite. Being now three quarters after three o'clock, the electricity was absolutely imperceptible: however in about three minutes time it became again perceptible; but upon trial, was now found to be negative. It is therefore plain, that its stopping was nothing more than a change from positive to negative; which was evidently occasioned by the approach of the cloud, part of which by this time had reached the zenith of the kite, and the rain also had begun to fall in large drops. The cloud also came farther on; the rain increased; and the electricity keeping pace with it, the electrometer soon arrived at 15°. Seeing now that the electricity was pretty strong, I began again to charge the two coated phials, and to give shocks with them; but the phials had not been charged above three or four times, before I perceived that the index of the electrometer was arrived at 35°, and was keeping still increasing. The shocks being now very smart, I desisted from charging the phials any longer; and, considering the rapid advance of the electricity, thought to

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take off the insulation of the string, in case that, if it should increase farther, it might silently be conducted to the earth without causing any bad accident by being accumulated in the insulated string. To effect this, as I had no proper apparatus near me, I thought to remove the silk lace, and fasten the string itself to the chair. Accordingly I disengaged the wire that connected the electrometer with the string; laid hold of the string; untied it from the silk lace, and fastened it to the chair: but while I effected this, which took up less than half a minute of time, I received about 12 or 15 very strong shocks, which I felt all along my arms, in my breast, and legs; shaking me in such a manner, that I had hardly power enough to effect my purpose, and to warn the people in the rooom to keep their distance. As soon as I took my hands off the string, the electricity (in consequence of the chair being a bad conductor) began to snap between the string and the shutter of the window, which was the nearest body to it. The snappings, which were audible at a good distance out of the room, were at first isochronous with the shocks which I had received; but, in about a minutes time, oftener; so that the people of the house compared their sound to the rattling noise of a jack going when the fly is off. The cloud now was just over the kite; it was black, and well defined, almost of a circular form, its diameter appearing to be about 40°. The rain was copious, but not remarkably heavy. As the cloud was going off, the electrical snapping began to weaken, and in a short time became inaudible. I went then near the string, and finding the electricity weak, but still negative, I insulated it again, thinking to keep up the kite some time longer: but observing that another larger and denser cloud was approaching towards the zenith, and I had then no proper apparatus at hand to prevent every possible bad accident, resolved to pull the kite in: accordingly a gentleman who was by me began pulling it in, while I was winding up the string. The cloud was now very nearly over the kite; and the gentleman told me that he had received one or two slight shocks in his arms; and that if he was to receive another, he would certainly let the string go: upon which I laid hold of the string, and pulled the kite in as fast as I could without any farther observation; being then ten minutes after four o'clock.—N.B. There was neither thunder nor lightning perceived that day, nor indeed for some days before or after.

From his observations on the electricity of the atmosphere, Mr Cavallo deduces the following conclusions.

76 Conclusions drawn from the experiments.

"1. That there is in the atmosphere at all times a quantity of electricity; for whenever I use the abovementioned instrument, it always acquires some electricity.

"2. That the electricity of the atmosphere, or fogs, is always of the same kind, namely, positive; for the electrometer is always negative, except when it is evidently influenced by heavy clouds near the zenith.

"3. That, in general, the strongest electricity is observable in thick fogs, and also in frosty weather; and the weakest, when it is cloudy, warm, and very near raining: but it does not seem to be less by night than in the day.

"4. That in a more elevated place the electricity is stronger than in a lower one; for having tried the atmospherical electrometer both in the stone and iron gallery on the copula of St Paul's cathedral, I found that the balls diverged much more in the latter than in the former less elevated place. Hence it appears, that if this rule takes place at any distance from the earth, the electricity in the upper regions of the atmosphere must be excedingly strong."

The conclusions drawn from the experiments with the kites, are as follow.

"1. The air appears to be electrified at all times; its electricity is constantly positive, and much stronger in frosty than in warm weather; but it is by no means less in the night than in the day time.

"2. The presence of the clouds generally lessens the electricity of the kite; sometimes it has no effect upon it; and it is very seldom that it increases it a little." To this the abovementioned instance is a most remarkable exception.

"3. When it rains, the electricity of the kite is generally negative, and very seldom positive.

"4. The aurora borealis seems not to affect the electricity of the kite.

"5. The electric spark taken from the string of the kite, or from any insulated conductor connected with it, especially when it does not rain, is very seldom longer than a quarter of an inch; but it is exceedingly pungent. When the index of the electrometer is not higher than 20°, the person who takes the spark will feel the effect of it in his legs; it appearing more like the discharge of an electric jar than the spark taken from the prime conductor of an electrical machine.

"6. The electricity of the kite is generally stronger or weaker, according as the string is longer or shorter; but it does not keep any exact proportion to it. The electricity, for instance, brought down by a string of 100 yards, may raise the index of the electrometer to 20, when, with double that length of string, the index of the electrometer will not go higher than 25.

"7. When the weather is damp, and the electricity is pretty strong, the index of the electrometer, after taking a spark from the string, or presenting the knob of a coated phial to it, rises surprisingly quick to its usual place; but in dry and warm weather it rises exceedingly slow."

II. The second position requisite for establishing Dr Franklin's theory is, "That glass and other electric substances, though they contain a great deal of electric matter, are nevertheless *impermeable* by it." This assertion evidently has a contradictory appearance. It is very difficult, if not impossible, to conceive, that any substance can be full of a fluid, and yet impermeable by that fluid; especially when we continually talk of putting in an additional quantity into one side, and taking out of the other. Nay, what is still more extraordinary, the thinner the glass is, *i. e.* the *less* quantity of electric matter it can contain, the *more* we are able to put into it; for the thinner a glass is, the more easily does it receive a high charge.

77 Arguments for the impermeability of glass refuted.

The chief arguments for the impermeability of glass by the electric fluid are drawn from the phenomena of the Leyden phial. It is indeed very plain, that there is in that case an expulsion of fire from the outside at the

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the same time that it is thrown upon the inside. This appears from numberless experiments, but is most readily observable in the following. Let a coated phial be set upon an insulating stand, and the knob of another phial brought near the coating of the first. As soon then as the electric sparks are discharged from the prime conductor to the knob of the first bottle, an equal number will be observed to proceed from the coating of the first to the knob of the second. This is very remarkable, and an unphilosophical observer will scarce ever fail to conclude, that the fire runs directly through the substance of the glass. Dr Franklin, however, concludes that it does not, because there is found a very great accumulation of electricity on the inside of the glass, which discovers itself by a violent flash and explosion when a communication is made between the outside and inside coatings. But it must be observed, that there is here no other reason for concluding the glass to be impermeable, except that we *suppose* the electric matter to be *accumulated* on one side of the glass, and *deficient* on the other. If this supposition therefore cannot be proved, the evidence of sense, which is indeed very strong in favour of the permeability, must undoubtedly preponderate. It is said, indeed, that if the glass was permeable by the electric matter, a phial would be discharged immediately after being charged, or rather could never be charged at all; because the matter would no sooner be thrown upon one side than it would fly off from the other. This supposition, however, depends entirely upon the abovementioned one, namely, that in bodies *positively* electrified there is an *accumulation*, and in such as are *negatively* electrified there is a *deficiency* of fluid; which never can be proved.

Another argument against the permeability of glass and other electrics is, that coated phials, it is said, standing upon electric substances, cannot be charged. This, however, seems to very much exaggerated. A phial, though ever so perfectly insulated, will always receive a charge from a machine which acts very powerfully. Nay, it is certain, that though a phial is placed in such a manner, that both its knob and outside coating are in contact with the prime conductor, it will still receive a charge; much less indeed in this case than in any other, but still the shock will be perceptible.

In 1759, Mr Wilson read a paper before the Royal Society, in which the permeability of glass by the electric fluid was asserted. The experiments from which he deduced this conclusion were the following. He took a very large pane of glass, a little warmed; and holding it upright by one edge, while the opposite edge rested upon wax, he rubbed the middle part of the surface with his finger, and found both sides electrified *plus*. He accounted for this from the electrical fluid passing through the glass from his finger to the opposite side. But here Dr Priestley observes, that on Franklin's principles it ought to be so. If one side be rubbed by the finger, it acquires from it some electrical fluid. This being spread on the glass as far as the rubbing extended, repels an equal quantity of that contained in the other side of the glass, and drives it out on that side, where it stands as an atmosphere, so that both sides are found positively electrified. Mr Wilson also tried another experiment, which seemed more decisive than the former: Having by him a pane of glass, one side of which was rough and the other smooth, he rubbed it slightly on one side; upon doing which, both sides were electrified *minus*. This also Dr Priestley attempts to reconcile with Franklin's hypothesis. "As the electric fluid, contained in the glass (says he), is kept equal in both sides by the common repulsion; if the quantity in one side is diminished, the fluid in the other side, being less repelled, retires *inward*, and leaves that surface also *minus*." But here it is impossible to avoid observing, that Dr Priestley's own words, in the strongest manner militate against the doctrine he means to establish. The quantity of fluid in one side being diminished, that on the other, he says, *retires inward*. But into what does it retire? if into the substance of the glass, then the glass is undoubtedly permeable by it; and this is the very thing which Dr Priestley argues against.

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The electric fluid cannot be proved repulsive of itself.

III. "The electric matter violently repels itself, and attracts all other matter." The proofs of this position are chiefly derived from the following experiment, and others of a similar kind. Let a smooth piece of metal be insulated, and bring an excited glass tube near one end of it. A spark of positive electricity will be obtained from the other end; after which, if the tube is suddenly removed, the metal becomes electrified negatively. Here, then, it is said, is a plain repulsion of one part of the electric fluid by another. That contained in the tube repels the fluid contained in the nearest end of the metal; of consequence it is accumulated in the other end, and when the tube is removed, the metal is found to be deprived of part of its natural quantity of electricity, or is electrified negatively.—On such experiments as this, however, it is obvious to remark, that we ought first to prove that positive electricity consists in an *accumulation*, and negative electricity in a *deficiency*, of the electric fluid. But while this is only *supposed*, it is impossible that any proofs drawn from the supposition can be conclusive.

IV. "By the excitation of an electric, the equilibrium of the fluid contained in it is broken, and one part is overloaded with electricity, while the other contains too little." This position is entirely hypothetical. No electrician hath yet explained, in a satisfactory manner, how the fluid is procured by the excitation of glass or any other electric substance. Dr Priestley, instead of giving an explanation, proposes several queries concerning it. Mr Cavallo tells us, that the act of excitation *pumps* as it were the electric fluid from the rubber, and consequently from the earth. He adds 79

Beccaria's hypothesis concerning excitation.

"By what mechanism one body extracts the electric fluid from another, is not yet known. The celebrated Father Beccaria supposes, that the action of rubbing increaseth the capacity of the electric, *i. e.* renders that part of the electric which is actually under the rubber, capable of containing a greater quantity of electric fluid; hence it receives from the rubber an additional share of fluid, which is manifested upon the surface of the electric, when that surface is come out from the rubber; in which state it loses, or as it were, contracts its capacity. Signior Beccaria's experiment to prove this supposition is the following. He caused a glass plate to be rubbed by a rubber applied on one side of the plate, while it was turning vertically; and holding at the same time a linen thread on the other side of the plate

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plate just opposite to the rubber, he observed that the thread was not attracted by that part of the glass which corresponded to the rubber, but by that which was opposite to the surface of the glass that had just come out from the rubber; which shows, that the fluid acquired by the glass plate did not manifest its power until the surface of the glass was come out from the rubber." But from this experiment it seems impossible to draw any conclusion concerning the capacity of glass either one way or other. It is evident, therefore, that whatever parts of Dr Franklin's hypothesis rest on this supposition concerning excitation, are entirely void of evidence.

80 Whether the electric fluid pervades the substance of conductors.

V. "Conducting bodies are permeable by the electric fluid through the whole of their substance, and do "not conduct it merely over their surface." The proof most commonly adduced in favour of this position, is the following experiment. Take a wire of any kind of metal, and cover part of it with some electric substance, as rosin, sealing-wax, &c. then discharge a jar through it, and it will be found that it conducts as well with as without the electric coating. This, says Mr Cavallo, proves that the electric matter passes through the substance of the metal, and not over its surface. A wire, adds he, continued through a vacuum, is also a convincing proof of the truth of this assertion. Even here, however, the proof, if impartially considered, will be found very defective. It is a fact agreed upon by all philosophers, that bodies which to us are apparently in contact, do nevertheless require a very considerable degree of force to make them actually touch one another. Dr Priestley found that a weight of six pounds was necessary to press 20 shillings into close contact, when lying upon one another on a table. A much greater weight was necessary to bring the links of a chain into contact with each other. It cannot be at all incredible, therefore, that a wire, though covered with sealing-wax or rosin, should still remain at some little distance from the substance which covers it. The following experiments of Dr Priestley also seem to be much in favour of the supposition that the electric fluid passes chiefly over the surface of conducting substances.

"From the very first use of my battery (says he), I had observed a very black smoke or dust to arise on every discharge, even when no wire was melted; and the brass chain I made use of was of a considerable thickness. I observed that a piece of white paper, on which lay the chain I was using to make the discharge, was marked with a black stain, as if it had been burnt, wherever it had touched it. I neglected the experiment, till, some time after, observing a very striking appearance of the same kind, I was determined to attend to the circumstances of it a little more particularly. I made my chain very clean, and wrapping it in white paper, I made a discharge of about 40 square feet through it, and found the stain wherever it had touched the paper. Some time after I wrapped the paper, in the same manner, round a piece of brass wire; but, making a discharge through it, saw no stain. To ascertain whether this appearance depended upon the discontinuity of the metallic circuit, I stretched the chain with a considerable weight, and found the paper on which it lay, as the shock passed through it, hardly marked at all. Finding that it depended upon the discontinuity, I laid the chain upon white paper, making each extremity fast with pins stuck through the links; and when I had made the discharge, observed that the black stains were directly opposite to the body of the wire that formed the chain, and not to the intervals, as I had sometimes suspected. A chain five feet four inches long, which weighed one ounce seventeen penny-weights four grains, lost exactly half a grain after each discharge.

81 A chain shortened by the electric shock.

"In making the mark abovementioned, I once happened to lay the chain so as to make it return at a sharp angle, in order to impress the form of a letter upon the paper; and observed, that on the discharge, the part of the chain that had been doubled was displaced, and pulled about two inches towards the rest of the chain. At this I was surprised, as I thought it lay so, that it could not slide by its own weight. Upon this I repeated the experiment with more accuracy. I stretched the whole chain along a table, laying it double all the way, and making it return by a very sharp angle. The consequence always was, that the chain was shortened about two inches, and sometimes more, as if a sudden pull had been given to it by both the ends. Suspecting that the black smoke which rose at every discharge, might come, not from the chain, but from the paper, or the table on which it lay, and which was probably burnt by the contact of it, I let the chain hang freely in the air; but, upon making the discharge, I observed the same gross black smoke that had before risen from the paper or the table. Fig. 76. represents the spots made upon the paper by a chain laid over it. The breadth of the spots is about the mean thickness of the wire of the chain, and *a b* marks the place to which that part of the chain which returned was thrown back by the discharge. Plate CLXXVII.

"Being willing to try what would be the effect of laying the chain in contact with non-conductors, I dipped it in melted rosin till it had got a coating of considerable thickness. When it was quite stiff, I laid it carefully, without bending, upon white paper, and made the discharge through it. The rosin was instantly dispersed from all the outside of the chain, it being left as clean as if none had ever been put on. That with which the holes in the chain had been filled having been impelled in almost all directions, was beaten to powder; which, however, hung together but was perfectly opaque; whereas it had been quite transparent before this stroke. I next laid the chain upon a piece of glass, which was marked in the most beautiful manner wherever the chain had touched it; every spot the width and colour of the link. The metal might be scraped off the glass at the outside of the marks; but in the middle part it was forced within the pores of the glass. On the outside of this metallic tinge was the black dust, which was easily wiped off.

From these experiments it would seem, that the electrical flash had passed over the surface of the chain rather than through its substance; seeing it threw off the rosin with such extreme violence. The same thing appears from the manner in which electricity generally acts, which is not according to the solid contents of any substance, but according to the dimensions of its sur-

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surface. It is not to be doubted, however, but that, where a great quantity of electric matter is made to pass along a very small wire, it will enter the substance of the metal. This appears from the possibility of melting wires by the force of electric batteries, and even totally dissipating them into small globules. To accomplish this, it is only necessary to connect the hook communicating with the outside coating of a battery, containing at least 30 square feet of coated surface, with a wire that is about one-fiftieth part of an inch thick and about two feet long. The other end of it must be fastened to one end of the discharging rod: this done, charge the battery; and then by bringing the discharging rod near its wires, send the explosion through the small wire, which by this means will be made red hot and melted, so as to fall upon the floor in different glowing pieces. When a wire is melted in this manner, sparks are frequently seen at a considerable distance from it, which are red hot particles of the metal, that, by the violence of the explosion, are scattered in all directions. If the force of the battery is very great, the wire will be entirely dispersed by the explosion, so that none of it can be afterwards found. If it is required to melt such particles as cannot easily be drawn into wires, ores, for instance, or grain-gold, they may be set in a train upon a piece of wax: they are then to be put into the circuit, and an explosion sent through them, which, if sufficiently strong will melt them as well as the wires. If a wire is stretched by weights, and a shock is sent through it which renders it just red hot, the wire, after the explosion, is found to be considerably lengthened.

82 Dr Franklin's hypothesis concerning positive and negative electricity cannot be proved.

VI. The last position on which Dr Franklin's theory depends, and which indeed may be called the foundation of the whole, is, "That positive electricity is "an accumulation, or too great a quantity, of elec"tric matter contained in a body; and negative elec"tricity is when there is too little." Of this, however, there is not one solid proof; and all attempts that have hitherto been made to prove it, are only arguing in a circle, or proving the thing by itself. Thus, for instance, a body electrified positively, attracts one that is electrified negatively; because the first has too much, and the other too little, electric matter. But how do we know that one has too much, and the other too little, electricity? Because they attract each other. Again it has been proved, that when a phial is electrified positively, their is as constant a stream of fire from the outside coating, as there is from the conductor to the inside coating. Therefore, it is said, the outside of the glass has too little, and the inside too much, electricity. But how is this known to be the case? Because glass is impermeable by the electric fluid. And how is glass known to be impermeable? because, in the above experiment, one side has too much, and the other too little, electricity. Thus in every instance, the arguments for Dr Franklin's hypothesis return into themselves, and no conclusion can be drawn from them. In the subsequent section, the nature of the electric fluid is particularly considered, where the improbability of its ever being accumulated in the substance of solid bodies will more plainly appear.

Sect. VI. *An Inquiry into the Nature of the Electric Fluid; with an attempt to explain the principal Phenomena of Electricity, from the known Laws by which other Fluids are observed to act upon one another.*

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In making this inquiry, or indeed any other, it is proper to take for granted as little as possible. No position should be assumed as the basis of any reasoning whatever, except what has been proved by incontestable facts. In the present case, therefore, it is sufficient to assume as a fact what hath been already proved by innumerable experiments, namely, That the air, the earth, and sea, all contain great quantities of electric fluid. The question which most naturally suggests itself when this is once admitted, is, Whence hath the electric fluid come? is it essentially inherent in these bodies, or hath it come from without? This cannot be resolved, without considering the nature of the fluid itself, and whether it is analogous to any other which is more generally known.

§ 1. *Proofs of the Identity of the Electric and Elementary Fire or Light of the Sun.*

The similarity between the electric matter and fire, naturally suggested to the first observers, that it was no other than elementary fire, which pervaded all substances, as we have already mentioned. This, however, was objected to; and the principal objection was, that though the electric matter emitted light, and had the appearance of fire, it nevertheless wanted its most essential quality, namely, *burning*. In particular, the blast which comes from an electrified point, feels cold instead of being hot; and where great quantities of the fluid are forced with violence through certain substances, and thus set them on fire, it was thought that the fire might be occasioned by the internal commotion excited among their small particles. This objection, however, seems now to be totally removed. The dispute concerning the preferable utility of pointed or knobbed conductors for securing buildings from lightning, occasioned the fitting up of a more magnificent apparatus than had ever appeared before. An immense conductor was constructed at the expence of the board of ordnance, and suspended in the *Pantheon*. It consisted of a great number of drums covered with tinfoil, which formed a cylinder of about 155 feet in length, and more than 16 inches in diameter; and to this vast conductor were occasionally added 4800 yards of wire. The electric blast from this machine fired gun-powder in the most unfavourable circumstances that can be imagined, namely, when it was drawn off by a sharp point, in which case it has generally less force than in any other. The method of doing this was as follows. Upon a staff of baked wood a stem of brass was fixed, which terminated in an iron point at the top. This point was put into the end of a small tube of Indian paper, made somewhat in form of a cartridge, about an inch and a quarter long, and two-tenths of an inch in diameter. When the cartridge was filled with common gun-powder, unbruised, a wire communicating with the earth was then fastened to the bottom of the brass stem. The charge in the great cylinder being continually kept up by the motion of the wheel, the top of the cartridge was brought very

83 Gun-powder fired by the elctric blast.

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very near the drums, so that it frequently even touched the tin-foil with which they were covered. In this situation a small faint luminous stream was frepuently observed between the top of the cartridge and the metal. Sometimes this stream would set fire to the gun-powder the moment it was applied; at others, it would require half a minute or more before it took effect. But this difference in time was supposed to be owing to some small degree of moisture in the powder or the paper, which was always unfavourable to the experiment. Tinder was fired much more readily.

As it therefore appears, that the electric fluid, when it moves through bodies either with great rapidity, or in very great quantity, will set them on fire, it seems scarce disputable, that this fluid is the same with the element of fire. For further proofs of this opinion, which is now adopted by some very eminent philosophers, see the articles FIRE and HEAT. See also CHEMISTRY-*Index*. This being once admitted, the source from whence the electric fluid is derived into the earth and atmosphere, must be exceedingly evident, being no other than the sun, or source of light itself. The vast quantity of light which continually comes from him to the earth must of necessity be absorbed by that opaque body, at least in great part. It is impossible it can remain there, because there is a perpetual succession of new quantities coming from the sun. It must be observed, however, that as this fluid receives a great number of different directions after once it enters the earth, it cannot appear in its natural form of fire or light, till it receives a new motion similar to what it had when proceeding from the sun.

84 Action of the electric matter and light compared.

The solar light only burns, or produces heat, when diverging from a centre, or converging towards one. The heat is always greatest at the central point; and even there, no heat is produced except where the light passes through a resisting medium. In those cases likewise the electric fluid burns. When discharged with violence from an electrified bottle, it flies out on all sides, and then will fire gun-powder, or other combustible substances. The same thing it will do when converging towards a point, if in sufficient quantity, as was observed in the experiment with the large conductor abovementioned. But when the electric fluid neither meets with any considerable resistance, diverges from a centre, nor converges towards one, it is almost always invisible, and without heat. A most remarkable proof of this we have, even when a vast quantity of electric matter is forced to go through a very small wire. Dr Priestley tells us he had once an opportunity of observing what part of the conductors which form an electric circuit are most affected by the explosion. Upon discharging a battery of 51 square feet thro' an iron wire nine inches long, the whole of it was glowing hot, and continued so for some seconds. The middle part grew cool first, while both the extremities were sensibly red. When the wire was afterwards examined, both the extremities were found quite melted; an inch or two of the part next to them was extremely brittle, and crumbled into small pieces on being handled; while the middle part remained pretty firm, but had quite lost its polish, so that it looked darker than before. This is precisely what would have happened, had both ends been put into a common fire. We are very sure, that the same quantity of electric matter passed through the middle of the wire, that entered one end of it and went out at the other. Why then did it not produce the same degree of heat in the middle that it did at each end? The reason is plain: At one end it was in a state of *convergence* from the battery to the point of the wire; at the other, it was in a state of *divergence* from the point of the wire to the battery. At the points, therefore, an intense heat was produced; but in the middle, where the fluid neither converged nor diverged, but moved forwards in a parallel direction, the heat was much less. Now we know that this is the case with the solar light itself. At the focus of a burning-glass there is an intense heat both where the convergence ends and the divergence begins. But where this divergence considerably ceases, and the motion of the light becomes more parallel, the heat is vastly diminished. The case is the same with a common fire, and with all burning bodies; for heat never acts but from a centre, and is always greatest at the central point. It is true, that we can never produce electric fire without at the same time producing a violent shock exceedingly different from the *burning* of common fire. But the reason of this is, that we cannot produce a divergence in a stream of electric matter, without at the same time giving it such a motion in some other direction, that its impetus becomes very perceptible. If it was in our power to make the flash produced by an electric bottle keep its place, we cannot suppose that any shock, or other sensation than heat, would be felt. But there is no possibility of hindering it from flying with prodigious celerity from one side of the bottle to the other. Therefore, as it is neither in a state of divergence nor convergence, except where it comes out from and enters into the bottle, no sensation is perceived except what arises from its change of place; and hence it is said, that the electric matter hath no heat.

§ 2. *The Identity of Electric Matter and Light farther considered; with some positive Proofs, that Electric Substances are actually penetrated by the Electric Fluid.*

THE only objection of any strength which can arise to the identity of the electric fluid and light is, the surprising ease with which the latter penetrates glass, and the seeming stop which is put to the motions of the former when a piece of glass or any other electric substance is presented to it. Here, however, it must be observed, that light, as proceeding from a luminous body, must be regulated by very different laws from light which is absorbed by opaque bodies, and consequently subjected to motions quite different from what it originally had. Water, the only fluid with which we are very well acquainted (tho' all others we know seem to be regulated by the same laws), is capable of two very different motions. The one is a rectilinear one, by which great quantities of it run from one place to another. The other is not so easily explained. It may, however, be very readily observed, by throwing a small stone into a pool of water. A great number of concentric circles will be propagated from the place where the stone fell, as from a centre, which will gradually grow larger and larger. If another stone is thrown in at some distance, similar circles will proceed from the place where it fell. These will meet with the former,

85 Objection concerning the impenetrability of glass answered.

and

and cross them without interfering with each other in the least. It is certain, however, that two streams of water rushing opposite to one another, would shatter and destroy each other. If, therefore, there is a difference in the motion of the electric fluid when it burns, and when it does not (which there certainly is), we may easily suppose it possible, that glass should obstruct one kind of motion and not another: It which case, the glass would seem to be permeable by the fluid when manifesting itself by the first kind of motion, and not so when it manifests itself by the other.

86 Surprising experiments concerning the transparency of bodies.

It hath commonly been thought, that the transparency of bodies depends upon the rectilinear direction of their pores, and opacity upon the situation of them in some other direction. Electrical experiments, however, have shown that this is not the case. Sealing-wax and pitch are as opaque bodies as we are acquainted with; yet in Mr Hauksbee's experiments, mentioned n° 4. these substances were both rendered transparent by the action of the electric fluid. These experiments are confirmed by some others still more surprising, mentioned by Dr Priestley. See also below Sect. VIII. One was made by S. Beccaria. He discharged an electric shock through some brass dust sprinkled between two plates of sealing-wax. The whole was perfectly luminous and transparent. The most extraordinary experiment, however, was made by Dr Priestley himself, of which he gives the following account. "I laid a chain in contact with the outside of a jar lightly on my finger, and sometimes kept it at a small distance by means of a thin piece of glass; and, if I made the discharge at the distance of about three inches, the electric fire was visible on the surface of the finger, giving it a sudden concussion, which seemed to make it vibrate to the very bone; and when it happened to pass on that side of the finger which was opposite to the eye, the whole seemed perfectly *transparent* in the dark."

87 Consequences from them.

Experiments of this kind, though they have not hitherto been much pursued by electricians, seem to be more worthy of notice than almost all others. One consequence which may be derived from them is, that there is in bodies, whether electric or non-electric, a certain subtile medium, on the motion of which transparency depends. That is, when the medium is at rest, the body is opaque; but when set in motion, it becomes transparent. This motion, we see, may be given in two different ways. One is by simple electrification *in vacuo*, according to Mr Haukbee's experiments. The other is, by sending the flash of an electrified bottle over their surface. In Dr Priestley's experiment, he could determine the motion to be of the vibratory kind; and hence we may easily conclude, that some bodies may be constructed in such a manner, that they are capable of transmitting the vibrations of this fluid, but not any other kind of motion. Such kinds of bodies will be naturally transparent: but others, whose particles are disposed in such a manner, that the vibrations cannot be propagated thro' them without considerable violence, are naturally opaque. The question then only is, What is this subtile medium, the vibrations of which occasion transparency? It is scarce possible to answer this question in another manner than by saying, that it is the electric fluid. That it is this fluid which gives the power to electric substances, has never been denied. That the motion of this fluid along the surfaces of bodies throws another fluid within them into vibrations, is also evident from the experiments abovementioned. All bodies are confessed to have much of this fluid in their pores: therefore, if a quantity of the same matter passes over the surface of any body, it must affect what is within its substance with a motion of some kind or other; because it affects that which lies on the outside, and this cannot fail to affect all the rest. This motion Dr Priestley's experiment determines to be of the vibratory or tremulous kind; and, indeed, it is natural to think it should be so. The vibrations of the electrical fluid, therefore, conduct light through opaque bodies. But whatever fluid is conducted by the vibration of another, must itself also vibrate while it is so conducted. Light, therefore, vibrates when emitted from luminous bodies. In the present case, these vibrations are originally occasioned by the electric flash. They are conducted thro' opaque bodies by the vibrations of the electric fluid. The air is also full of the same fluid. The air is naturally transparent; but we have seen that transparency consists only in the easy transmission of a vibratory motion of the electric fluid. The light, therefore, is perpetually conducted by means of the vibrations of this fluid: therefore, the vibrations of the electric fluid and light are the same; for no two fluids are always capable of setting one another in motion precisely in the same manner, unless their nature is in all respects exactly the same.

88 Light proved to be a vibration of the electric fluid.

These experiments seem in the strongest manner to prove the identity of the electric fluid and light, and that both are transmitted through electric as well as other substances. The reason, therefore, of the seeming stop, which is observed in our electrical operations by the intervention of glass, is, that in all artificial electricity, the fluid has a very considerable progressive motion, which cannot be easily propagated through the solid substance of any body, especially where there is a pretty strong resistance on the other side; which shall afterwards be shown to be the case with this fluid when passing through electric substances.

§ 3. *Of the Passage of the Electric Fluid over the Surface, and through the Substance, of different Bodies.*

89 Dr Priestley's experiments with ice.

Dr Priestley hath made many very curious experiments concerning the discharging of electric shocks over the surface of different bodies; and finds, that by this means a battery may be made to discharge itself at a much greater distance than it would do if sent directly through the air. The experiments were begun with ice, and he first accidentally discovered, that, when the shock of a common jar was discharged on a plate of ice, it would sometimes run over the surface and strike the chain directly on the other side. With a single jar, however, the distance was not much greater than what it would have passed over in the usual way; but, with a battery, it exceeded the usual distance in a very great degree.

90 With raw flesh;

Endeavouring to make a circular spot, such as he had formerly made on metals, upon a piece of raw flesh, he took a leg of mutton, and laying the chain that communicated with the outside of the battery over the shank, he took the explosion on the outward membrane, about seven inches from the chain but was greatly surprised to observe the electric fire not

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to enter the flesh, but to pass in a body along the surface of it to come to the chain. Thinking that this might be occasioned by the fatty membrane on which the explosion was made, he again laid the chain in the same manner over the shank, and took the explosion upon the muscular fibres, where they had been cut off from the rest of the body; but still the fire avoided entering the flesh, made a circuit of near an inch round the edge of the joint, and passed along the surface to come to the chain as before, though the distance was near 11 inches. Imagining that this effect was promoted by the chain lying lightly on the surface of the flesh, and therefore not actually in contact with it, he took another explosion upon the hook of the chain, which was thrust into the flesh. On this the fire entered the mutton; and as he held it in his hands, both his arms were violently shocked up to his shoulders.

91 With water;

The Doctor next determined to try the effect of different conducting substances in the same manner; and of these water was the most obvious. "Next day, (says he) I laid a brass rod communicating with the outside of the battery, very near the surface of a quantity of water (to resemble the chain lying upon the surface of the flesh, without being in contact with it), and, by means of another rod furnished with knobs, made a discharge on the surface of the water, at the distance of several inches from any part of the rod; when the electric fire struck down to the water, and, without entering it, passed visibly over its surface till it arrived at that part of the rod which was nearest the water, and the explosion was exceedingly loud. If the distance at which I made the discharge exceeded seven or eight inches, the electric fire entered the water, making a beautiful star upon its surface, and yielding a very dull sound. When I first made this experiment of the electric flash passing over the surface of water, I thought it necessary, that neither the piece of metal communicating with the outside, nor that communicating with the inside, of the jars, should touch the water immediately before the discharge. But I afterwards found, that the experiment would answer, tho' either, or even both of them, were dipped in the water: for, in this case, the explosion would still prefer the surface to the water itself, if the distance was not very great; and would even pass at a greater distance along the surface, when there was a nearer passage from one rod to the other in the water."

92 With many other bodies.

He afterwards tried to pass the electric flash over the surfaces of a great number of different bodies, but found it impossible with many of them. He therefore imagined that this property of conducting a shock over its surface was peculiar to water and raw flesh. It was found, however, that the flash passed over the surface of a touch-stone, and likewise over a piece of the best kind of iron ore, exceedingly smooth on some of its sides. The piece was about an inch thick, and three inches in its other dimensions. The full charge of a jar of three square feet would not enter it. The explosion passed over the surface of oil of vitriol, with a dull sound and a red colour; but in all other cases, if it passed at all, it was in a bright flame, and with a report peculiarly loud. It passed over the surface of the most highly rectified spirit of wine without firing it; but when too great a distance was taken, the electric fire entered the spirit, and the whole was in a blaze in a moment.

This was the case when such substances were employed as are but indifferent conductors of electricity; raw flesh for instance, water, &c. When good conductors were used, such as charcoal of different kinds, no remarkable appearances were produced. So far was the shock from passing visibly over the surface of any metal, that, if the distance through the air, in order to a passage through the metal, was ever so little nearer than the distance between the two surfaces, it never failed to enter the metal; so that its entering the surface of the metal, and coming out again, seemed to be made without obstruction. If as much water was laid on a smooth piece of brass as could lie upon it, it would not go over the surface of the water, but always struck thro' the water into the metal. But if the metal lay at any considerable depth under the water, it would prefer the surface. It even passed over three or four inches of the surface of water as it was boiling in a brass pot, amidst the steam and bubbles, which seemed to be no hindrance to it. Animal fluids, however, of all kinds, seemed peculiarly to favour this passage of the electric matter over their surface; and the report of these explosions was manifestly louder than when water was used. In all cases of this kind, the report was considerably louder than when the discharge was made in the common way. The explosions were observed by persons out of the house, and in a neighbouring house, very much to resemble the smart cracking of a whip. "But (says Dr Priestley) the sound made by these explosions, though by far the loudest that ever I heard of the kind, fell much short of the report made by a single jar, of no very great size, of Mr Rackstrow's, who says, that it was as loud as that of a pistol." He also observes, that when the electrical explosion does not pass over the surface of the water, but enters it, a regular star is made upon the surface, consisting of ten or a dozen rays; and what is very remarkable, those rays which stretch towards the brass rod that communicates with the outside of the battery are always longer than the rest; and if the explosion is made at such a distance as to be very near taking the surface, those rays will be four or five times longer than the rest, and a line bounding the whole appearance will be an ellipsis, one of whose foci is perpendicularly under the brass knob with which the discharge is made.

93 Circular spots produced by electrical explosions.

When an electric battery is discharged upon smooth pieces of metal, the effects are very different from any of those we have yet mentioned. Dr Priestley having constructed some large batteries, determined to try what would be the effects of a very great electric power discharged upon metals and other substances; and, in the course of his random experiments, he made the following discoveries. "June 13. 1766 (says he), after having discharged a battery of about 40 square feet with a smooth brass knob, I accidentally observed upon it a pretty large circular spot, the centre of which seemed to be superficially melted, in a great number of dots; larger near the centre, and smaller at a distance from it. Beyond this spot was a circle of black dust which was easily wiped off: but what I was most struck with was, that after an interruption of melted places, there was an entire and exact circle of shining dots, consisting of places superficially melted like those at the

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the centre. The appearance of the whole, exclusive of the black dust, is represented Plate CLXXVII. fig. 75. n° 1.

"June 14th, I took the spot upon smooth pieces of lead and silver. It was in both cases like that on the brass knob; only the central spot on the silver consisted of dots disposed with the utmost exactness, like radii from the centre of a circle, each of which terminated a little short of the external circle. I took the circular spot upon polished pieces of several metals with the charge of the same battery, and observed that the cavities in some of them were deeper than in others; as I thought in the following order, beginning with the deepest, tin, lead, brass, gold, steel, iron, copper, silver. I will not be positive as to the order of some of the metals, but silver was evidently not affected a fourth part so much as gold, and much less than any of the others. The circles were marked as plain, but the impression was more superficial.

"I also made the explosion between a piece of lead just solid after melting, and another smooth piece that I had kept a considerable time. The piece of fresh lead was melted more than the other, but there was no other difference between them. The semimetals, as bismuth and zinc, received the same impression as the proper metals; being melted nearly as much as iron. I made three discharges between a piece of highly polished steel and a piece of very smooth iron, and in all cases thought the steel was more deeply melted than the iron.

"Presently after I had observed the single circle, I imagined, that, whatever was the cause of the appearance, it was not improbable but that two or more concentric circles might be procured, if a greater quantity of coated glass was used, or perhaps if the explosion was received upon metals that were more easily fused than brass. Accordingly, June 27, taking the moderate charge of a battery, consisting of about 38 square feet, upon a piece of tin, I first observed a second outer circle, at the same distance from the first, as the first was from the central spot. It consisted of very fine points hardly visible, except when held in an advantageous light; but the appearance of the whole was very beautiful, and was such as is represented Plate CLXXVII. fig. 75. n° 2.

"Having hitherto found the circles the most distinct on metals that melt with the least degree of heat, I soon after procured a piece of that composition which melts in boiling water; and having charged 60 square feet of coated glass, I received the explosion with it, and found three concentric circles; the outermost of which was not quite so far from the next to it, as that was from the innermost. All the space within the first circle was melted; but the space was very well defined, and by no means like a central spot, which in this case was quite obliterated. The appearance of these three concentric circles is represented Plate CLXXVII. fig. 75. n° 3. The distance at which the discharge was made occasioned no difference in the diameter of these circular spots. When, by putting a drop of water upon the brass rod communicating with the inside of the battery, I made the discharge at the distance of two inches, the spot was just the same as if it had been received at the distance of half an inch, *i. e.* about a quarter of an inch in diameter. Attempting to send an electric shock over the surface of quicksilver or melted lead, I found that it would not pass; though neither of the rods with which the discharge was made touched the metals. A dark impression was made on the surfaces of both the quicksilver and the lead of the usual size of the circular spot; and remained very visible notwithstanding the state of fusion in which the metals were."

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§ 4. *The electric Fluid moves through the Substance of Electrics, though with difficulty. In most Cases, it passes over the Surface of good Conductors.*

This will appear from a consideration of the phenomena abovementioned, and some others. The electric most universally present is *air*. That the fluid pervades its substance is evident to our eye-sight; for if a pointed body is placed on the prime conductor, and at the same time the cylinder is briskly turned, a continual stream of blue fire will be observed to issue from the point. This is undoubtedly the fluid itself made visible by the resistance it meets with from the air. That the electric fluid in this case pervades the air to a considerable distance, is also evident from the different methods by which the air of a room may be electrified. One method is that abovementioned: One or more needles are fixed on the prime conductor, which is kept strongly electrified for about 10 minutes. If, afterwards, an electrometer is brought into the room, the air will show that it has received a considerable quantity of electricity; for the balls will separate, and continue to do so even after the apparatus has been quite removed out of the room. Another method of electrifying the air is to charge a large jar and insulate it; then connect a sharp-pointed wire, or a number of them, with the knob of the jar; and make a communication from the outside coating to the table. If the jar is charged positively, the air of the room will likewise soon become electrified positively; but if the jar is charged negatively, the air will also become negative. To this it may be replied, that the air is always full of conducting substances, and that by means of them the electricity is propagated from one part of the air to another. But whether this is the case or not, it is certain that the air, notwithstanding all the conducting substances it may contain, is in fact an electric, and capable of receiving a charge like glass or any other electric substance. To this purpose there is a very curious experiment made in the following manner. Take two smooth boards, of a circular form, and each about three or four feet in diameter. Coat one side of each with tin-foil, which should be pasted down and burnished, and turned over the edge of the board. These boards must be both insulated, parallel to one another, in a horizontal position. They must be turned with their coated sides towards each other; and should be placed in such a manner as to be easily moved to or from each other; to do which, it will be proper to fix to one of the boards a strong supporter of glass or baked wood, and to suspend the other by silk strings from the ceiling of the room; from which it may be lowered at pleasure by means of a pulley. When these boards are placed in the manner above described, and about an inch distant from one another, they may be used exactly as the coatings of a pane of glass. If a spark is given from the conductor to the upper board, a spark will in-

94 Methods of electrifying the air of a room.

95 To charge a plate of air.

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instantly be discharged from the lower one, if any conducting substance is presented to it. By continuing to give sparks to the upper board, and to take them from the lower one, the air between them will at last become charged like a piece of glass; and if a communication is made between them, they will explode, give the shock, &c. like glass.

In this experiment it seems impossible to deny that the air is penetrated by electric fluid. The distance of an inch is so small, that it must appear ridiculous to say that this space is penetrated only by a *repulsive power*, when in other cases we plainly see the fluid penetrating it to three or four times that distance. The flat surface of the boards indeed makes the motion of the electric fluid through the plate of air gradual and equal, so that it is not seen to pass in sparks or otherwise; but this is necessary to its receiving a charge, as will be afterwards explained.

If one electric substance is penetrable by the electric fluid, we must be led strongly to suspect at least, that all the rest are so too. That rosin, pitch, sealing-wax, &c. are so, hath been already proved; and from thence, if we reason analogically, we must conclude, that glass is likewise penetrable by it. A very strong additional proof of this is, that the electric shock cannot be sent over the surface of glass. If this substance was altogether impenetrable to the fluid, it is natural to think, that it would run over the surface of glass very easily. But instead of this, so great is its propensity to enter, that a shock sent through between two glass plates, if they are pressed pretty close together, always breaks them to pieces, and even reduces part of them to a powder like sand. This last effect cannot be attributed to any other cause than the electric fluid entering the pores of the glass; and, meeting with resistance, the impetus of its progressive motion violently forces the vitreous particles asunder in all directions.

96 Accounts of globes burst by electrical operations.

To this violent impetus of the electric fluid, when once it is set in motion, we may also with some probability ascribe the bursting of electric globes, both such as are made of glass, and other materials, in the act of excitation. Dr Priestley hath given several instances of this accident. "The fragments (says he) have been thrown with great violence in every direction, so as to be very dangerous to the bystanders. This accident happened to Mr Sabbatelli in Italy, Mr Nollet in France, Mr Beraud at Lyons, Mr Boze at Wittemberg, Mr Le Cat at Rouen, and Mr Robein at Rennes. The air in the inside of Mr Sabbatelli's globe had no communication with the external air, but that of the Abbe Nollet had. This last, which was of English flint glass, had been used for more than two years, and was above a line thick. It burst like a bomb in the hands of a servant who was rubbing it, and the fragments, none of which were above an inch in diameter, were thrown to a considerable distance. The Abbe says, that all the globes which were burst in that manner, exploded after five or six turns of the wheel; and he ascribes this effect to the action of the electric matter making the particles of glass vibrate in a manner he could not conceive.

"When Mr Beraud's globe burst (and he was the first to whom this accident was ever known to happen), he was making some experiments in the dark on the 8th of February 1750. A noise was first heard as of something rending to pieces; then followed the explosion; and when the lights were brought in, it was observed that those places of the floor which were opposite to the equatorial diameter of the globe were strewed with smaller pieces, and in greater numbers, than those which were opposite to other parts of it. This globe had been cracked, but it had been in constant use in that state above a year; and the crack had extended itself from the pole quite to the equator. The proprietor ascribed the accident to the vibrations of the glass, and thought the crack had some way impeded these vibrations. When Mr Boze's globe broke, he says that the whole of it appeared, in the act of breaking, like a flaming coal. Mr Boulanger says, that glass globes have sometimes burst like bombs, and have wounded many persons, and that their fragments have even penetrated several inches into a wall. He also says, that if globes burst in whirling by the gun-barrel's touching them, they burst with the same violence, the splinters often entering into the wall. The Abbe Nollet had a globe of sulphur which burst as he was rubbing it with his naked hands, after two or three turns of the wheel, having first cracked inwardly. It broke into very small pieces, which flew to a great distance, and into a fine dust; of which part flew against his naked breast, where it entered the skin so deep, that it could not be got off without the edge of a knife."

97 Proofs of the electric fluid's passing over the surface of conductors.

From these appearances we must necessarily conclude, not only that the electric fluid moves within the substance of electric bodies, but that it sometimes moves with extreme violence; so that its repulsive power separates even the minutest particles from each other; and this could not happen without a thorough penetration of the electric body. It seems more difficult to prove, that the electric matter does not generally pass directly through the substance of metals, but over their surface. A little consideration, however, will show, that this must very probably be the case. If we compare Dr Priestley's experiments on metals related in § 3. with the effects of the solar light collected in the focus of a burning-glass upon the same metals, we shall find a considerable degree of resemblance. Under the article BURNING-GLASS, it is observed, that, notwithstanding the prodigious power of that concave mirror with which Mr Macquer melted platina, all bodies did not melt equally soon in the focus. In particular, polished silver, though a very fusible metal, did not melt at all. It is not to be doubted, that this was owing to the complete reflection of the light by the silver: and had polished pieces of all the metals been tried, it is equally certain, that the difficulty of melting them would have been found exactly proportioned to their reflective power. Something like this happened with Dr Priestley; for silver was less touched by the electric explosion than any other metal. The violent progressive motion of the fluid indeed forced it into the metal, but at the same time the reflective power of the silver hindered it from going so deep as it had done in the others. The case was still more evident when melted lead and quicksilver were used. These have a very great reflective power; and though by reason of the extreme violence wherewith the fluid struck them, part of their substance might naturally have

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have been supposed to be dissipated in the hard metals, yet we find this was not the case. Only a black spot was made on the surface, and the fluid was immediately dispersed, most probably over the surface of the metal.

It is not indeed easy to bring a decisive proof in favour of this hypothesis. The extreme subtility, and, in most cases, invisibility, of the electric fluid, render all reasoning about its motions precarious. It is incredible, however, that this fluid should pass through the very substance of metallic bodies, and not be in the least retarded by their solid particles. In those cases, where the solid parts of metals are evidently penetrated, i. e. when wires are exploded, there is a very manifest resistance; for the parts of the wire are scattered about with violence in all directions. The like happened in Dr Priestley's circles made on smooth pieces of metal. Part of the metal was also dispersed and thrown off, for the circular spots were composed of little cavities. If therefore the fluid was dispersed throughout the substance; and not over the surface of the metal, it is plain, that a wire whose diameter was equal to one of those circular spots, ought also to have been destroyed by an explosion of equal strength sent through it. But this would not have been the case. A wire whose diameter is equal to one of those circular spots represented in n° 1, 2, 3. fig. 75. Plate CLXXVII. would without injury conduct a shock much greater than any battery hitherto constructed could give. It is most probable therefore, that though violent flashes of electricity, which act also as fire, will enter into the substance of metals and consume them; yet it immediately disperses itself over their surface, without entering the substance any more, till being forced to collect itself into a narrow compass it again acts as fire.

In many cases, the electric fluid will be conducted very well by metals reduced to a mere surface, so that we can scarce say they have any thickness at all. A piece of white paper will not conduct a shock without being torn in pieces, as it is an electric substance. But a line drawn upon it with a black-lead pencil will safely convey the charge of several jars. It is impossible we can think that the fire here passes through the substance of the black-lead stroke. It must run over its surface; and if we consider some of the properties of metals, we shall find, that there is very great reason for believing that their conducting power lies at their surface.

The metals are, of all terrestrial substances, those which reflect the light most powerfully. Sir Isaac Newton hath shown that this reflective power they have not from their substance as metals, but from what he calls a *repulsive power*, spread equally over their surface. The existence of this repulsive power hath already been taken notice of in several instances, particularly in that of a chain, whose links cannot be brought into contact with each other without a considerable degree of force. It is exceedingly probable, that the repulsive power by which the links of the chain are kept asunder, and that by which the rays of light are reflected, are one and the same. As the electric fluid is known to pervade all substances, and metals as well as others, it seems also probable, that the repulsive and reflective power on the substance of metals is no other than the electric fluid itself in a quiescent state. Perhaps it may be thought absurd to ascribe the reflection of light to a substance of such extreme fluidity and tenuity as the electric fluid is; but we find that the vacuum of an air-pump, a medium of nearly equal tenuity with the electric fluid (as will elsewhere be proved), is in some cases capable of reflecting light very powerfully. Now it is certain, that nothing can be supposed to give such an easy passage to the electric fluid as itself; because it is the thinnest and most subtile of all the substances we know, and therefore must make the least resistance. Hence the fluid slides over the surface of a piece of metal with surprising ease; and when a large surface of metal is electrified, the effect is proportionable to the extent of it, because all that quantity of electric fluid which is spread over the surface, easily receives the motion communicated by the electrical machine.

Theory.

The vacuum of an air-pump is found to be a very good conductor, and by means of it the motion of the fluid is rendered visible. Hence this is brought as an argument that the electric fluid *always* passes through the substance of conductors. That it doth so in some cases is indeed very evident, but it then meets with considerable resistance; and, even in the present instance, the passing through the vacuum of an air-pump, where it is opposed by a considerable quantity of the same kind of fluid, gives such a considerable resistance, that it will prefer a passage along a metalline rod to one through a vacuum. With regard to charcoal, and other conductors of that kind, as they are very porous, and likewise composed of fine spiculæ, it is probable the fluid may run along the surface of the spiculæ, and at the same time through the substance of the coal. Even in passing over the best conductors, however, this fluid meets with some resistance, as it will prefer a short passage through the air to a long one through the best conductors.

§ 5. *The exceeding great Velocity and Strength of the Electric Fluid are not owing to a repulsive Power among its Particles; but to the mutual Action of the Air and Electric Fluid upon themselves and one another.*

The arguments for a repulsive power existing between the particles of the electric fluid are very inconclusive. Some of them have been already taken notice of. The strongest is that drawn from the appearance of the electric fire issuing from a point, or from any body highly electrified. In the open air this diverges excessively; and very often divides into several distinct rays, which by avoiding each other seem to be violently repulsive. That they are not so in reality, however, is plain from the appearance they have *in vacuo;* when, the resistance of the atmosphere being taken off, the electric light would have room to spread more widely. Fig. 27. Plate CLXXIV. represents an exhausted receiver with an electrified wire discharging a stream of this fluid from itself, by means of its communication with a machine. If the electric matter then was really elastic, or endowed with a power repulsive of itself, it is impossible it could pass in an uninterrupted column through an exhausted receiver as in the figure. A column of air, if blown swiftly through the orifice of a small pipe, will go forward a considerable way, if it is counterbalanced by air like itself on every side. But if such a column enters a vacuum, what

98 Electric fluid shown to be not repulsive of itself.

Theory.

what we call its *elasticity*, occasions it to be dissipated in a moment, and equally diffused through the whole exhausted receiver. But this by no means happens to the electric fluid; for even the small divergency represented in the figure seems entirely owing to some quantity of air left in the air-pump. Dr Watson, by means of a long bent tube of glass filled with mercury, and inverted, made all the bended part which was above the mercury the most perfect vacuum that could be made. This vacuum he insulated; and one of the basons of mercury being made to communicate with the prime conductor, when some non-electric substance touched the other, the electric matter pervaded the vacuum in a continued arch of lambent flame, and, as far as the eye could follow it, without the least divergency. From these experiments it appears, that there is in the vacuum of an air-pump, as well as in the Torricellian vacuum, a fluid of nearly the same density with the electric one: that the electric fluid is not repulsive of itself, but is resisted by the atmosphere; and therefore all appearances of electrical light are less bright *in vacuo* than in the open air; because, the more resistance the matter meets with, the brighter is the flash.

Thus, as long as a stream of electric fluid is moved through a medium of an equal density with itself, the equable pressure of the fluid all round will keep the luminous streams from diverging; but if the pressure is taken off from any part of the receiver, the pressure of the rest will immediately force the stream to that place, as represented fig. 28. That it is by a pressure of this kind, and not by any obscure *attractive power*, that this is occasioned, will be rendered very probable from the following example. Suppose a pot or kettle is boiling violently over a fire, and in such a situation that there is very little agitation in the surrounding air. The equal pressure of the atmosphere will then force the steam straight upwards in a cylindrical column; but if any object is brought near the edge of the pot, so that the pressure of the atmosphere is taken off on one side, the steam will be directly forced upon the body, or seemingly attracted by it. The electric matter therefore, being capable of having its motions resisted by the air, must immediately fly to that place where the resistance is least; but in the case abovementioned, this is best done by applying a conducting substance to the side of a receiver, or one along which the fluid can run downward to the earth. This, however, will be more fully explained when we speak of the phenomena of the Leyden phial.

Plate CLXXIV.

From this simple principle, *viz*. that fluids impelled by any force will always tend towards that place where there is the least resistance, most of the phenomena of electricity may be explained. The first thing to be considered is, From what source it originally derives the astonishing agility and strength displayed in its motions. If it is granted that the electric fluid is the same with the solar light, the ultimate cause of its momentum must be the power by which the light of the sun is emitted. As the power extends through regions of space which to our conceptions are truly *infinite*, so must the power itself be; and it is plain, that by this equable action all round, throughout the whole space thro' which the sun's light is propagated, the pressure of it upon all bodies must be equal all round, and consequently it can neither move them one way nor another. But if, by the intervention of some other power, the pressure is lessened upon any particular part, a current of electric matter will set towards that part, with a force exactly proportioned to the diminution of the pressure. Thus, in the common experiments of the air-pump, when the air is exhausted from a glass vessel, the pressure of the superincumbent atmosphere is directed towards every part of the glass; so that if it is of a flat square shape, and not very strong, it will certainly be broken. But after the air is exhausted, the vessel is discovered to be full of another subtile fluid of the same nature with the electric one*. If this could also be attracted from the vessel, the pressure on its sides would necessarily be much greater, because not only the atmosphere, but the whole surrounding ether or electric matter, would urge towards the place; and it is not probable, that the pressure could be resisted by any terrestrial power whatever. The momentum of the electric matter therefore, in our experiments, depends on two causes, *viz*. the pressure of the atmosphere upon the electric matter, and the pressure of one part of this matter upon another. The celerity with which it moves may be explained from its parts lying in contact with each other throughout the wide immensity of space. Hence the great tendency of the fluid to circulate; because, from whatever point a stream of it is sent off, there the pressure is lessened, and the stream, finding no place empty for its reception, must necessarily have a tendency to return to the place from whence it came, as there it meets with the least resistance; and hence, when a passage is opened for it, by which it can return to this point, it is urged thither with great violence, the equable pressure is restored, and the artificial motion ceases.

99 Origin of the prodigious power of electricity.

* See *Vacuum*.

§ 6. *The Manner in which an Electric Substance becomes excited, or diffuses its Electric Virtue.*

This will easily appear from considering the means taken for the excitation of a common cylinder for electric experiments. The glass is a substance, as we have already seen, into which the electric matter is very apt to enter. To the surface of the glass is applied some amalgam spread on leather. This is a metallic substance which has an exceeding great reflective power, being that which is employed for silverizing looking-glasses. The electric fluid therefore runs over its surface with great ease, and there is always a certain quantity of this fluid in a state of stagnation on its surface. At the place where the cylinder touches the amalgam, the air is excluded, and consequently the electric fluid hath there a tendency to rise more than at any other part of the surface where the atmosphere presses with its full force. When the cylinder begins to turn, it necessarily forces before it a small quantity of that electric matter which lay upon the surface of the amalgam. To understand this the more easily, we must consider that property which glass has of transmitting the electric fluid through it, and refusing it a passage along its surface. Thus we may conceive it to be formed of a vast number of exceedingly small tubes placed close to each other. If we suppose any substance made by art of such a texture, we would find it impossible to pour water along its surface, though it would very easily run through it. If such a substance

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was made in the shape of a cylinder, and turned briskly round, with its surface just touching a quantity of water contained in a vessel, the consequence would be, that the water would be scattered round in all directions. The case seems to be the same with the more subtile electric fluid. The glass cylinder throws out part of the electric fluid lying on the surface of the amalgam. This quantity is perpetually renewed from the conducting side of the rubber. The quantity which is thrown out cannot be conducted over the surface of the glass, nor can it pass through it; because it is resisted by the air in the inside, and, in some measure, by the glass itself. It is also resisted by the air on the outside; but as that resistance is less than what is made by the air and glass both put together, the fluid naturally forces itself into the open air. Still, however, there neither is nor can be, any *accumulation* of the matter itself. It cannot enter the air without displacing the electric matter which was there before. This will displace more of the same kind, and so on, till at last the motion is communicated to the electric matter lodged in some part of the earth. From thence it is propagated to the rubber of the electric machine, and thus a kind of circulatory motion is carried on. By the excitation of an electric substance, therefore, the fluid is not accumulated, but only set in motion. The reason of that seeming accumulation observable about the excited cylinder is, the resistance which the fluid meets with from the air. This instantly produces a divergency in the stream of electric matter, and a vibratory struggle betwixt it and the air; which again produces the appearances of fire and light, for the reasons already given.

100 Proofs of the vibratory motion of the electric fluid.

That this kind of vibratory motion or struggle between the electric fluid and air always takes place when the latter is set in motion, seems evident from the sensation which is felt when a strongly excited electric is brought near any part of the human body. This is such as would be occasioned by a spider's web drawn lightly along the skin, or rather by a multitude of small insects crawling upon the body. It is, however, more clearly proved by an experiment made by Dr Priestley. He was desirous to know whether the electric fluid was concerned in the freezing of water or not. For this purpose he exposed two dishes of water to the open air in the time of a severe frost. One of them he kept pretty strongly electrified; but could observe no difference in the time either when it began to freeze, which was in about three minutes, or in the thickness of the ice, when both had been frozen for some time. Happening to look out at the window through which he had put the dishes, he observed on each side of the electrified wire the same dancing vapour which is seen near the surface of the earth in a hot day, or at any time near a body strongly heated.

101 Why an exhausted cylinder cannot be excited;

If the glass cylinder which we want to excite is exhausted of air, the electric matter, instead of flying off into the air, runs directly through the glass; and, meeting with some resistance from the *vacuum* as it is called, a weak light is produced in the inside, but no signs of electricity are perceived on the outside of the glass. The same thing happens by giving the cylinder or tube a metallic coating. The fluid collected from the rubber runs directly through the glass, and along the surface of the metallic coating, which keeps off the pressure of the air contained in the glass. If an electric lining is used, and the glass is exhausted of air, the motion of the fluid becomes visible through both, and the whole is transparent, as already observed. If the cylinder is lined with an electric substance, and the air is not exhausted, the electricity on the outside is often considerably increased; but the reason of this is not evident. Most probably it is owing to the different kind of electricity acquired by the inside lining; for electricity of any kind always produces its opposite at a small distance, the reason of which shall be afterwards given.

102 Nor one filled with condensed air.

If the air within the cylinder is condensed, the electrical appearances on the outside are lessened in proportion. The reason of this seems to be, that though it is necessary that the fluid should not go through the substance of the glass very easily, yet it is requisite that its passage should not be totally obstructed; and therefore the electric experiments succeed best when the air within the glass is a little rarefied. We must also consider, that when an additional quantity of air is forced into the cylinder, an equal bulk of electric matter is forced out. The rest of the matter, therefore, which is contained all round the glass, presses violently into its pores; but this pressure, being directly opposite to what happens when the glass is excited, must of consequence hinder the excitation. If the glass is now made very hot, the pressure of the atmosphere is kept off, and the passage of the electric fluid through the glass and condensed air is rendered easier, and therefore the electric appearances on the outside return.

On the same principles may we explain the excitation of a solid stick of glass, sealing-wax, or sulphur. Though these have no air within them, yet they have a very considerable quantity of electric matter, which resists an expulsion from its place: and therefore, tho' it may yield a little when the rubber is applied to the outside, yet it will instantly throw off into the atmosphere what the rubber has left on the surface; because the resistance is least towards that place, as soon as the electric has come out from under the rubber. Hence also we see the reason why no signs of electricity are observed on glass to which the rubber is immediately applied; namely, because the pressure being equally great all round, no part of the electric fluid can be thrown off into the atmosphere, in order to set the rest in motion.

The only thing necessary to be added in confirmation of this theory of excitation is, that electric substances of the same kind cannot be excited by rubbing them against one another. Thus glass cannot be excited by rubbing it against glass, &c. Mr Wilcke observed, that when two pieces of glass were rubbed upon each other in the dark, a very vivid light appeared upon them; which, however, threw out no rays, but adhered to the place where it was excited. It was attended with a strong phosphoreal smell, but no attraction or repulsion. From this experiment he inferred, that friction alone would not excite electricity; but that to produce this effect, the bodies rubbed together must be of different natures with respect to their attracting the electric fluid.

§ 7.

§ 7. *Of Positive and Negative Electricity.*

From what hath been already advanced, it will pretty plainly appear, that to increase the quantity of electric fluid in any body is a thing impossible, unless we also augment the size of the body. All the fine pores of every terrestrial fluid are exceedingly full, and unless we separate the minutest particles of the body farther from one another than they are naturally, we cannot introduce more of the electric fluid into it than there was before. This fluid, we have already seen, is not, like the air, endued with a repulsive force between its particles; and therefore it must be incompressible. If it is incompressible, all the phenomena attending it must be owing to its various motions, and the seeming accumulations of it must be owing only to its more brisk action in some places than in others. But before a complete solution of the phenomena of positive and negative electricity can be given, it is necessary to show that these are not so essentially distinct and opposite as they have been thought to be, but may be converted into each other in such cases as we cannot possibly suppose either an addition or subtraction of the electric fluid.

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Methods of changing positive and negative electricity into one another.

This position, however opposite to the common opinions on the subject, may be proved by the following experiments. 1. Let a coated phial be set upon an insulating stand, and let its knob be touched by the knob of another phial negatively electrified. A small spark will be observed between them, and both sides of the insulated phial will instantly be electrified negatively. Now, though we may suppose the one side of the phial which is touched by the negatively electrified one to lose part of its fire, yet this cannot be the case with the other, because there is nothing to take it away, and therefore it ought to appear in its natural state. 2. Let a phial, having a pith-ball electrometer fastened to its outside coating, be slightly charged positively, and then set upon an insulating stand. The outside is then negatively electrified, or, according to Dr Franklin's theory, has too little electric matter in it. The pith-balls, however, will touch each other, or separate but in a very small degree: but let the knob of another bottle, which hath received a strong charge of positive electricity, be brought near to the knob of the first, and the pith-balls on the outside will diverge with positive electricity. Now, it is impossible that any substance can have both too much and too little electric matter at the same instant: yet we see that negative electricity may thus instantaneously be converted into the positive kind, in circumstances where no addition of fire to the outside can be supposed. 3. Let the same phial, with the pith-balls affixed to its outside coating, be slightly charged negatively, and then insulated. The outside is now electrified positively, or, according to Dr Franklin's hypothesis, has too great a quantity of electric fluid. Nevertheless, upon bringing the knob of a phial strongly electrified negatively to that of the insulated one, the pith-balls will instantly diverge with *negative* electricity. 4. Let a phial receive as full a charge of positive electricity as it can contain, and then insulate it. Charge another very highly with negative electricity. Bring the knob of the negative bottle near that of the positive one, and a thread will play briskly between them. But when the knobs touch each other, the thread after being attracted will be repelled by both. The negative electricity is somehow or other superinduced upon the positive; and, for a few moments after the bottles are separated, both will seem to be electrified negatively. But if the finger is brought near the knob of that bottle on which the negative electricity was superinduced, it will instantly be dissipated, a small spark strikes the finger, and the bottle appears positively charged as before.

From these metamorphoses of positive into negative, or negative into positive, electricity, it seems proven in the most decisive manner, that positive electricity doth not consist in an *accumulation*, nor the negative kind in a *deficiency*, of the electric fluid. We are obliged, therefore, to adopt the only probable supposition, namely, that both of them arise entirely from the different directions into which the fluid is thrown in different circumstances; and of consequence, the only method of giving an intelligible explanation of positive and negative electricity is by considering the different direction of the fluid in each.

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Method of determining the direction of the fluid.

A great variety of methods have been contrived to ascertain the direction of the electric fluid, but all of them seem uncertain except that which is drawn from the appearance of electric light. The luminous matter appearing on a point negatively electrified is very small, resembling a globule; it makes little noise, and has a kind of hissing sound. The positive electricity, on the other hand, appears in a diverging luminous stream, which darts a considerable way into the air, with a cracking noise. Now, it is certain, that in whatever case the electric fluid darts from the point into the air, in that case it must be the most resisted by it; and this is evident in the positive electricity. In this, the rays evidently *diverge* from the points. We may, indeed, suppose them to be *converging* from many points in the surrounding air towards the metallic point. But why should we imagine that a visible ray would break out from one place of the atmosphere more than another? The air, we know, resists the motion of the electric fluid, and it certainly must resist it equally. Of consequence, when this fluid is coming from the air towards a pointed conductor, it must percolate slowly and invisibly through the air on all sides equally, till it comes so near that it is able to break through the intermediate space; and as this will likewise be equal, or nearly so, all round, the negative electricity must appear like a steady luminous globule on the point, not lengthening or shortening by flashes as the positive kind does. Electricians have therefore determined with a great deal of reason, that when a point is electrified positively the matter flows out from it.

It is to be remarked, however, that in most cases, if not in all, a body cannot be electrified negatively till it has first become positively electrified; and it is in the act of discharging its positive electricity that it becomes negative. Thus, suppose a coated phial to be set upon an insulated stand, and its knob is approached by that of another bottle charged positively: a small spark is observed between them, and both sides of the insulated bottle are electrified positively; but as soon as the finger is brought near to the outside, the positive electricity is discharged by a spark, and a negative one appears. But from what hath been already advanced, it

Theory.

it is evident, that positive electricity is when the fluid hath a tendency to leave any body, and the negative electricity when it hath the same tendency to enter it. Therefore, as the electric fluid is subject to mechanical laws as well as other fluids, it must follow, that these tendencies are produced and kept up by the motions excited originally in the air, and electric fluid in the air, surrounding these bodies. If this principle is kept in view, it will lead us to an easy explanation of many electrical phenomena, for which no satisfactory reason hath hitherto been given.

§ 8. *Of Electric Attraction and Repulsion.*

It hath now been shown, that, in bodies electrified positively, there is a flux of electric matter from their surface all round; that is, the fluid contained in their pores pushes out on every side, and communicates a similar motion to the electric fluid contained in the adjacent atmosphere. This must of necessity very soon exhaust the body of its electric matter altogether, if it was not instantaneously supplied after every emission. But this supply is immediately procured from the surrounding atmosphere. The quantity sent off is instantly returned from the air, and the vibratory motion or struggle between the air and electric fluid, which hath been often mentioned, immediately takes place. The positive electricity therefore consists in a vibratory motion in the air and electric fluid; and the force of this vibration is directed outwards from the electrified body. In bodies negatively electrified, the fluid contained in the neighbouring atmosphere is directed towards the body so electrified. But it is certain, that this motion inwards cannot be continued unless there is also a motion of the fluid outwards from the body. In this case also there is a vibratory motion, but the force of it is directed inwards, and as the source of it lies not in the body, but in the surrounding atmosphere, it manifests itself somewhat less vigorously.

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Why electric appearances continue so long.

The reason why these motions are continued for such a length of time as we see they are, is, the extreme mobility of the electric fluid. It doth not indeed appear from any experiments, that this fluid hath the least friction among its parts. A motion once induced into it must therefore continue for ever, until it is counteracted by some other motion of the same fluid. Hence, when a vibratory motion is once introduced among the particles of the electric fluid contained in any substance, that motion will be kept up by the surrounding fluid, let the body be removed to what place we please. There is no occasion indeed for supposing any thing like an electric atmosphere round the electrified body. The case is exactly the same as with a burning body. Let a candle be carried to what place we will, it will still burn; but it would be absurd to say, that the fire surrounded it like an atmosphere, as we know the fire is kept up by the air only, which is changed every moment. In like manner, the positive and negative electricities, which are two different motions of the electric fluid, are kept up by the air and electric matter contained in it; and, wherever the electrified body is carried, these fluids are equally capable of continuing them.

The phenomena of attraction and repulsion are now easily explained. Let us suppose a body positively electrified suspended by a small thread, at a distance from any other. The vibration abovementioned, in which positive electricity consists, being kept up by the equable pressure on all sides, the body is neither moved to one side nor another. But when a negatively electrified body is brought near, the force of the vibration being directed outwards in the one, and inwards in the other, the pressure of the fluid in the intermediate space between them is greatly lessened; and of consequence the pressure on the other sides drives them together, and they are said to *attract* each other. If another body, electrified also positively, is brought near to the first, the force of the vibrations are directly opposed to one another, and therefore the bodies recede from each other, and are said to *repel* one another. The case is the same with two bodies negatively electrified: for there the electricity, as far as it extends round the bodies, consists of a vibratory motion of the electric fluid; and the vibrations being directed towards both the bodies, as towards two different centres, must necessarily cause them recede from each other; because, if they remained in contact, the vibratory motions would interfere with and destroy one another.

When a small body is brought within the sphere of another's electricity, the equable pressure of that vibratory or electrical sphere is somewhat lessened upon the side near which the second body is brought; and therefore it is immediately impelled towards the first by the action of the surrounding fluid, in order to keep up the equilibrium. As soon as it arrives there, the vibrations of the fluid around the first body being communicated to that within the pores of the second, it immediately acquires a sphere of electricity as well as the first, and is consequently repelled. The repulsion continues till the vibration ceases either by the action of the air, or by the body coming in contact with another much larger than itself; in which case the electricity is said to be *discharged*. If, after this discharge of electricity, the second body is still within the electric sphere of the first, it will immediately be attracted, and very soon after repelled, and so on alternately till the electricity of the former totally ceases.

§ 9. *Of the Discharge of Electricity by Sparks upon blunt Conductors, and silently by pointed Ones.*

The manner in which this is accomplished will best appear from considering the nature of what is commonly called *electricity*. This cannot appear but in an electric substance; and the substance in which it doth appear is the air. The prime conductor of an electrical machine discovers no other properties in itself, when electrified, than it had before. The metal is equally hard, shining, and impenetrable. The electricity, or properties of attracting, repelling, &c. are all lodged in the air; and if the conductor is placed *in vacuo*, they instantly cease. It hath already been shown, that the electric matter runs over the surface of conducting substances in great quantities, like a stream of water running from one place to another. In this manner it will not pass over the surface of electrics. It enters their substance, and passes through it with a vibratory motion. This vibratory motion always shows a resistance; nor is it in any case possible to induce a vibration without first impressing a motion in one direction, and then resisting it by a contrary motion.

106
Electricity only shows itself in the air.

Round

Theory. Round the surface of an electrified body suspended in the air, therefore, there is always an equable pressure by which the emission of the electric fluid is every moment checked, and by which its vibrations are occasioned. When a metallic substance is brought near the electrified body the fluid has an opportunity of making its escape, provided it could get at the metal, because it could run along its surface. The pressure of the air is also lessened on that side which the conducting substance approaches. The whole effort of the electric matter contained in the vibratory sphere is exerted against that single place, because the resistance is least. If the body has a broad surface, however, the disproportion between these resistances is not so great as when its surface is less. Let us suppose, for instance, that the surface of the conducting substance contains an inch square, and that the whole surface of the electrified sphere contains only six square inches. When the conducting substance approaches, all the pressure is directed towards that place; and the effort made by the electric matter to escape there, is five times as great as what it is any where else. Nevertheless, though it has a vibratory motion in the substance of the air, it cannot have a progressive motion through it without violently displacing its parts; and an inch square of air makes a considerable resistance. At last, however, if this resistance is every moment made less by approaching the conducting substance nearer to the electrified body, the electric matter breaks through the thin plate of air, strikes the conductor, and runs along it. The spark is produced by the resistance it meets with from the air. But if, instead of a body with a broad surface, we present the point of a needle, whose surface is perhaps not above the ten-thousandth part of a square inch, the effort of the electric matter to discharge itself there will be 60,000 times greater than at any other place, because the whole effort of the six square inches, of which we suppose the surface of the electric sphere to consist, is exerted against that single point. The air also resists, as in the former case; but it can resist only in proportion to the extent of its surface which covers the conducting body; and this, being only the ten-thousandth part of a square inch, must be exceedingly little. As soon therefore as a needle, or any other fine pointed body, is presented to an electrified substance, the electric matter is urged thither with great velocity; and as it hath an opportunity of running along the needle, its vibrations quickly cease, and the electricity is said to be *drawn off*.—This drawing off, however, does not extend all round the electrified body, if means are used to keep up the electricity perpetually. Thus, if, on the end of the prime conductor, there are fastened a number of fine threads, hairs, &c. when the cylinder is turned, the threads on the end will diverge, and spread out like as many rays proceeding from a centre. If a point is presented on one side of the conductor, though at a considerable distance, the threads on one side will lose their divergency and hang down, but those on the other side will continue to diverge. The reason of this is, the difficulty with which the electric fluid gets through the atmosphere, even where the resistance of it is made as little as possible; and hence also we may see why more conductors than one may be necessary for the safety of large buildings. See LIGHTNING.

§ 10. *Why Positive Electricity hath a Tendency to induce the Negative Kind on any Body kept within its Sphere of Action, and why Negative Electricity produces the Positive Kind in similar Circumstances.*

Theory.

THIS is one of the electrical phenomena most difficult to be solved; and indeed seems totally insolvable, unless we give up the idea of *accumulation* and *deficiency* of the electric fluid in different bodies. On Dr Franklin's principles, no solution hath been attempted. Mr Cavallo places this among the *properties* of electricity for which he doth not pretend to account, but gives as the *causes* of other phenomena. It is indeed certain, that if a body hath already *too much* electricity or any thing else, it cannot be continually taking from those around it; and if it hath *too little*, it cannot be continually giving them. By attending to the principles above laid down, however, this phenomenon admits of an easy solution. As positive electricity consists in a vibratory motion of the electric matter in the pores of any body, and to some distance through the air, while at the same time the force is directed outwards from the body, it is plain, that if any other body is brought within this sphere, the direction of the vibration is changed; for what is *outwards* from the one is *inwards* to the other. But a vibratory motion, the force of which is directed *inwards*, is what constitutes negative electricity; and, therefore, no sooner is any body placed at some distance from one positively electrified, than it immediately becomes negatively so. The same reason may be given why negative electricity produces the positive kind on a body placed near it. In the negative kind, the force 107
of the vibration is directed inwards. If another body is brought near, the vibration which is *inwards* to the first must be *outwards* from the second, which thus becomes positively electrified. The only difficulty here, is to account for this motion, which is only inward or outward to one side of the body brought near the electrified one, being so suddenly propagated all round. This, however, must easily be seen to arise from the extreme subtility of the electric fluid, and its effort to keep up an equilibrium in all parts, which it will never suffer to be broken. When this fluid pushes inward to one side of the body, the fluid contained in that body would immediately yield, and allow a free passage to what came after, if its yielding was not obstructed by something on the other side. This obstruction arises from the air, which cannot admit a progressive motion of electric matter through it. No sooner, therefore, is a push made against one side than a contrary one is made against the other; and thus the body instantly becomes electrified all round.

Why a motion of the electric fluid on one side is suddenly propagated round a body.

On these principles, also, may we account for the zones of positive and negative electricity which are to be found on the surface of glass tubes *; and especially in electrified air. When the prime conductor of a machine is strongly electrified positively, it is throwing out the fluid from it in all directions. The air cannot receive this fluid without throwing out that which it also contains; and this shows, that simple electrification can neither increase nor diminish the density of the air, which is also vouched by numberless experiments. But if the air throws out its electric fluid in all directions, it must throw part of it back upon the conductor, 108

Zones of positive and negative electricity accounted for.

* See n° 68.

Theory.

tor, and conſequently obſtruct its operations. This likewiſe is found to be the caſe; for it is impoſſible to make an electric machine act long with the ſame degree or ſtrength, owing to the electricity communicated from it to the air. But if the conductor and air are thus reciprocally throwing the electric matter back upon one another, it is impoſſible but another zone of air which lies at a greater diſtance muſt be continually receiving it, or be electrified negatively. But this cannot receive, without alſo emitting the fluid it contains; which, therefore, will be thrown upon another zone behind it, and partly back upon the firſt. The original force of the fluid being now ſpread over a large ſpace, will conſequently be diminiſhed; and the ſucceeding zone will be electrified weakly, though poſitively. In like manner, a ſucceeding zone muſt yield, and receive the fluid from this; which will conſequently be electrified negatively, though weaker than the former: and thus zones of poſitive and negative electricity will gradually ſucceed each other in the air, till no traces of either are to be found.—In theſe zones, it muſt be remembered, that there is a centre peculiar to each, and from this centre the vibrations proceed either inward or outward. Thus, when the machine is firſt ſet in motion, a vibration is propagated from it as from a centre to ſome diſtance in the air, and the air is at firſt negatively electrified. But as this vibratory motion cannot be extended far in one direction, vibrations begin to be propagated in all directions from another centre at ſome diſtance. The conductor becomes then leſs poſitively electrified than before; however, by means of the machine, its electricity is ſtill kept up, though weaker; but a zone of air beyond the firſt, where the reſiſtance is much leſs, becomes negatively electrified. This again cannot continue long till vibrations outwards ariſe from another centre, and ſo on. It is ſcarce needful to add here, that the longer the electrification is continued, and the ſtronger it is, the broader theſe zones muſt be.

§ 11. *Of the Leyden Phial.*

The phenomena of the Leyden phial are eaſily explained from what hath been already advanced. Glaſs and other electric ſubſtances are ſo conſtituted, that they can tranſmit the vibratory motions of the electric matter, though they cannot admit of any conſiderable progreſſive one. Conducting ſubſtances, on the other hand, admit of a progreſſive motion, but not ſo eaſily of a vibratory one. When the electric fluid is procured from the earth by an electric machine, if the conductor had a communication with the earth, all the matter collected by the cylinder would run along the conductor into the earth, and not a ſpark or other appearance of electricity would be procured in the air. But when the conductor is inſulated, the matter is forced to go off into the air, and there produces the vibratory motions already mentioned. If a pane of glaſs which has no metallic coating touches the conductor, though it is permeable by the vibratory motion of the fluid, yet a conſiderable reſiſtance is made, and the fluid cannot eaſily diffuſe itſelf over its ſurface. Nevertheleſs, it will ſoon ſhow ſigns of having received electricity, that is, of having the fluid within its pores thrown into a vibratory motion. This motion is directed outwards, from the middle of the ſubſtance of the glaſs, to the ſurface, and a conſiderable way beyond it on both ſides. Both ſides of the glaſs are then poſitively electrified. If a conducting ſubſtance touches one of the ſides of the glaſs, the vibrations on that ſide are deſtroyed; becauſe the fluid which occaſioned them yields to the reſiſtance it met with, and runs along the conductor into the earth. But no ſooner is this done, than the power which reſiſted the vibration outward from the glaſs having got the better in the manner juſt now explained, a new vibration is produced by that reſiſting power; and the force of this vibration is directed towards the ſide from whence the electricity is drawn off, which therefore becomes electrified negatively. Thus may we underſtand how a pane of glaſs or any other electric, may receive poſitive electricity on the one ſide and negative on the other, to as high a degree as we pleaſe. But there is found to be a limit to every degree of electricity we can give; and this limit is the reſiſtance of the air. A phial will contain double the charge in air doubly condenſed that it does in the common atmoſphere; and when once the vibration becomes too great to be borne, the poſitive ſide of the glaſs throws out pencils of light, and will receive no more electricity in that ſtate of the atmoſphere.

109 In what manner a phial becomes charged.

110 Why it retains its charge.

Thus, in every charged phial, there is a violent impulſe or vibration of the fluid, *outward* from the poſitive, and *inward* to the negative, ſide. As long as theſe continue, the phial continues charged. As the electric fluid ſeems to be ſubject to no other natural power, but controuls all its own actions only by moving in oppoſite directions, it is plain, that if a charged phial is carefully kept from any of thoſe means by which it is known to be diſcharged, it muſt keep its charge for a long time; and thus, by keeping phials within glaſs caſes, their charge will be retained for ſix or eight weeks, or perhaps a great deal longer. The only method of diſcharging a phial, is by making a communication between the coatings. The fluid preſſing out of the poſitive ſide, now yields to the preſſure of that from the negative ſide, and runs along the conductor. But no ſooner does it come near the negative ſide of the phial, than, meeting with more of the ſame kind, the current of which is directed the ſame way, both together break through the air with a violent flaſh and crack, and all appearances of electricity ceaſe. —In this, as in all other electrical experiments, it is eaſy to ſee, that the force, velocity, &c. of the fluid depends intirely on the preſſure of that which ſurrounds us. Nature hath appointed a certain conſtitution or modification of the electric fluid in all terreſtrial bodies, and likewiſe all round the earth. In our electrical experiments, we violate this conſtitution in ſome degree. When this violation is but ſmall, the powers of nature operate gently in repairing the diſorder we have introduced; but when any conſiderable deviation is occaſioned, the natural powers reſtore the original conſtitution with extreme violence.

111 Reaſon of its diſcharge.

§ 12. *The Phenomena of the Electrophorus accounted for.*

The electrophorus is a machine repreſented Plate CLXXVII. fig. 73. It conſiſts of two plates, A and B, uſually of a circular form; though they may be made ſquare, or of the figure of a parallelogram, with more eaſe, and with equal advantage. At firſt the under plate was

Theory.

112 Construction of the electrophorus.

was of glass, covered over with sealing-wax; but there is little occasion for being particular either with regard to the substance of the lower plate, or the electric which is put upon it. A metallic plate, however, is perhaps preferable to a wooden one, though the latter will answer the purpose very well. This plate is to be covered with some electric substance. Pure sulphur answers very near as well as the dearer electrics, sealing-wax, gum-lac, &c.: but it hath this bad quality, that, by rubbing it, some exceeding subtile steams are produced, which infect the person's clothes, and even his whole body, with a very disagreeable smell, and will change silver in his pocket to a blackish colour.—The upper plate of the electrophorus is a brass plate, or a board or piece of pasteboard covered with tin-foil or gilt paper, nearly of the same size with the electric plate, though it will not be the worse that it is somewhat larger. It is furnished with a glass handle (I), which ought to be screwed into the centre. The manner of using this machine is as follows. First, the plate B is excited by rubbing its coated side with a piece of new white flannel, or a piece of hare's skin. Even a common hard shoe-brush, having the hair a little greased, will excite sulphur extremely well. When this plate is excited as much as possible, it is set upon the table with the electric side uppermost. Secondly, the metal plate is laid upon the excited electric, as represented in the figure. Thirdly, the metal plate is touched with the finger or any other conductor, which, on touching the plate, receives a spark from it. Lastly, the metal plate A, being held by the extremity of its glass handle (I), is separated from the electric plate; and, after it is elevated above that plate, it will be found strongly electrified with an electricity contrary to that of the electric plate; in which case, it will give a very strong spark to any conductor brought near it. By setting the metal upon the electric plate, touching it with the finger, and separating it successively, a great number of sparks may be obtained apparently of the same strength, and that without exciting again the electric plate. If these sparks are repeatedly given to the knob of a coated phial, it will presently become charged.

113 Mr Cavallo's observations.

"As to the continuance of the virtue of this electric plate (says Mr Cavallo), when once excited, without repeating the excitation, I think there is not the least foundation for believing it perpetual, as some gentlemen have supposed; it being nothing more than an excited electric, it must gradually lose its power by imparting continually some of its electricity to the air, or other substances contiguous to it. Indeed its electricity, although it could never be proved to be perpetual by experiments, lasts a very long time, it having been observed to be pretty strong several days, and even weeks, after excitation. The great duration of the electricity of this plate, I think, depends upon two causes; first, because it does not lose any electricity by the operation of putting the metal plate upon it, &c. and secondly, because of its flat figure, which exposes it to a less quantity of air, in comparison with a stick of sealing-wax, or the like, which, being cylindrical, exposes its surface to a greater quantity of air, which is continually robbing the excited electrics of their virtue.

"The first experiments that I made, relative to this machine, were with a view to discover which substance would answer best for coating the glass plate, in order to produce the greatest effect. I tried several substances either simple or mixed; and at last I observed, that the strongest in power, as well as the easiest, I could construct, were those made with the second sort of sealing-wax, spread upon a thick plate of glass. A plate that I made after this manner, and no more than six inches in diameter, when once excited, could charge a coated phial several times successively, so strongly as to pierce a hole through a card with the discharge. Sometimes the metal plate, when separated from it, was so strongly electrified, that it darted strong flashes to the table upon which the electric plate was laid, and even into the air, besides causing the sensation of the spider's web upon the face brought near it, like an electric strongly excited. The power of some of my plates is so strong, that sometimes the electric plate adheres to the metal when this is lifted up, nor will they separate even if the metal plate is touched with the finger or other conductor. It is remarkable, that sometimes they will not act well at first, but they may be rendered very good by scraping with the edge of a knife the shining or glossy surface of the wax. This seems analogous to the well-known property of glass, which is, that new cylinders or globes, made for electrical purposes, are often very bad electrics at first; but that they improve by being worked, *i. e.* by having their surface a little worn. Paper also has this property.

114 Experiment with the electrophorus.

"If, after having excited the sealing-wax, I lay the plate with the wax upon the table, and the glass uppermost, *i. e.* contrary to the common method; then, on making the usual experiments of putting the metal plate on it, and taking the spark, &c. I observe it to be attended with the contrary electricity; that is, if I lay the metal plate upon the electric one, and, while in that situation, touch it with an insulated body, that body acquires the positive electricity; and the metallic, removed from the electric plate, appears to be negative; whereas it would become positive, if laid upon the excited wax. This experiment, I find, answers in the same manner if an electric plate is used which has the sealing-wax coating on both sides, or one which has no glass plate.

"If the brass plate, after being separated from, be presented with the edge toward the wax, lightly touching it, and thus be drawn over its surface, I find that the electricity of the metal is absorbed by the sealing-wax, and thus the electric plate loses part of its power; and if this operation is repeated five or six times, the electric plate loses its power entirely, so that a new excitation is necessary in order to revive it.

"If, instead of laying the electric plate upon the table, it is placed upon an electric stand, so as to be accurately insulated, then the metal plate set on it acquires so little electricity, that it can only be discovered with an electrometer: which shows, that the electricity of this plate will not be conspicuous on one side of it, if the opposite side is not at liberty either to part with or acquire more of the electric fluid. In consequence of this experiment, and in order to ascertain how the opposite sides of the electric plate would be affected in different circumstances, I made the following experiments.

"Upon an electric stand E, (Plate CLXXVII. fig. 73.)

I

Theory.

I placed a circular tin-plate, nearly six inches in diameter, which by a slender wire H communicated with an electrometer of pith-balls G, which was also insulated upon the electric stand F. I then placed the excited electric plate D of six inches and a quarter in diameter, upon the tin-plate, with the wax uppermost; and on removing my hand from it, the electrometer G, which communicated with the tin-plate, *i. e.* with the under side of the electric plate, immediately opened with negative electricity. If, by touching the electrometer, I took that electricity off, the electrometer did not afterwards diverge. But if now, or when the electrometer diverged, I presented my hand open, or any other uninsulated conductor, at the distance of about one or two inches, over the electric plate, without touching it, then the pith-balls diverged; or, if they diverged before, came together, and immediately diverged again with positive electricity:—I removed the hand, and the balls came together; approached the hand, and they diverged: and so on.

"If, while the pith-balls diverged with negative electricity, I laid the metal plate, holding it by the extremity K of its glass handle, upon the wax, the balls came, for a little time, towards one another, but soon opened again with the same, *i. e.* negative electricity.

"If, whilst the metallic rested upon the electric plate, I touched the former, the electrometer immediately diverged with positive electricity; which if, by touching the electrometer, I took off, the electrometer continued without divergence.—I touched the metal plate again, and the electrometer opened again; and so on for a considerable number of times, until the metal plate had acquired its full charge. On taking now the metal plate up, the electrometer G instantly diverged with strong negative electricity.

"I repeated the above-described experiments, with this only difference in the disposition of the apparatus, *i. e.* I laid the electric plate D with the excited sealing-wax upon the circular tin-plate, and the glass uppermost; and the difference in their result was, that where the electricity had been positive in the former disposition of the apparatus, it now became negative, and *vice versa*; except that, when I first laid the electric plate upon the tin, the electrometer G diverged with negative electricity, as well in this as in the other disposition of the apparatus.

"I repeated all the above experiments with an electric plate, which, besides the sealing-wax coating on one side, had a strong coat of varnish on the other side, and their result was similar to that of those made with the above-described plate."

115 Mistakes in Mr Cavallo's observations.

This is Mr Cavallo's account of the electrophorus; but there is one part of it in which he must certainly be mistaken. He tells us, that "if instead of laying the electric plate upon the table, it is set upon an electric stand, so as to be accurately insulated, then the metal plate set on it acquires so little electricity, that it can only be discovered by an electrometer." In what manner this gentleman came to mistake a plain fact so egregiously, is not easy to determine; but it is certain, than an electrophorus, instead of having its virtue impaired by being insulated, has it greatly increased, at least the sphere of its activity is greatly enlarged. When lying on the table, if the upper plate is put upon it without being touched with the finger, it will not show much sign of electricity. But as soon as it is put on the electric stand, both the upper and under side appear strongly negative. A thread will be attracted at the distance of eight or ten inches. If both the upper and under side are touched at the same time, a strong spark will be obtained from both, but always of the same kind of electricity, namely, the negative kind. If the upper plate is now lifted up, a strong spark of positive electricity will be obtained from it; and on putting it down again, two sparks of negative electricity will be produced.

116 Singular appearance on insulating an electrophorus.

The singularity of this experiment is, that it produces always double the quantity of negative electricity that it doth of the positive kind; which cannot be done by any other method yet known. Another very surprising circumstance is, that when the electrophorus remains in its insulated situation, you need not always touch the upper and under side of the plates at once, in order to procure positive electricity from the upper plate: It is sufficient to touch both sides only once. On lifting up the upper plate, a spark of positive electricity is obtained as already mentioned. On putting it down again, a spark of the negative kind is obtained from the upper plate, even though you do not touch the lower one. On lifting up the upper plate, a spark of positive electricity is obtained, but weaker than it would have been had both sides been touched at once. Putting down the upper plate again without touching both, a still weaker spark first of negative and then of positive electricity will be obtained from the upper one. Thus the sparks will go on continually diminishing, to the number perhaps of two or three hundred. But at last, when the electricity of the whole machine seems to be totally lost, if both sides are touched at once, it will instantly be restored to its full strength, and the double spark of negative, with the single one of positive electricity, will be obtained without intermission as before.

117 General reason of all the phenomena.

To account for all these phenomena very particularly, is perhaps impossible, without a greater degree of knowledge concerning the internal fabric of bodies than we have access to attain. In general, however, it is evident, that the phenomena of the electrophorus arise from the disposition that the electric matter hath to keep up an equilibrium within itself throughout every part of the universe. In consequence of this, no motion of the electric matter can be produced upon the one side of a body, but it must immediately be balanced by a corresponding one on the opposite side; and in proportion to the strength of the one, so will the strength of the other be. When the under plate of the electrophorus is excited, the negative electricity or vibratory action of the electric matter towards the excited side, is produced; and the moment that such an action is produced on one side, it is resisted by a similar one on the opposite side, and thus the electrophorus becomes negatively electrified on both sides. As long as the under part of the machine communicates with the earth, the vibratory motion is impeded by the progressive one towards the earth. This makes the resistance on the under side less, and therefore the vibratory motion on the upper part extends but a small way. When the plate is insulated, the electric matter has not an opportunity of escaping to the earth as before, because it is strongly resisted by the air; a vibration

bration therefore takes place on both sides, and extends to a great distance from the plate. When the upper plate is set upon the electrophorus, the same kind of electricity, *viz.* the negative kind, is communicated to it. When both sides are touched with the finger, or with any other conducting substance, both electricities are suddenly taken off, because the electric matter running along the conducting substance on both sides, puts an end to the vibratory motion in the air, which constitutes the very essence of what we call *electricity*. There is now a quiet and equal balance of the electric matter on both sides, and therefore no signs of electricity are shown. But as soon as the upper plate is taken off, this balance is destroyed. The fluid in the metal plate had not been able to penetrate the electric substance in such a manner as to put a stop to the vibrations of what was within it. As soon then as the plate is taken off, the electricity or vibratory motion towards the electric breaks out at that side. But this motion *inwards* to the electric, which constitutes negative electricity, necessarily becomes *outward* from the plate; and as no motion of the fluid can be produced on one side of a body, but what is immediately communicated to the other, the upper plate becomes electrified positively, and the under one negatively on both sides.

SECT. VII. *Of the Method of using the Electrical Apparatus already described, with some practical Rules for performing Experiments with it to the best Advantage.*

THE machines already described are calculated for exhibiting the phenomena of electricity in a very high degree; and in general the following effects may be expected from them.

118 Appearances on exciting the electric cylinder.

1. On whirling the cylinder in contact with the rubber, without bringing any conducting body near the former, or insulating the latter, we will perceive in the dark a stream of fire seemingly issuing from the place of contact between the rubber and cylinder, and adapting itself to the form of the cylinder so as to involve it in a blue flame mixed with bright sparks; the whole making a very perceptible whizzing and snapping noise. If the finger is brought near the cylinder in this situation, the flame and sparks will leave the cylinder and strike it; and this phenomenon will continue as long as the globe is whirled round.

119 On adding the prime conductor.

2. On applying the prime conductor, the light will in a great measure vanish, and be perceptible only upon the points presented by it to the cylinder: but if the finger is now brought near the conductor, a very smart spark will strike it, and that at a greater or smaller distance according to the strength of the machine. This spark, when the electricity is not very strong, appears like a straight line of fire; but if the machine acts very powerfully, it will put on the appearance of zigzag lightning, throwing out other sparks from the corners, and strike with such force as to give considerable pain to those who receive it. These sparks in certain circumstances will set fire to spirits, tinder, gunpowder, &c.

120 Method of drawing sparks.

3. If instead of the hand or any part of the human body, we hold the knob of a coated phial near the conductor, a vast number of sparks will appear between them, first with a loud snapping noise, but gradually diminishing until at last it ceases, and pencils of blue flame intermixed with small sparks will be thrown out by the phial; and if the latter is still kept near the conductor, it will in a little time discharge itself with a violent flash and crack; after which, if the phial has not been broke by the discharge, the sparks from the conductor will begin as before, and the same phenemena be repeated as long as the cylinder is turned, or till the phial breaks.

121 On applying the battery, &c.

4. On applying the battery, though the accumulation of electricity be much greater than in a single phial, the signs of it are much less apparent; and sparks will always pass between the conductor and knob leading to the battery, by reason of the great evaporation from the latter into the air. But here, if one of the jars discharges itself, all the rest are likewise discharged in the same moment, and some of them generally broken.

5. A thread or other light body suspended near the conductor will be attracted at a considerable distance; and the force of attraction will be greater or less according to the power of the machine.

6. The electricity in all cases will be positive if the rubber be not insulated, and negative if it is so: and by Mr Nairne's contrivance of having a conductor connected with the insulated rubber, and another with the cylinder, both kinds of electricity may be had with equal ease.

122 Effects of the great machine in Teyler's museum.

All these phenomena are the more remarkable in proportion to the power of the machine. That used in Teyler's museum is the strongest of which we have yet heard; and its effects are as follow.

On presenting a very sharp steel point to the prime conductor, a luminous stream of about half an inch was perceived between them. On fixing the point to the conductor, so as to project three inches from it, streams of light were thrown out from the point six inches long when a ball of three inches in diameter was presented, but only two inches in length on presenting another point.

The sensation called the *spider's web* on the face of the bystanders (B) is often felt at the distance of eight feet from the prime conductor. A thread six feet long was sensibly attracted at the distance of 30 feet from the prime conductor, and a pointed wire appeared luminous at the distance of 28 feet; a cork-ball electrometer diverged at the distance of 40 feet.

A single spark from the conductor melted a considerable length of gold-leaf; gunpowder and other combustibles, inclosed in a paper cartridge, with a sharp point in the middle, were fired; and when another conductor communicating with the earth was placed at the distance of 21, or sometimes 24 inches from

(B) This is a kind of sensation always produced by strong electricity, sometimes resembling the creeping of insects or the motion of a light body, such as a spider's web, over the skin, as already mentioned. It seems to proceed from the attraction and electrification of the small hairs with which the body is covered.

Method of using the Electrical Apparatus, &c.

from the prime conductor of the machine, a stream of fire was perceived between them. This was crooked, and darting out many lateral brushes of a very large size, in the manner already mentioned. A Leyden phial, containing about one square foot of coated surface, was fully charged by about half a turn of the winch so as to discharge itself; and by repeated trials it was found, that in one minute it discharged itself 76, 78, and frequently 80 times. Lastly, it was found, that though the conductor, which received the sparks from the prime one of the machine, communicated with the earth by a wire $\frac{3}{8}$ths of an inch in diameter, this wire would give small sparks to any conducting body brought near it, as if even this wire had not been sufficient to conduct the quantity of electricity it received from the machine very readily to the earth.

Though these effects are not to be expected from our ordinary electrical machines, yet it is certain, that by taking proper care of them they will be found to act much more powerfully than if neglected. The following directions therefore will be found useful for such as wish to make electrical experiments.

1. The first thing to be observed is, the preservation and care of the instruments. The electrical machine, the coated jars, and in short every part of the electrical apparatus, should be kept clean, and as free as possible from dust and moisture.

2. When the weather is clear, and the air dry, especially in clear and frosty weather, the electrical machine will always work well. But when the weather is very hot, the electrical machine is not so powerful; nor in damp weather, except it be brought into a warm room, and the cylinder, the stands, the jars, &c. be made thoroughly dry.

3. Before the machine be used, the cylinder should be first wiped very clean with a soft linen cloth that is dry, clean, and warm; and afterwards with a clean hot flannel, or an old silk handkerchief: this done, if the winch be turned from the prime conductor and other instruments are removed from the electrical machine, and the knuckle be held at a little distance from the surface of the cylinder, it will be soon perceived, that the electric fluid comes like a wind from the cylinder to the knuckle; and, if the motion be a little continued, sparks and crackling will soon follow. This indicates that the machine is in good order, and the electrician may proceed to perform his experiments. But if, when the winch is turned for some time, no wind is felt upon the knuckle, then the fault is, very likely, in the rubber: and to remedy that, use the following directions: By loosening the screws on the back of the rubber, remove it from its glass pillar, and keep it a little near the fire, so that its silk part may be dried; take now a dry piece of mutton suet, or a little tallow from a candle, and just pass it over the leather of the rubber; then spread a small quantity of the above described amalgam over it, and force it as much as possible into the leather. This done, replace the rubber upon the glass pillar; let the glass cylinder be wiped once more, and then the machine is fit for use.

4. Sometimes the machine will not work well because the rubber is not sufficiently supplied with electric fluid; which happens when the table, upon which the machine stands, and to which the chain of the rubber is connected, is very dry, and consequently in a bad conducting state. Even the floor and the walls of the room are, in very dry weather, bad conductors, and they cannot supply the rubber sufficiently. In this case the best expedient is, to connect the chain of the rubber, by means of a long wire, with some moist ground, a piece of water, or with the iron work of a water-pump; by which means the rubber will be supplied with as much electric fluid as is required.

5. When a sufficient quantity of amalgam has been accumulated upon the leather of the rubber, and the machine does not work very well, then, instead of putting on more amalgam, it will be sufficient to take the rubber off, and to scrape a little that which is already upon the leather.

6. It will be often observed, that the cylinder, after being used for some time, contracts some black spots, occasioned by the amalgam, or some foulness of the rubber, which grow continually larger, and greatly obstruct its electric power. These spots must be carefully taken off, and the cylinder must be frequently wiped in order to prevent its contracting them.

7. In charging electric jars in general, it must be observed, that not every machine will charge them equally high. That machine whose electric power is the strongest, will always charge the jars highest. If the coated jars, before they are used, be made a little warm, they will receive and hold the charge the better.

8. If several jars are connected together, among which there is one that is apt to discharge itself very soon, then the other jars will soon be discharged with that; although they may be capable of holding a very great charge by themselves. When electric jars are to be discharged, the electrician must be cautious, lest by some circumstance not adverted to, the shock should pass through any part of his body; for an unexpected shock, though not very strong, may occasion several disagreeable accidents. In making the discharge, care must be taken that the discharging rod be not placed on the thinnest part of the glass, for that may cause the breaking of the jar.

9. When large batteries are discharged, jars will be often found broken in it, which burst at the time of the discharge. To remedy this inconvenience, Mr Nairne says, he has found a very effectual method, which is, never to discharge the battery through a good conductor, except the circuit be at least five feet long. Mr Nairne says, that ever since he made use of this precaution, he has discharged a large battery near a hundred times without ever breaking a single jar, whereas before he was continually breaking them. But here it must be considered, that the length of the circuit weakens the force of the shock proportionably; the highest degree of which is in many experiments required.

10. It is advisable, when a jar, and especially a battery, has been discharged, not to touch its wires with the hand, before the discharging rod be applied to its sides a second and even a third time; as there generally remains a residuum of the charge, which is sometimes very considerable.

11. When any experiment is to be performed which requires but a small part of the apparatus, the remaining part of it should be placed at a distance from the machine,

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machine, the prime conductor, and even from the table, if that is not very large. Candles, particularly, should be placed at a considerable distance from the prime conductor, for the effluvia of their flames carry off much of the electric fluid.

Sect. VIII. *Entertaining Experiments.*

I. *The Electrified Cork-ball Electrometer.*

Fix at the end of the prime conductor a knobbed rod, and hang on it two small cork-balls suspended by threads of equal length. The balls will now touch one another, the threads hanging perpendicularly, and parallel to each other. But if the cylinder of the machine be whirled by turning the winch, then the cork-balls will repel one another; and more or less according as the electricity is more or less powerful.—If the electrometer be hung to a prime conductor negatively electrified, *i. e.* connected with the insulated rubber of the machine, the cork-balls will also repel each other. If, in this state of repulsion, the prime conductor is touched with some conducting substance not insulated, the cork-balls will immediately come together. But if, instead of the conducting substance, the prime conductor is touched with an electric, as for instance a stick of sealing-wax, a piece of glass, &c. then the cork-balls will continue to repel each other; because the electric fluid cannot be conducted through that electric: hence we have an easy method of determining what bodies are conductors and what electrics. This electrical repulsion is also shown by a large downy feather, or still more agreeably by the representation of a human head with hair, as shown fig. 47. for there the electric repulsion will make the hair erect itself in a strange manner. If the feather is used, it will appear beautifully swelled by the divergency of its down.

Plate CLXXV.

II. *Attraction and Repulsion of light Bodies.*

Connect with the prime conductor, by means of the hook *H*, the two parallel brass plates *F*, *G*, as represented in fig. 38. at about three inches distance from one another; and upon the lower plate put any kind of light bodies, as bran, bits of paper, bits of leaf-gold, &c.; then work the machine, and the light bodies will soon move between the two plates, leaping alternately from one to the other with great velocity. If, instead of bran or irregular pieces of other matter, small figures of men or other things cut in paper and painted, or rather made of the pith of alder, be put upon the plate, they will generally move in an erect position, but will sometimes leap one upon another, or exhibit different postures, so as to afford a pleasing spectacle to an observing company. When bran or other substances of that kind are made use of, it will be proper to inclose both plates in a glass cylinder, by which the bran will be kept from dispersing and flying about the room.

The phenomena of electric attraction and repulsion may be represented also with a glass tube, or a charged bottle, and some of them in a manner more satisfactory than with the machine.

III. *The Flying-feather, or Shuttle-cock.*

Take a glass tube (whether smooth or rough is not material); and after having rubbed it, let a small light feather be let out of your fingers at the distance of about eight or nine inches from it. This feather will be immediately attracted by the tube, and will stick very close to its surface for about two or three seconds, and sometimes longer; after which time it will be repelled; and if the tube be kept under it, the feather will continue floating in the air at a considerable distance from the tube, without coming near it again, except it first touches some conducting substance; and if you manage the tube dexterously, you may drive the feather through the air of a room at pleasure.

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There is a remarkable circumstance attending this experiment; which is, that if the feather be kept at a distance from the tube by the force of electric repulsion, it always presents the same part towards the tube;—You may move the excited tube about the feather very swiftly, and yet the same side of the feather will always be presented to the tube.

This experiment may be agreeably varied in the following manner: A person may hold in his hand an excited tube of smooth glass, and another person may hold an excited rough glass tube, a stick of sealing-wax, or in short another electric negatively electrified, at about one foot and a half distance from the smooth glass tube: a feather now may be let go between these two differently excited-electrics, and it will leap alternately from one electric to the other; and the two persons will seem to drive a shuttle-cock from one to the other by the force of electricity.

IV. *The Electric Well.*

Place upon an electric stool a metal quart mug, or some other conducting body nearly of the same form and dimension; then tie a short cork-ball electrometer, at the end of a silk thread proceeding from the ceiling of the room, or from any other support, so that the electrometer may be suspended within the mug, and no part of it may be above the mouth: this done, electrify the mug by giving it a spark with an excited electric or otherwise; and you will see that the electrometer, whilst it remains in that insulated situation, even if it be made to touch the sides of the mug, is not attracted by it, nor does it acquire any electricity; but if, whilst it stands suspended within the mug, a conductor, standing out of the mug, be made to communicate with or only presented to it, then the electrometer is immediately attracted by the mug.

The following experiments require to be made in the dark: for although the electric light in several circumstances may be seen in the day-light, yet its appearance in this manner is very confused; and that the electrician may form a better idea of its different appearances, it is absolutely necessary to perform such experiments in a darkened room.

V. *The Star and Pencil of Electric Light.*

When the electrical machine is in good order, and the prime conductor is situated with the collector sufficiently near the glass cylinder, turn the winch, and you will see a lucid star at each of the points of the collector. This star is the constant appearance of the electric fluid that is entering a point. At the same time you will see a strong light proceeding from the

Entertaining Experiments.

rubber, and spreading itself over the surface of the cylinder; and if the excitation of the cylinder is very powerful, dense streams of fire will proceed from the rubber, and, darting round almost half the circumference of the cylinder, will reach the points of the collector. If the prime conductor is removed, the dense streams of fire will go quite round the cylinder; reaching from one side of the rubber to the other. If the chain of the rubber is taken off, and a pointed body, as for instance the point of a needle or a pin, is presented to the back of the rubber, at the distance of about two inches, a lucid pencil of rays will appear to proceed from the point presented, and diverge towards the rubber. If another pointed body be presented to the prime conductor, it will appear illuminated with a star; but if a pointed wire or other pointed conducting body be connected with the prime conductor, it will throw out a pencil of rays.

VI. *Drawing Sparks.*

Let the prime conductor be situated in its proper place, and electrify it by working the machine; then bring a metallic rod with a round knob at each end, or the knuckle of a finger, within a proper distance of the prime conductor, and a spark will be seen between that and the knuckle or knobbed wire. The longer and stronger spark is drawn from that end of the prime conductor which is farthest from the cylinder, or rather from the extremity of the knobbed rod fixed at its end; for the electric fluid seems to acquire an impetus by going through a long conductor, when electrified by a powerful machine. This spark appears like a long line of fire, reaching from the conductor to the opposed body, and often (particularly when the spark is long, and different conducting substances are near the line of its direction) it will have the appearance of being bended to sharp angles in different places, exactly resembling a flash of lightning. It often darts brushes of light sidewise in every direction.

VII. *The Electric Light flashing between two Metallic Plates.*

Let two persons, one standing upon an insulated stool, and communicating with the prime conductor, and another standing upon the floor, each hold in one of his hands a metal plate, in such a manner that the plates may stand back to back in a parallel situation, and about two inches asunder. Let the winch of the machine be turned, and you will see the flashes of light between the two plates so dense and frequent, that you may easily distinguish any thing in the room. By this experiment the electric light is exhibited in a very copious and beautiful manner, and it bears a striking resemblance to lightning.

VIII. *To fire Inflammable Spirits.*

The power of the electric spark to set fire to inflammable spirits, may be exhibited by several different methods, but more easily thus: Hang to the prime conductor a short rod having a small knob at its end; then pour some spirits of wine, a little warmed, into a spoon of metal; hold the spoon by the handle, and place it in such a manner, that the small knob on the rod may be about one inch above the surface of the spirits. In this situation, if, by turning the winch, a spark be made to come from the knob, it will set the spirits on fire. It will generally be found more advantageous to fix the dish containing the spirits upon the prime conductor, as represented fig. 48.

This experiment may be varied different ways, and may be rendered very agreeable to a company of spectators. A person, for instance, standing upon an electric stool, and communicating with the prime conductor, may hold the spoon with the spirits in his hand, and another person, standing upon the floor, may set the spirits on fire by bringing his finger within a small distance of it. Instead of his finger, he may fire the spirits with a piece of ice, when the experiment will seem much more surprising. If the spoon is held by the person standing upon the floor, and the insulated person brings some conducting substance over the surface of the spirits, the experiment succeeds as well.

IX. *the artificial Bolognian Stone illuminated by the Electric Light.*

The most curious experiment to show the penetrability of the electric light, is made with the real, or more easily with the artificial, Bolognian stone invented by the late Mr J. Canton. This phosphorus is a calcareous substance, generally used in the form of a powder, which has the property of absorbing light when exposed to it, and afterwards appearing lucid when brought into the dark *. Take some of this powder, and, by means of spirits of wine or ether, stick it all over the inside of a clear glass phial, and stop it with a glass stopper, or a cork and sealing-wax. If this phial be kept in a darkened room (which for this experiment must be very dark), it will give no light; but let two or three strong sparks be drawn from the prime conductor, when the phial is kept at about two inches distance from the sparks, so that it may be exposed to that light, and this phial will receive that light, and afterwards will appear illuminated for a considerable time. The powder may be stuck upon a board by means of the white of an egg, so as to represent figures of planets, letters, or any thing else at the pleasure of the operator; and the figures may be illuminated in the dark, in the same manner as the above described phial.

* See *Chemistry*, n° 1414.

A beautiful method to express geometrical figures with the above phosphorus, is to bend small glass tubes of about the tenth part of an inch diameter, in the shape and figure desired, and then fill them with the phosphorus powder. These may be illuminated in the manner described, and they are not so subject to be spoiled as the figures represented upon the board frequently are. The best method of illuminating this phosphorus, and which Mr W. Canton generally used, is to discharge a small electric jar near it.

X. *The Luminous Conductor.*

Plate CLXXIV.

Fig. 24. represents a prime conductor invented by Mr Henley, which shows clearly the direction of the electric fluid passing through it, from whence it is called the *luminous conductor*. The middle part *EF* of this conductor is a glass tube about 18 inches long and three or four inches in diameter. To both ends of this tube the hollow brass pieces *FD*, *BE*, are cemented air-tight, one of which has a point *C*, by which

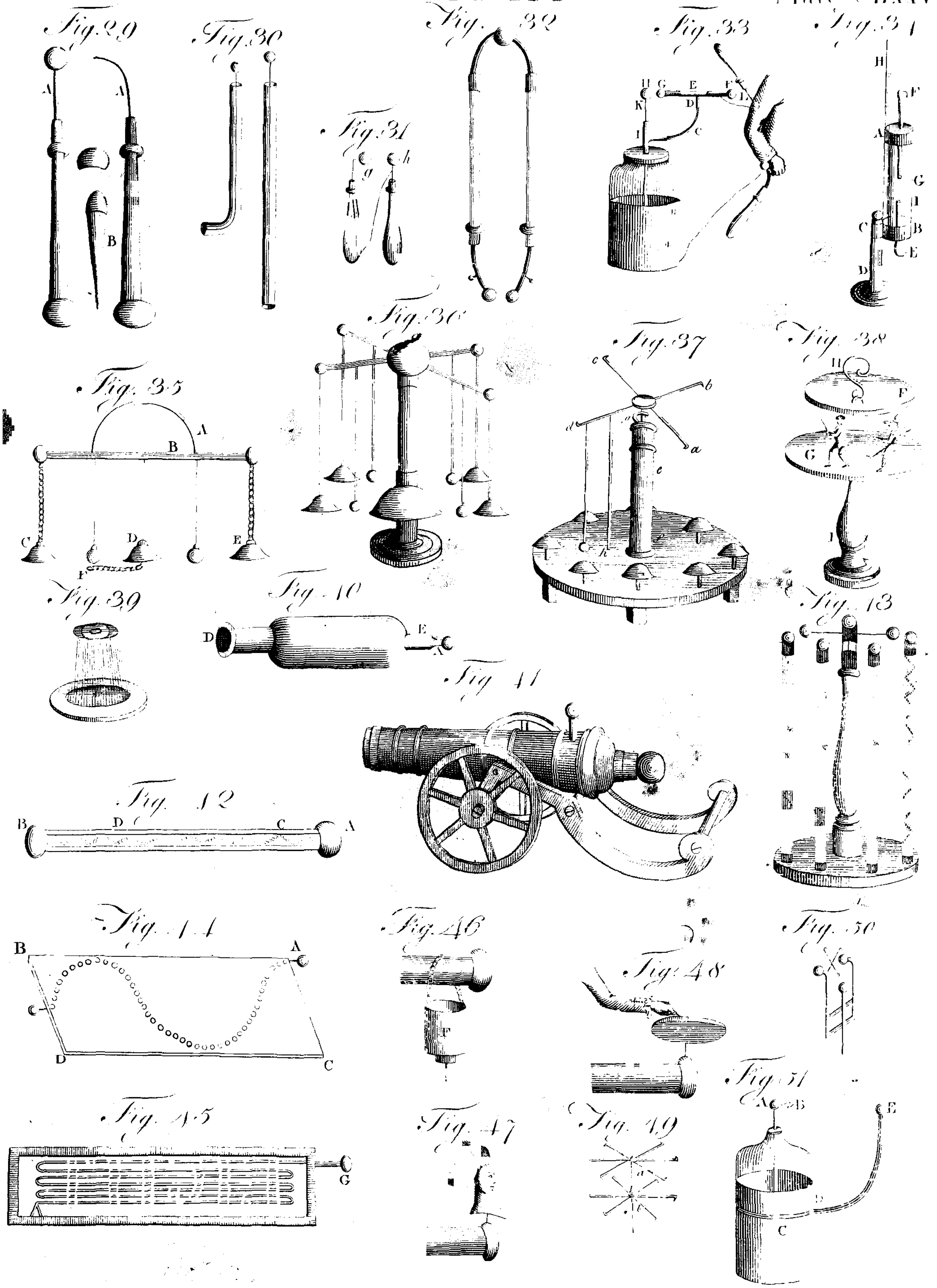
Fig. 29
Fig. 30
Fig. 31
Fig. 32
Fig. 33
Fig. 34
Fig. 35
Fig. 36
Fig. 37
Fig. 38
Fig. 39
Fig. 40
Fig. 41
Fig. 42
Fig. 43
Fig. 44
Fig. 45
Fig. 46
Fig. 47
Fig. 48
Fig. 49
Fig. 50
Fig. 51

Scot, Philad.

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which it receives the electric fluid, when set near the excited cylinder of the electric machine, and the other has a knobbed wire *G*, from which a strong spark may be drawn; and from each of the pieces *FD*, *BE*, a knobbed wire proceeds within the cavity of the glass tube. The brass piece *FD*, or *BE*, is composed of two parts; *i. e.* a cap *F* cemented to the glass tube, and having a hole with a valve, by which the cavity of the glass tube is exhausted of air; and the ball *D*, which is screwed upon the cap *F*. The supporters of this instrument are two glass pillars fastened in the bottom-board *H*, like the supporters of the prime conductor. When the glass tube of this conductor is exhausted of air by means of an air-pump, and the brass ball is screwed on, as represented in the figure, then it is fit for use, and may serve for a prime conductor to an electrical machine. If the point *C* of this conductor is set near the excited cylinder of the machine, it will appear illuminated with a star; at the same time the glass tube will appear illuminated with a weak light; but from the knobbed wire that proceeds within the glass from the piece *FD*, a lucid pencil will issue out, and the opposite knob will appear illuminated with a star, which, as well as the pencil of rays, is very clear, and discernible among the other light that occupies the greatest part of the cavity of the tube. If the point *C*, instead of being presented to the cylinder, be connected with the rubber of the machine, the appearance of light within the tube will be reversed; the knob which communicates with the piece *FD* appearing illuminated with a star, and the opposite with a pencil of rays; because in this case the direction of the electric fluid is just the contrary of what it was before: it then going from *D* to *B*, and now coming from *B* and going to *D*. If the wires within the tube *EF*, instead of being furnished with knobs, be pointed, the appearance of light is the same; but it seems not so strong in this as in the other case.

XI. *The Conducting Glass Tube.*

Take a glass tube of about two inches diameter, and about two feet long; fix to one of its ends a brass cap, and to the other a stop-cock or a valve; then, by means of an air-pump, exhaust it of air. If this tube be held by one end, and its other end be brought near the electrified prime conductor, it will appear to be full of light whenever a spark is taken by it from the prime conductor, and much more so if an electric jar be discharged through it. The experiment may also be made with the receiver of an air-pump: take, for instance, a tall receiver, clean and dry; and through a hole at its top insert a wire, which must be cemented air tight. The end of the wire that is within the tube must be pointed, but not very sharp; and the other end must be furnished with a knob. Put this receiver upon the plate of the air-pump, and exhaust it. If now the knob of the wire at the top of the receiver be touched with the prime conductor, every spark will pass through the receiver in a dense and large body of light, from the wire to the plate of the air-pump. When any thing is to be touched with the prime conductor that is not very portable, as the air-pump abovementioned, the communication between the former and the latter may be made by means of a rod furnished with an electric handle, or the like.

XII. *The Aurora Borealis.*

Plate CLXXIV. fig. 21.

Take a phial nearly of the shape and size of a Florence flask; fix a stop-cock or a valve to its neck, and exhaust it of air as much as possible with a good air-pump. If this glass is rubbed in the common manner used to excite electrics, it will appear luminous within, being full of a flashing light, which plainly resembles the aurora borealis or northern light. This phial may also be made luminous, by holding it by either end, and bringing the other end to the prime conductor; in this case, all the cavity of the glass will instantly appear full of flashing light, which remains in it for a considerable time after it has been removed from the prime conductor. Instead of the above-described glass vessel, a glass tube exhausted of air and hermetically sealed may be used, and perhaps with better advantage. The most remarkable circumstance of this experiment is, that if the phial, or tube, after it has been removed from the prime conductor (and even several hours after its flashing light hath ceased to appear), be grasped with the hand, strong flashes of light will immediately appear within the glass, which often reach from one of its ends to the other.

XIII. *The Visible Electric Atmosphere.*

Plate CLXXIV.

GI, fig. 26. represents the receiver with the plate of an air-pump. In the middle of the plate *IF*, a short rod is fixed, having at its top a metal ball *B* nicely polished, whose diameter is nearly two inches. From the top of the receiver, another rod *AD*, with a like ball *A*, proceeds, and is cemented air-tight in the neck *C*; the distance of the balls from one another being about four inches, or rather more. If, when the receiver is exhausted of air, the ball *A* be electrified positively, by touching the top *D* of the rod *AD* with the prime conductor, or an excited glass tube, a lucid atmosphere appears about it, which although it consists of a feeble light, is yet very conspicuous, and very well defined; at the same time, the ball *B* has not the least light. This atmosphere does not exist all round the ball *A*; but reaches from about the middle of it, to a small distance beyond that side of its surface which is towards the opposite ball *B*. If the rod with the ball *A* be electrified negatively, then a lucid atmosphere, like the above described, will appear upon the ball *B*, reaching from its middle to a small distance beyond that side of it that is towards the ball *A*; at the same time the negatively electrified ball *A* remains without any light. The operator in this experiment must be careful not to electrify the ball *A* too much; for then the electric fluid will pass in a spark from one ball to the other, and the experiment will not have the desired effect. A little practice, however, will render the operation very easy and familiar.

XIV. *Of charging and discharging a Phial in general.*

Plate CLXXIV.

Make a coated jar, and place it upon the table near the prime conductor, so that the knob of its wire, and that only, may be in contact with it: fix the quadrant electrometer fig. 15. upon the prime conductor, and then turn the winch of the machine. You will observe, that as the jar is charging, the index of the electrometer

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lectrometer will rise gradually as far as 90°, or thereabouts, and then rest: when this happens, you may conclude that the jar has received its full charge. If now you take a discharging rod, and holding it by the glass handle, apply first one of its knobs to the outside coating of the jar, and then bring the other knob near the knob of the wire of the jar, or near the prime conductor that communicates with it, you will hear a report, and see very vivid sparks between the discharging rod and the conducting substances, communicating with the sides of the jar. This operation discharges the jar. If, instead of using the discharging rod, you touch the outside of the jar with one hand, and bring the other hand near the wire of the jar, the same spark and report will follow; but now you will feel a shock which affects your wrists, elbows, and if strong, your breast also. If a number of persons join hands, and the first of them touches the outside of the jar, and the last touches the wire communicating with the inside, they will all feel the shock, and precisely at the same perceivable time. This shock, bearing no resemblance to any sensation otherwise felt, cannot consequently be described; and in order that a person may form a just idea of it, he must absolutely feel it. A shock may be given to any single part of the body, if that part only be brought into the circuit.

XV. *The Leyden Vacuum*

Plate CLXXIV.

Fig. 22. 23. represent a small phial coated on the outside, about three inches up the sides, with tin-foil; at the top of the neck of this phial, a brass cap is cemented, having a hole with a valve, and from the cap a wire proceeds a few inches within the phial, terminating in a blunt point. When this phial is exhausted of air, a brass ball is screwed upon the brass cap, which is cemented into its neck, so as to defend the valve, and prevent any air from getting into the exhausted glass. This phial exhibits clearly the direction of the electric fluid, both in charging and discharging; for if it be held by its bottom, and its brass knob be presented to the prime conductor positively electrified, you will see that the electric fluid causeth the pencil of rays to proceed from the wire within the phial, as represented fig. 22.; and if it is discharged, a star will appear in the place of the pencil, as represented in fig. 23. But if the phial is held by the brass cap, and its bottom be touched with the prime conductor, then the point of the wire on its inside will appear illuminated with a star when charging, and with a pencil when discharging. If it be presented to a prime conductor electrified negatively, all these appearances, both in charging and discharging, will be reversed.

The apparatus represented fig. 25. will be found very convenient for the various experiments upon the luminous conductor, Leyden vacuum, jars charged positively or negatively, with their different states of insulation. *A* is an insulating pillar of glass, which is screwed to the wooden foot *B*; and on this pillar all the apparatus may be screwed alternately. *CD* is an exhausted tube of glass, furnished at each end with brass caps; at the end *D* is a valve properly secured under the brass plate; a brass wire with a ball projects from the upper cap; a pointed wire proceeds from the bottom plate; and this tube is called the *luminous conductor*. The flask represented at *E* is called the *Leyden vacuum*. It is furnished with a valve under the ball *E*; to come at which the more readily, the ball may be unscrewed: a wire, with a blunt end, projects to within a little of the bottom of the flask, the latter being coated with tin-foil; and a female screw is cemented to the bottom, in order to screw it on the pillar *A*. *F* is a syringe to exhaust the air occasionally, either from the luminous conductor or the Leyden vacuum. To do this, unscrew the ball of the Leyden vacuum, or the plate of the luminous conductor, and then screw the syringe in the place of either of these pieces, being careful that the bottom of the female screw *G* bears close against the leather which covers the shoulders *a b c d*; then work the syringe, and in a few minutes the glasses will be sufficiently exhausted. *H* and *I* are two Leyden bottles; each of which has a female screw fitted to the bottom, in order that they may be conveniently screwed on the pillar *A*; and the bottle *H* is furnished with a belt by which it may be screwed sidewise to the same. *K* and *L* are two small wires, to be screwed occasionally either into the ball *E*, the knobs *e* or *f*, the cap *c*, or the socket *g* on the top of the pillar: the balls may be unscrewed from these wires, which will then exhibit a blunt point. *M* is a wooden table to be screwed occasionally on the glass pillar.

XVI. *To pierce a Card and other Substances with the Electric Explosion.*

Take a card, a quire of paper, or the cover of a book, and keep it close to the outside coating of a charged jar; put one knob of the discharging rod upon the card, quire of paper, &c. so that between the knob and coating of the jar the thickness of that card, or quire of paper, only is interposed; lastly, by bringing the other knob of the discharging rod near the knob of the jar, make the discharge, and the electric matter will pierce a hole (or perhaps several) quite through the card or quire of paper. This hole has a bur raised on each side, except the card, &c. be pressed hard between the discharging rod and the jar; which shows that the hole is not made in the direction of the passage of the fluid, but in every direction from the centre of the resisting body. If this experiment be made with two cards instead of one, which however must be kept very little distant from one another, each of the cards after the explosion, will be found pierced with one or more holes, and each hole will have burs on both surfaces of each card. The hole, or holes, are larger or smaller, according as the card, &c. is more damp or more dry. It is remarkable, that if the nostrils are presented to it, they will be affected with a sulphureous, or rather a phosphoreal, smell, just like that produced by an excited electric.

If, instead of this paper, a very thin plate of glass, rosin, sealing-wax, or the like, be interposed between the knob of the discharging rod and the outside coating of the jar, on making the discharge, this will be broken in several pieces. Small insects may also be killed in this manner. They may be held between the outside coating of the jar and the knob of the discharging rod, like the above card; and a shock of a common phial sent through them, will instantly deprive them of

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of life, if they are pretty small: but if larger, they will be affected in such a manner, as to appear quite dead on first receiving the stroke; but will, after some time recover: this, however, depends on the quantity of the charge sent through them.

XVII. *To show the Effect of the Shock sent over the Surface of a Card or other Substances.*

Put the extremities of two wires upon the surface of a card, or other body of an electric nature, so that they may be in one direction, and about one inch distance from one another; then, by connecting one of the wires with the outside of a charged jar, and the other wire with the knob of the jar, the shock will be made to pass over the card or other body. If the card be made very dry, the lucid track between the wires will be visible upon the card for a considerable time after the explosion. If a piece of common writing paper be used instead of the card, it will be torn by the explosion into very small bits.

If, instead of the card, the explosion is sent over the surface of a piece of glass, this will be marked with an indelible track, which generally reaches from the extremity of one of the wires to the extremity of the other. In this manner, the piece of glass is very seldom broken by the explosion. But Mr Henley has discovered a very remarkable method to increase the effect of the explosion upon the glass; which is by pressing with weights that part of the glass which lies between the two wires (*i. e.* that part over which the shock is to pass). He puts first a thick piece of ivory upon the glass, and places upon that ivory a weight at pleasure, from one quarter of an ounce to six pounds: The glass in this manner is generally broken by the explosion into innumerable fragments, and some of it is absolutely reduced into an impalpable powder. If the glass is very thick, and resists the force of the explosion, so as not to be broken by it, it will be found marked with the most lively prismatic colours, which are thought to be occasioned by very thin laminæ of the glass, in part separated from it by the shock. The weight laid upon the glass is always shook by the explosion, and sometimes it is thrown quite off from the ivory. This experiment may be most conveniently made with the universal discharger, fig. 8.

XVIII. *To swell Clay, and break small Tubes, by the Electric Explosion.*

Roll up a piece of soft tobacco-pipe clay in a small cylinder, and insert in it two wires, so that their ends without the clay may be about a fifth part of an inch from one another. If a shock be sent through this clay, by connecting one of the wires with the outside of a charged jar, and the other with the inside, it will be inflated by the shock, *i. e.* by the spark, that passes between the two wires, and, after the explosion, will appear swelled in the middle. If the shock sent through it is too strong, and the clay not very moist, it will be broken by the explosion, and its fragments scattered in every direction. To make this experiment with a little variation, take a piece of the tube of a tobacco-pipe, about one inch long, and fill its bore with moist clay; then insert in it two wires, as in the above rolled clay; and send a shock through it. This tube will not fail to burst by the force of the explosion, and its frgments will be scattered about to a great distance. If, instead of clay, the abovementioned tube of the tobacco-pipe, or a glass tube (which will answer as well), be filled with any other substance, either electric or non-electric, inferior to metal, on making the discharge, it will be broken in pieces with nearly the same force. This experiment is the invention of Mr Lane, F. R. S.

XIX. *To make the Electric Spark visible in Water.*

Fill a glass tube of about half an inch in diameter, and six inches long, with water; and to each extremity of the tube adapt a cork, which may confine the water; through each cork insert a blunt wire, so that the extremities of the wires within the tube may be very near one another; lastly, connect one of these wires with the coating of a small charged phial, and touch the other wire with the knob of it; by which means the shock will pass through the wires, and cause a vivid spark to appear between their extremities within the tube. In performing this experiment, care must be taken that the charge be exceedingly weak, otherwise the tube will burst. If we place in a common drinking glass, almost full of water, two knobbed wires, so bent, that their knobs may be within a little distance of one another in the water, and if one of these wires be connected with the outside coating of a pretty large jar, and the other wire be touched with the knob of it; the explosion which must pass through the water from the knob of one of the wires to that of the other, will disperse the water, and break the glass with a surprising violence. This experiment is very dangerous if not conducted with great caution.

XX. *To fire Gun-powder.*

Make a small cartridge of paper, and fill it with gun-powder, or else fill the tube of a quill with it; insert two wires, one at each extremity, so that their ends within the quill, or cartridge, may be about one fifth of an inch from one another: this done, send the charge of a phial through the wires; and the spark between their extremities, that are within the cartridge, or quill, will set fire to the gun-powder. If the gun-powder be mixed with steel-filings, it will take fire more readily, and with a very small shock.

XXI. *To strike Metals into Glass.*

Take two slips of common window-glass about three inches long, and half an inch wide; put a small slip of gold, silver, or brass leaf, between them, and tie them together, or else press them together between the boards of the press *H*, belonging to the universal discharger fig. 8, 9. Plate CLXXIV. leaving a little of the metallic leaf out between the glasses at each end; then send a shock through this metallic leaf, and the force of the explosion will drive part of the metal into so close a contact with the glass, that it cannot be wiped off, or even be affected by the common menstrua which otherwise would dissolve it. In this experiment the glasses are often shattered to pieces; but whether they are broken or not, the indelible metalliic tinge will always be found in several places, and sometimes thro' the whole length of both glasses.

XXII. *To stain Paper or Glass.*

Lay a chain, which forms a part of the circuit between the two sides of a charged jar, upon a sheet of white paper; and if a shock be sent through it, the paper will be found stained with a blackish tinge at the very juncture of the links. If the charge be very large, the paper, instead of being stained with spots, is burnt through. If the chain be laid upon a pane of glass instead of paper, the glass will often be found stained with spots in several places, but (as might be expected) not so deep as the paper. If this experiment be made in the dark, a spark will be seen at every juncture of the links; and if the links are small, and the shock pretty strong, the chain will appear illuminated like a line of fire.

XXIII. *The Lateral Explosion.*

If a jar be discharged with a discharging rod that has no electric handle, the hand that holds it, in making the discharge, feels some kind of shock, especially when the charge is considerable. In other words: A person, or any conducting substance, that is connected with one side of a jar, but forms no part of the circuit, will feel a kind of shock, *i. e.* some effect of the discharge. This may be rendered visible in the following manner. Connect with the outside of a charged jar a piece of chain; then discharge the jar thro' another circuit, as for instance with a discharging rod in the common way, and the chain that communicates with the outside of the jar, and which makes no part of the circuit, will appear lucid in the dark, *i. e.* sparks will appear between the links; which shows, that the electric fluid, natural to that chain, must by some means have been disturbed. This chain will also appear luminous, if it is not in contact with the outside of the jar, but only very near it; and on making the discharge a spark will be seen between the jar and the end of the chain near it. This electrical appearance out of the circuit of a discharging jar, is that which we call the *lateral explosion*; and to make it appear in the most conspicuous manner, observe the following method, which is that of Dr. Priestley.

When a jar is charged, and stands upon the table as usual, insulate a thick metallic rod, and place it so that one of its ends may be contiguous to the outside coating of the jar; and within about half an inch of its other end place a body of about six or seven feet in length, and a few inches in breadth: then put a chain upon the table, so that one of its ends may be about an inch and a half distant from the coating of the jar: at the other end of the chain apply one knob of the discharging rod, and bring the other knob to the wire of the jar, in order to make the explosion. On making the discharge in this manner, a strong spark will be seen between the insulated rod, which communicates with the coating of the jar and the body near its extremity, which spark does not alter the state of that body in respect to electricity. Whether this lateral explosion is received on flat and smooth surfaces, or upon sharp points, the spark is always equally long and vivid.

XXIV. *To discharge a Jar silently.*

When a large jar is fully charged, which would give a terrible shock, put one of your hands in contact with its outside coating; with the other hold a sharp pointed needle, and keeping the point directed towards the knob of the jar, proceed gradually near it, until the point of the needle touches the knob. This operation discharges the jar entirely; and you will either receive no shock at all, or so small a one as can hardly be perceived. The point of the needle, therefore, has silently and gradually drawn all the superfluous fluid from the inside surface of the electric jar.

XXV. *Drawing the Electricity from the Prime Conductor by a Point.*

Let a person hold the knob of a brass rod at such a distance from the prime conductor, that sparks may easily fly from the latter to the former, when the machine is in motion. Then let the winch be turned; and while the sparks are following one another, present the sharp point of a needle at nearly twice the distance from the prime conductor, that the knobbed rod is held; and you will observe that no more sparks will go to the rod:—remove the needle entirely, and the sparks will be seen again;—present the needle, and the sparks disappear: which evidently shows, that the point of the needle draws off silently almost all the fluid that the cylinder throws upon the prime conductor.

If the needle be fixed upon the prime conductor with the point outward, and the knob of a discharging rod, or the knuckle of a finger, be brought very near the prime conductor, though the excitation of the cylinder may be very strong, yet you will perceive that no spark, or an exceeding small one, can be obtained from the prime conductor.

XXVI. *The Electrified Cotton.*

Take a small lock of cotton, extended in every direction as much as conveniently can be done; and by a linen thread about five or six inches long, or by a thread drawn out of the same cotton, tie it to the end of the prime conductor: then let the winch of the machine be turned, and the lock of cotton, on being electrified, will immediately swell, by repelling its filaments from one another, and will stretch itself towards the nearest conductor. In this situation let the winch be kept turning, and present the end of your finger, or the knob of a wire, towards the lock of cotton, which will then immediately move towards the finger, and endeavour to touch it; but take with the other hand a pointed needle, and present its point towards the cotton, a little above the end of the finger, and you will observe the cotton immediately to shrink upward, and move towards the prime conductor.—Remove the needle, and the cotton will come again towards the finger. Present the needle, and the cotton will shrink again.

XXVII. *The Electrified Bladder.*

Take a large bladder well blown, and cover it with gold, silver, or brass leaf, sticking it with gum-water: suspend the bladder at the end of a silk thread, at least six or seven feet long, hanging from the ceiling of the room; and electrify the bladder, by giving it a strong spark with the knob of a charged bottle: this done, take a knobbed wire, and present it to the bladder when motionless; and you will perceive, that as the knob ap-

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approaches the bladder, the bladder also moves towards the knob, and, when nearly touching it, gives it the spark which it received from the charged phial, and thus it becomes unelectrified. Give it another spark, and, instead of the knobbed wire, present the point of a needle towards it, and you will perceive that the bladder will not be attracted by, but rather recede from, the point, especially if the needle be very suddenly presented towards it.

XXVIII. *The Spider seemingly animated by Electricity.*

Plate CLXXV.

FIG. 51. represents an electric jar, having a wire *C D E* fastened on its outside, which is bended so as to have its knob *E* as high as the knob *A*.—*B* is a spider made of cork, with a few short threads run thro' it to represent its legs. The spider is fastened at the end of a silk thread, proceeding from the ceiling of the room, or from any other support, so that the spider may hang mid-way between the two knobs *A, E,* when the jar is not charged. Let the place of the jar upon the table be marked; then charge the jar, by bringing its knob *A* in contact with the prime conductor, and replace it in its marked place. The spider will now begin to move from knob to knob, and continue this motion for a considerable time, sometimes for several hours.

The inside of the jar being charged positively, the spider is attracted by the knob *A,* which communicates to it a small quantity of electricity; the spider then becoming possessed of the same electricity with the knob *A,* is repelled by it, and runs to the knob *E,* where it discharges its electricity, and is then attracted by the knob *A,* and so on. In this manner the jar is gradually discharged; and when the discharge is nearly completed, the spider finishes its motion.

XXIX. *The Dancing Balls.*

FIX a pointed wire upon the prime conductor, with the point outward; then take a glass tumbler, grasp it with your hands, and present its inside surface to the point of the wire upon the prime conductor while the machine is in motion: the glass in this manner will soon become charged; for its inside surface acquires the electricity from the point, and the hands serve as a coating for the outside. This done, put a few pith-balls upon the table, and cover them with this charged glass tumbler. The balls will immediately begin to leap up along the sides of the glass as represented fig. 39. and will continue their motion for a considerable time.

XXX. *The Electrical Jack.*

THIS is an invention of Dr Franklin's, and turns with considerable force, so that it may sometimes be used for the purposes of a common jack. A small upright shaft of wood passes at right angles through a thin round board of about 12 inches diameter, and turns on a sharp point of iron fixed in the lower end, while a strong wire in the upper end, passing through a small hole in a thin brass plate, keeps the shaft truly vertical. About 30 radii, of equal length, made of sash-glass cut into narrow slips, issue horizontally from the circumference of the board, the ends most distant from the centre being about four inches apart. On the end of every one a brass thimble is fixed. If now the wire of a bottle electrified in the common way be brought near the circumference of this wheel, it will attract the nearest thimble, and so put the wheel in motion. That thimble, in passing by, receives a spark; and thereby being electrified, is repelled, and so driven forwards; while a second, being attracted, approaches the wire, receives a spark, and is driven after the first; and so on, till the wheel has gone once round; when the thimbles before electrified approaching the wire, instead of being attracted, as they were at first, are repelled, and the motion presently ceases. But if another bottle which had been charged through the coating, or otherwise negatively electrified, is placed near the same wheel, its wire will attract the thimble repelled by the first, and thereby double the force that carries the wheel round. The wheel therefore moves very swiftly, turning round 12 or 15 times in a minute, and with such force, that a large foul spitted on the upper shaft may be roasted by means of it.

XXXI. *The Self-moving Wheel.*

THIS appears more surprising than the former, tho' constructed upon the same principles. It is made of a thin round plate of window-glass 17 inches in diameter, well gilt on both sides, all but two inches next the edge. Two small hemispheres of wood are then fixed with cement to the middle of the upper and under sides, centrally opposite; and in each of them a strong thick wire eight or ten inches long, which together make the axis of the wheel. It turns horizontally on a point at the lower end of its axis, which rests on a bit of brass cemented within a glass salt-celler. The upper end of its axis passes through a hole in a thin brass plate, cemented to a long and strong piece of glass; which keeps it six or eight inches distant from any non-electric, and has a small ball of wax or metal on its top to keep in the fire.

In a circle on the table which supports the wheel, are fixed 12 small pillars of glass, at about 11 inches distance, with a thimble on the top of each. On the edge of the wheel is a small leather bullet, communicating by a wire with the gilding of the upper surface of the wheel; and about six inches from it is another bullet communicating in like manner with the under surface. When the wheel is to be charged by the upper surface, a communication must be made from the under surface to the table. As soon as it is well charged, it begins to move. The bullet nearest to a pillar moves towards the thimble on that pillar; and, passing by, electrifies it, and is then repelled from it. The succeeding bullet, which communicates with the other surface of the glass, more strongly attracts that thimble on account of its being electrified before by the other bullet; and thus the wheel increases its motion, till the resistance of the air regulates it. It will go half an hour; and make, one minute with another, 20 turns in a minute, which is 600 times in the whole; the bullet in the upper surface giving in each turn 12 sparks to the thimbles, making in all 2500 sparks; while the same quantity of fire is thought to be received by the under bullet. The whole space moved over by these bullets in the mean time is 2500 feet. If, instead

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instead of two bullets, you put eight, four communicating with the upper and four with the under surface, the force and swiftness will be greatly increased, and the wheel will make about 50 turns in a minute: but then it will not continue moving for such a long time. These wheels may be applied to the ringing of chimes, and the moving of small orreries, &c.

XXXII. *The Magic Picture.*

Plate CLXXVI. fig. 57.

This is a contrivance of Mr Kinnersley; and is perhaps more calculated to give surprise than any other experiment in electricity. It is made in the following manner: Having a large mezzotinto, with a frame and glass (suppose of a king), take out the print, and cut a pannel out of it near two inches distant from the frame all round. If the cut be through the picture, it is nothing the worse. With thin paste, or gum-water, fix the board that is cut off on the inside of the glass, pressing it smooth and close; then fill up the vacancy, by gilding the glass well with leaf-gold or brass. Gild likewise the inner edge of the back of the frame all round, except the top part, and form a communication between that gilding and the gilding behind the glass; then put in the board, and that side is finished. Turn up the glass, and gild the foreside exactly over the back gilding; and when it is dry, cover it, by pasting on the pannel of the picture that has been cut out; observing to bring the corresponding parts of the board and picture together, by which the picture will appear of a piece as at first; only part is behind the glass and part before. Lastly, hold the picture horizontally by the top, and place a little moveable gilt crown on the king's head. If now the picture is moderately electrified, and another person take hold of the frame with one hand, so that his fingers touch its inside gilding, and with the other endeavour to take off the crown, he will receive a terrible blow, and fail in the attempt. The operator, who holds the picture by the upper end, where the inside of the frame is not gilt, to prevent its falling, feels nothing of the shock; and may touch the face of the picture without danger, which he pretends to be a test of his loyalty.

XXXIII. *The Thunder-house.*

Fig. 52. is an instrument representing the side of a house, either furnished with a metallic conductor, or not; by which both the bad effects of lightning striking upon a house not properly secured, and the usefulness of metallic conductors, may be clearly represented. *A* is a board about three quarters of an inch thick, and shaped like the gable-end of a house. This board is fixed perpendicularly upon the bottom-board *B*, upon which the perpendicular glass pillar *C D* is also fixed in a hole about eight inches distant from the basis of the board *A*. A square hole *I L M K*, about a quarter of an inch deep, and nearly one inch wide, is made in the board *A*, and is filled with a square piece of wood nearly of the same dimensions. It is mentioned nearly of the same dimensions, because it must go so easily into the hole, that it may drop off by the least shaking of the instrument. A wire *L K* is fastened diagonally to this square piece of wood. Another wire *I H* of the same thickness, having a brass ball *H*, screwed on its pointed extremity, is fastened upon the board *A*; so also is the wire *M N*, which is shaped in a ring at *O*. From the upper extremity of the glass pillar *C D*, a crooked wire proceeds, having a spring socket *F*, through which a double knobbed wire slips perpendicularly, the lower knob *G* of which falls just above the knob *H*. The glass pillar *D C* must not be made very fast into the bottom board; but it must be fixed so as it may be pretty easily moved round its own axis; by which means the brass ball *G* may be brought nearer or farther from the ball *H*, without touching the part *E F G*. Now when the square piece of wood *L M I K* (which may represent the shutter of a window or the like) is fixed into the hole so, that the wire *L K* stands in the dotted representation *I M*, then the metallic communication from *H* to *O* is complete, and the instrument represents a house furnished with a proper metallic conductor: but if the square piece of wood *L M I K* is fixed so, that the wire *L K* stands in the direction *L K*, as represented in the figure, then the metallic conductor *H O*, from the top of the house to its bottom, is interrupted at *I M*, in which case the house is not properly secured.

Fix the piece of wood *L M I K* so, that its wire may be as represented in the figure, in which case the metallic conductor *H O* is discontinued. Let the ball *G* be fixed at about half an inch perpendicular distance from the ball *H*; then, by turning the glass pillar *D C*, remove the former ball from the latter; by a wire or chain connect the wire *E F* with the wire *Q* of the jar *P*, and let another wire or chain, fastened to the hook *O*, touch the outside coating of the jar. Connect the wire *Q* with the prime conductor, and charge the jar; then, by turning the glass pillar *D C*, let the ball *G* come gradually near the ball *H*; and when they are arrived sufficiently near one another, you will observe that the jar explodes, and the piece of wood *L M I K* is pushed out of the hole to a considerable distance from the thunder-house. Now the ball *G*, in this experiment, represents an electrified cloud, which, when it is arrived sufficiently near the top of the house *A*, the electricity strikes it; and as this house is not secured with a proper conductor, the explosion breaks off a part, *i. e.* knocks off the piece of wood *I M*.

Repeat the experiment with only this variation, *viz.* that this piece of wood *I M* is situated so, that the wire *L K* may stand in the situation *I M*, in which case the conductor *H O* is not discontinued; and you will observe, that the explosion will have no effect upon the piece of wood *L M*, thus remaining in the hole unmoved; which shows the usefulness of the metallic conductor.

Further. Unscrew the brass ball *H* from the wire *H I*, so that this may remain pointed. With this difference only in the apparatus, repeat both the above experiments; and you will find that the piece of wood *I M* is in neither case moved from its place, nor any explosion will be heard; which not only demonstrates the preference of the conductors with pointed termination to those with blunted ones; but also shows that a house furnished with sharp terminations, although not furnished with a regular conductor, is almost sufficiently guarded against the effects of lightning.

This apparatus is sometimes made in the shape of a house, as represented fig. 53. where, for the sake of di-

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Plate CLXXVI.

Fig. 55.

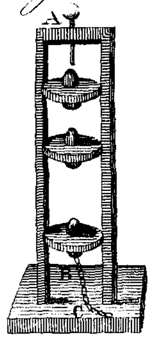


Fig. 54.

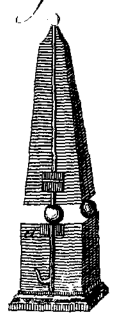


Fig. 53.

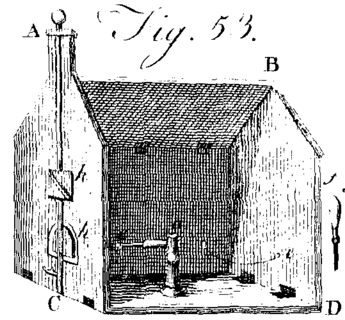


Fig. 52.

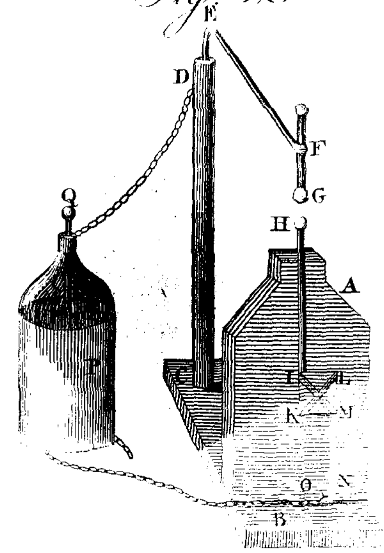


Fig 59.

Fig 58.

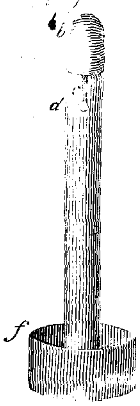


Fig. 57.

Fig. 56.

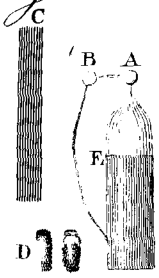


Fig. 60.

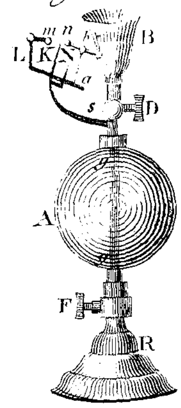


Fig. 61.

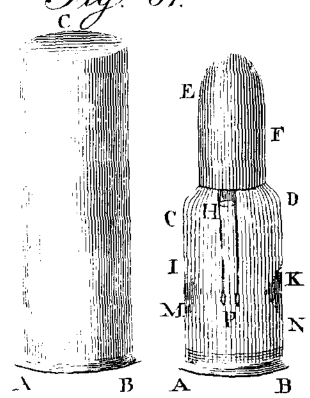


Fig. 62

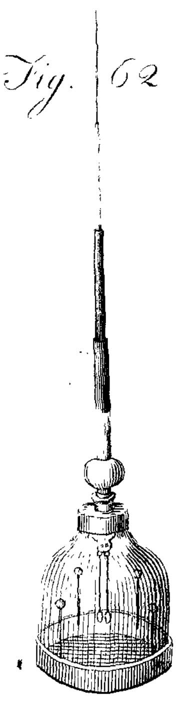


Fig. 65.

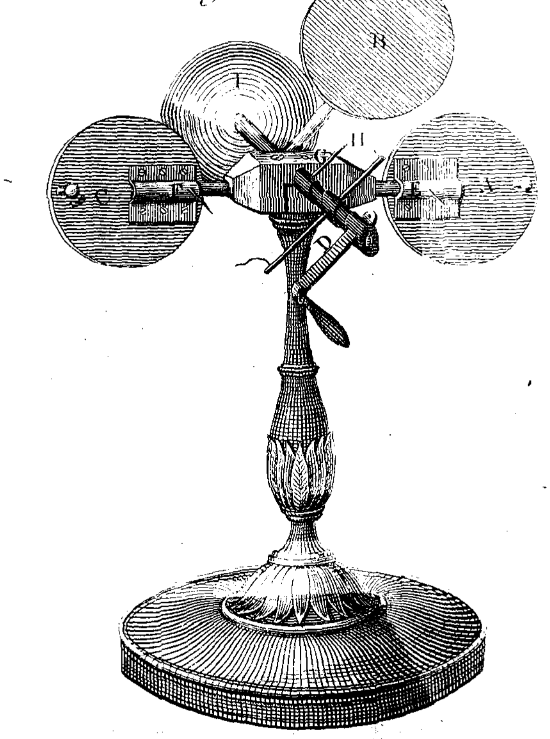
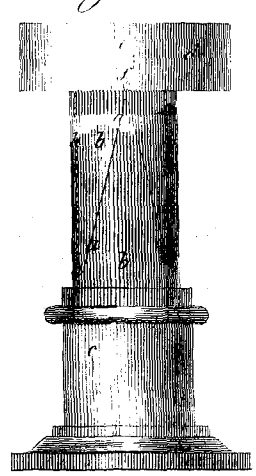


Fig. 66.

Fig. 63.

Fig. 64.



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distinctness, the side and part of the roof next the eye are not represented. The gable-end *AC* represents that of the thunder-house, and may be used in the same manner with that above described, or more readily by the following method. Let one ball of the discharging rod touch the ball of the charged jar, and the other the knob *A* of the conductor *AC* of the thunder-house; the jar will then of course explode, and the fluid will act upon the conductor just mentioned. The conducting wire at the windows *hh* must be placed in a line. The sides and gable *AC* of the house, are connected with the bottom by hinges; and the building is kept together by a ridge on the roof. To use this model, fill the small tube *a* with gunpowder, and ram the wire *c* a little way into the tube; then connect the tube *e* with the bottom of a large jar or battery. When the jar is charged, form a communication from the hook at *C*, on the outside, to the top of the jar, by the discharging rod; the discharge will fire the powder, and the explosion of the latter will throw off the rooof, with the sides, back, and front, so that they will all fall down together. The figures *f* and *g* in the side of the house represent a small ramrod for the tube *a*, and a pricker for the touch-hole at *C*. Fig. 54 represents a mahogany pyramid, by means of which the same experiment may be exhibited. It is used in a manner similar to that just now described, the piece at *a* being thrown out by the discharge; by which means the upper part falls down in three pieces.

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Mr Jones of Holborn makes the front of the common thunder-houses, as well as the powder-house above described, with two pieces of wood or windows *hh*, which, by being placed in proper situations, the one to conduct and the other to resist the fluid will illustrate by one discharge the usefulness of good conductors for securing buildings or magazines from the explosion of thunder, as well as the danger of using imperfect ones.

XXXIV. *The Electric Fly*.

This fly is composed of small brass wires, fig. 49. fixed into a cap of brass also, easily moveable upon an axis of the same metal, and exactly balanced, so that they may turn with the smallest force. The ends, which ought to be very sharp, are all bent one way, with regard to one another, as those belonging to *a*, *b*, in the figure; though the two sets of points constituting the two flies there represented, are contrary to each other; so that the whole flies must have a contrary motion. Fixing the axle with the two flies upon the prime conductor, and working the machine, both will begin to turn very swiftly, each in a direction contrary to that of the points. In this manner, with a powerful machine, a great many flies may be made to turn either in the same or in contrary directions; and by their gradual increase or decrease in size may represent a cone or other figure; for the course of each will be marked by a line of fire, and thus the whole will exhibit a beautiful appearance in the dark. The light is said to be more brilliant when the ends are slightly covered with sealing-wax, grease, or other electric matter.

In this experiment the fly will turn the same way whether the electricity be positive or negative; the reason of which will easily be conceived from the theory already laid down, viz. that in positive electricity the fluid issues from the body electrified, and that in negative electricity it enters into it. In the former case, the recoil of the fluid, which acts equally on the air and on the point from whence it issues, must continually put the point the contrary way; and in negative electricity, when the point solicits a continual draught of electric matter from the air the direct impulse of the former must also produce a motion in the point in the course in which the fluid itself moves. In vacuo no motion is produced; because there is no air on which the fluid may act when it issues from the point. In like manner, when air is inclosed in a glass vessel, the motion of the electric fly soon stops; because the fluid cannot easily get through the air and the glass, and therefore its motions are impeded so that it cannot press with force sufficient to produce motion. On applying a conductor to the outside of the glass, the fly renews its motion; because an opportunity is now given to the fluid to escape, by running through the glass. But this, for the reasons already given, must soon cease, because a contrary action of the fluid instantly begins to take place; and in a short time becomes equal to that which urges it forward from the machine. The motion of the fly, therefore, stops for the same reason that a Leyden phial becomes at last saturated and cannot receive a greater charge; and which has been already so fully discussed, that it would be superfluous to say more on the subject. Fig. 50. shows another fly which turns perpendicularly, and which will be readily understood from what has been already said.

XXXV. *The Electrified Bells*.

Plate CLXXV.

Fig. 35. represents an instrument having three bells, which are made to ring by electric attraction and repulsion. *B* is a brass rod; furnished with a ring *A* of the same metal, by which it is suspended from another rod fixed in the prime conductor. The outer bells *C* and *E* are suspended by brass chains; but the middle bell *D* and the two small brass clappers between *CD* and *DE* are suspended by silk threads. From the concave under part of the bell *D* a chain proceeds, which falls upon the table, and has a silk thread *E* at its extremity. When this apparatus is hung to the conductor by the ring *A*, and the cylinder of the machine gently turned, the clappers will fly from bell to bell with a rapid motion, and the bells will ring as long as they are kept electrified. The two bells *C* and *E* being suspended by brass chains, are first electrified: hence they attract the clappers, communicate to them a little electricity, and repel them to the unelectrified bell *D*; upon which the clappers deposite their electricity, and move again to the bells *CE*, from which they acquire more, and so on. If, by holding the silk thread *F*, the chain of the middle bell be raised from the table, the bells after ringing a little while will stop; because the bell *D* will have no opportunity of conveying the electricity it receives from the clappers to the ground, being insulated by the silk thread. In the dark, sparks will be seen between the clappers and bells.

Fig. 36. represents a set of bells more elegantly mounted, and which produce a better sound. In these the knob *a* must communicate with the conductor when the apparatus is made use of. Fig. 37. represents a

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a set of eight bells otherwise constructed. The clapper *h* is here suspended by a silken thread from the fly *a b c d*: the axis of the fly rests in a small hole on the top of a glass pillar; and its upper part moves freely in, and is confined by a hole in the brass arm *g*. To make use of these bells they must be applied to the cylinder of the machine, or at least brought very near it when the conductor is removed; so that the fly *a b c d* may be about the height of the centre of the cylinder. The latter being then put in motion, the electricity from it proceeding to the fly, will cause it to turn round in the manner described in the foregoing experiment, and the clapper attracted by each of the bells alternately in its rotation; which, if they are properly turned, will produce a pleasing and harmonious sound.

Plate CLXXV.

XXXVI. *To fire a Pistol or Cannon by Inflammable Air.*

Fig. 40. represents a brass pistol for inflammable air. It consists principally of a chamber, to the mouth *D* of which a cork is fitted: a glass tube *F* is cemented into the top of the chamber, through which a brass wire passes, and is bent within side so as to approach within an eighth part of an inch of the side. On the outside end of this wire is screwed a brass ball *A*, which serves to receive a spark from the conductor of the machine, and conduct it in that form to the inside of the pistol. The inflammable air with which the pistol is to be charged may be made in a common stone-ware or glass bottle, by mixing a handful of iron-filings with about two wine-glassfuls of water and near one of oil of vitriol. The air, when thus made, should be kept in a bottle corked up. To make use of the pistol, take out the cork from the bottle, and instantly apply the mouth of the pistol to the mouth of the bottle; and in about ten seconds it will be sufficiently charged: then remove it, and cork both the pistol and bottle with the utmost expedition: then bring the ball *A* near the prime conductor or the knob of a charged jar; and the spark that passes through the ball, and between the end of the wire withinside and the side of the chamber, will fire the inflammable air with a loud report, and drive the cork to a considerable distance. Instruments to fire inflammable air are often made in the form of a cannon with its carriage, as in fig. 41.

XXXVII. *The Spiral Tube.*

Fig. 42. represents an instrument composed of two glass tubes *C D*, one within another, and closed with two knobbed brass caps *A* and *B*. The innermost of these has a spiral row of small round pieces of tin-foil stuck upon its outside surface, and lying at about one-thirtieth of an inch from each other. If this instrument be held by one of its extremities, and its other extremity be presented to the prime conductor, every spark that it receives from the prime conductor will cause small sparks to appear between all the round pieces of tin-foil stuck upon the innermost tube; which in the dark affords a pleasing spectacle, the instrument appearing encompassed by a spiral line of fire.

Fig. 43. represents several spiral tubes placed round a board, in the middle of which is screwed a glass pillar, and on the top of this pillar is cemented a brass cap with a fine steel point. In this a brass wire turns, having a brass ball at each end, nicely balanced on the wire. To make use of this apparatus, place the middle of the turning wire under a ball proceeding from the conductor, so that it may receive a succession of sparks from the ball; then push the wire gently round; and the balls in their relative motions will give a spark to each tube, and thereby illuminate them down to the board, which from its brilliancy and rapid motion affords a most beautiful and pleasing sight.

Entertaining Experiments.

The small pieces of tin-foil are sometimes stuck on a flat piece of glass *A B C D*, fig. 44. so as to represent various fanciful figures. Upon the same principle is the luminous word *light* produced. It is formed by the small separations of the tin-foil pasted on a piece of glass fixed in a frame of baked wood, as represented fig. 45. To use this, the frame must be held in the hand, and the ball *G* presented to the conductor. The spark then will be exhibited in the intervals composing the word; from whence it passes to the hook at *h*, and thence to the ground by a chain. The brilliancy of this is equal to that of the spirals.

XXXVIII. *To fire a Piece of Iron-wire in Dephlogisticated Air.*

The apparatus for this is represented fig. 28. n° 2. where the wire is twisted into a spiral figure. When this is done, it may easily be inserted in the brass knob *D*. The jar comes out of the bottom *C*, and is filled with the dephlogisticated air, as directed under the article Aerology. The electricity of a common jar being then instantly sent down through the ball and wire at *A*, an explosion takes place betwixt the end of the small wire and the lower ball *B*, which sets the end of the former on fire. It burns with remarkable brightness; and by reason of the spiral shape into which it is twisted, shows the appearance of a small sun moving from the top to the bottom of the jar, and slowly moving round as the wire, which is of a spiral shape, gradually burns away.

Plate CLXXIV.

XXXIX. *The Electrified Capillary Syphon.*

Let a small bucket of metal filled with water be suspended from the prime conductor, and put in a glass syphon so narrow in the extremity that the water may just drop from it. If in this disposition of the apparatus the winch of the machine be turned, the water, which when not electrified run out only by drops, will now run in a full stream, or even be subdivided into smaller streams; and if the experiment be made in the dark, the appearance will be very beautiful. The same phenomenon will be exhibited by a small bucket with a jet, as represented fig. 46. or the experiment may be agreeably varied, by hanging one bucket from a positive conductor and another from a negative one; so that the ends of the tubes or jets may be about three or four inches from each other. The stream issuing from the one will be attracted by that issuing from the other, and both will unite into one; but though both are luminous in the dark before meeting, the united stream will not be so unless the one electricity has been stronger than the other.

Plate CLXXV.

XL. *To illuminate Eggs.*

Fig. 55. represents a mahogany stand so constucted as to hold three eggs at a greater or smaller distance, according to the position of the sliding pieces. A chain *C* is placed at the bottom in such a manner as to

Plate CLXXVI.

Entertaining Experiments. to touch the bottom of the egg at *B* with one end, and with its other the outside coating of a charged jar. The sliding wire *A* at top is made to touch the upper egg; and the distance of the eggs asunder should not exceed the quarter or eighth part of an inch. The electricity being by means of the discharging rod sent down the ball and wire at *A*, will in a darkened room render the eggs very luminous and transparent, as has already been mentioned.

XLI. *To render Ivory or Boxwood luminous.*

PLACE an ivory ball on the prime conductor of the machine, and take a strong spark, or send the charge of a Leyden bottle through its centre, the ball will appear perfectly luminous; but if the charge be not taken through the centre, it will pass over the surface of the ball and corrode it. A spark taken through a ball of boxwood not only illuminates the whole, but makes it appear of a beautiful crimson or rather fine scarlet colour.

XLII. *To illuminate Water.*

CONNECT one end of a chain with the outside of a charged jar, and let the other lie upon the table. Place the end of another piece of chain at about one quarter of an inch from the former; then set a decanter of water on these separated ends; and on making a discharge, the water will apper perfectly and beautifully luminous.

XLIII. *To make a beautiful Appearance* in vacuo.

Plate CLXXVI. FIG. 58. represents a glass barometer tube, having on the end *b* a steel cap fastened to the glass with cement. From this proceed a wire and ball *c d*. Fill this tube with quicksilver; and then by sending up a large bubble of air, and repeatedly inverting the tube, free the quicksilver and iron ball from air: then put a small drop of ether on the quicksilver, and put the finger on the end of the glass tube; and then invert the end *f* in a bason of quicksilver, taking care not to remove the finger from the end of the tube till the latter be immerged under the surface of the quicksilver. When the finger is removed, the mercury will descend, and the ether expand itself; present the metallic top of the tube to a large charged conductor, and a beautiful green spark will pass through the vapour of the ether from the ball *d* to the quicksilver. By admitting a small quantity of air into the tube, an appearance something like a falling star is produced.

XLIV. *To render Gold-leaf, or Dutch-metal luminous.*

THIS is done by discharging the contents of a small Leyden jar over it. A strip of gold leaf one-eighth of an inch in breadth and a yard long, will frequently be illuminated throughout its whole extent, by the explosion of a jar containing two gallons. This experiment may be beautifully diversified, by laying the gold or silver leaf on a piece of glass, and then placing the glass in water; for the whole gold-leaf will appear most brilliantly luminous in the water, by exposing it thus circumstanced to the explosion of a battery.

XLV. *To perforate a Glass Tube.*

FIG. 59. represents a small glass tube stopped at one end with a piece of cork; *k* is a wire with a ball, at one end of which is a brass ball; the other passes thro' a cork fitted to the upper part of the tube. This end of the wire is bent at right angles, in such a manner as to approach the side of the tube. To perform the experiment, take out the upper cork and wire, and then pour some sallad oil into the tube; replace the cork, and push down the wire, so that the end of it may be near or rather below the surface of the oil; present the ball to the electrified conductor, holding the finger or any other conducting substance opposite to the bent end of the wire; and when the spark passes from the conductor to the brass ball, the same will pass along the wire, perforating the tube in order to get at the finger, and produce a curious agitation of the oil.

XLVI. *The Inflammable Air-Lamp.*

FIG. 60. represents this machine, which is an invention of M. Volta. *A* is a glass globe to contain the inflammable air; *B*, a glass bason or reservoir to hold water; *D*, a cock to form occasionally a communication between the reservoir of water and that of air. The water passes into the latter through the metal pipe *gg*, which is fixed to the upper part of the reservoir *A*; as *s* is a small cock to cut off or open a communication with the air in the ball and the jet *K*.—*N* is a small pipe to hold a piece of wax taper; *L*, a brass pillar, on the top of which is a ball of the same metal; *a* is a pillar of glass with a socket at top, in which the wire *b* slides, having a ball screwed on the end of it. *F* is a cock by which the ball *A* is filled with inflammable air, and which afterwards serves to confine the air, and what water falls from the bason *B* into the ball *A*.

To use this instrument, after having filled the reservoir *A* with pure inflammable air and the bason with water, turn the cocks *D* and *s*, and the water which falls from the bason *B* will force out some of the inflammable air, and cause it to pass through the jet *K* into the air. If an electric spark be made to pass from the brass ball *m* to that marked *n*, the inflammable jet which passes through the pipe *K* will be fired. To extinguish the lamp, first shut the cock *s*, and then the cock *D*. The inflammable air is made of the usual ingredients, *viz.* iron-filings and vitriolic acid; and the reservoir is filled in the following manner: Having previously filled *A* with water, place the foot *R* in a tub of that fluid which may cover it, so that the bent glass tube through which the air passes may pass commodiously below the foot of the lamp. When the air has nearly driven out all the water, turn the cock *F*, and the apparatus is ready for use. This instrument is convenient for preserving a quantity of inflammable air ready for any occasional experiment, as charging the inflammable air-pistol, &c. It is also convenient for lighting a candle for economical purposes, as the least spark from an electrophorus or a small bottle is sufficient to fire the air.

XLVII. *Imitations of the Planetary Motions.*

See below, *Uses of the Electric fluid in the System of Nature.*

XLVIII. *Beautiful Figures produced in Powdered Rosin, &c. strewed over an Electric Substance.* Ibid.

SECT.

Miscellaneous Experiments.

Sect. IX. *Experiments of a Miscellaneous Nature, viz. those relating to the Effects of the Electric Fluid on Colours; on its Velocity; the Changes of Electric into Conducting Substances; the impossibility of forcing the Fluid through a perfect Vacuum; the Power of Batteries; its direction in various Cases; Improvements in the method of Excitation, &c.*

These experiments, though far from being unentertaining, we have thought proper to class under a different title, as many might wish to amuse themselves with producing an agreeable and beautiful phenomenon who would not choose to make experiments for the sake of investigating unknown subjects, where perhaps little else than the labour of making the experiment might be the reward of the operator. These experiments also may be truly said to be of an anomalous nature; as not being founded upon any known laws of electricity, but rather a collection of facts; from some of which we may afterwards deduce the laws by which this subtile fluid is occasionally governed. We shall begin with experiments made by Mr Cavallo upon substances painted over with colours of different kinds. They were occasioned by his having observed that an electric shock, sent over the surface of a card, made a black stroke upon a red spot, from which he was induced to try the effects of sending shocks over cards painted with different water-colours. The force employed was generally about one foot and an half of charged glass; and the shocks were sent over the cards while the latter were in a very dry state.

"Vermilion was marked with a strong black track, about one-tenth of an inch wide. This stroke is generally single, as represented by *A B*, fig. 74 of Plate CLXXVII. Sometimes it is divided in two towards the middle, like *E F*; and sometimes, particularly when the wires are set very distant from one another, the stroke is not continued, but interrupted in the middle, like *G H*. It often, although not always, happens, that the impression is marked stronger at the extremity of that wire from which the electric fluid issues, as it appears at *E*, supposing that the wire *C* communicates with the positive side of the jar; whereas the extremity of the stroke, contiguous to the point of the wire *D*, is neither so strongly marked, nor surrounds the wire so much, as the other extremity *E*.

"Carmine received a faint and slender impression of a purple colour.

"Verdigris was shaken off from the surface of the card; except when it had been mixed with strong gum-water, in which case it received a very faint impression.

"White-lead was marked with a long black track, not so broad as that on vermilion.

"Red lead was marked with a faint mark much like carmine.

Miscellaneous Experiments.

"The other colours I tried were orpiment, gamboge, sap-green, red-ink, ultramarine, Prussian blue, and a few others, which were compounds of the above; but they received no impression.

"It having been insinuated, that the strong black mark, which vermilion receives from the electric shock, might possibly be owing to the great quantity of sulphur contained in that mineral, I was induced to make the following experiment. I mixed together equal quantities of orpiment and flower of sulphur; and with this mixture, by the help, as usual, of very diluted gum-water, I painted a card; but the electric shock sent over it left not the least impression.

"Desirous of carrying this investigation on colours a little further, with a particular view to determine something relative to the properties of lamp-black and oil (c), I procured some pieces of paper painted on both sides with oil colours; and sending the charge of two feet of coated glass over each of them, by making the interruption of the circuit upon the surfaces, I observed that the pieces of paper painted with lamp-black, Prussian blue, vermilion, and purple brown, were torn by the explosion; but white lead, Naples yellow, English ochre, and verdigris, remained unhurt.

"The same shock sent over a piece of paper painted very thickly with lamp-black and oil left not the least impression. I sent the shock also over a piece of paper unequally painted with purple brown, and the paper was torn where the paint lay very thin, but remained unhurt where the paint was evidently thicker. These experiments I repeated several times and with some little variation, which naturally produced different effects; however they all seem to point out the following propositions.

"I. A coat of oil-paint over any substance, defends it from the effects of such an electric shock as would otherwise injure it; but by no means defends it from any electric shock whatever. II. No one colour seems preferable to the others, if they are equal in substance, and equally well mixed with oil; but a thick coating does certainly afford a better defence than a thinner one.

"By rubbing the abovementioned pieces of paper, I find that the paper painted with lamp-black and oil is more easily excited, and acquires a stronger electricity, than the papers painted with the other colours; and, perhaps, on this account it may be, that lamp-black and oil might resist the shock somewhat better than the other paints.

"It is remarkable, that vermilion receives the black impression, when painted with lintseed oil, nearly as well as when painted with water. The paper painted with white lead and oil receives also a black mark; but its nature is very singular. The track, when first painted

(c) "It has often been observed, that when lightning has struck the masts of ships, it has passed over such parts of the masts as were covered with lamp-black and tar, or painted with lamp-black and oil, without the least injury, at the same time that it has shivered the uncoated parts in such a manner as to render the masts useless."

Miscellaneous Experiments.

made, is almost as dark as that marked on white-lead painted with water; but it gradually loses its blackness, and in about an hour's time (or longer, if the paint is not fresh) it appears without any darkness; and when the painted paper is laid in a proper light, appears only marked with a colourless track, as if made by a finger-nail. I sent the shock also over a piece of board which had been painted with white-lead and oil about four years before, and the explosion marked the black track upon this also: this track, however, was not so strong, nor vanished so soon, as that marked upon the painted paper; but in about two days time it also vanished entirely."

123 Electric shock calcines, vitrifies, and revivifies metals.

Another very remarkable property of the electric fluid is, that it both calcines, vitrifies, and revivifies, metals. The calcination of them appears from Dr Priestley's experiments with the brass chain, formerly mentioned, where the black dust was plainly a calx of the metal. The vitrification is performed by exploding small wires of any kind with the shock of a battery. In this case, the small globules of metal, even though gold, silver, or platina, are found to be completely vitrified. The revivification is an experiment of Mr Beccaria. This he did by making the explosion between two pieces of the calces; and thus he revivified several metallic substances, particularly zinc, and even produced real quicksilver from cinnabar. In this case, he always observed streaks of black beyond the coloured metallic stains; owing, as he supposed, to the phlogiston driven from the parts that were vitrified, when the other part revivified the calx.

124 Mr Beccarias's experiments to show that the electric matter throws light conducting substances before it.

Mr Beccaria also discovered another very remarkable property of the electric matter; namely, that when it is obliged to pass through air, or any other substance through which it makes its way with difficulty, it throws before it all light conducting substances it can find, in order to facilitate its own passage; and thus it will pass through a greater quantity of resisting medium than it would otherwise be able to do. The experiments from which Mr Beccaria drew this conclusion, were the following. He put a narrow piece of leaf-silver between two plates of wax, laying it across them, but so that it did not quite reach one of the sides. The discharge being made through this strip of metal, by bringing a wire opposite to the silver, at the place where it was discontinued; the silver was found melted, and part of it dispersed all along the track that the electric matter took between the plates of wax, from the silver to the wire. Happening once to receive, inadvertently, the charge of a small jar through some smoke of spirit of nitre, a hole was made in his thumb, where the fire entered, and which he thought could only have been made by the acid carried along by the electric fluid. Dr Priestley hath made several more experiments, in order to ascertain this remarkable property; and of which he gives the following account.

125 Dr Priestley's experiments on this subject.

"I discharged frequent shocks, both of a common jar, and another of three square feet, through trains of brass dust, laid on a stool of baked wood, making interruptions in various parts of the train; and always found the brass dust scattered in the intervals, so as to connect the two disjoined ends of the train; but then it was likewise scattered nearly as much from almost all other parts of the train, and in all directions. The scattering from the train itself was probably occasioned by small electric sparks between the particles of the dust; which, causing a vacuum in the air, drove all that light matter to a considerable distance. But the particles of the dust, which were strowed in the intervals of the train, some of which were at least three inches, could hardly be conveyed in that manner.

"When small trains were laid, the dispersion was the most considerable, and a light was very visible in the dark, illuminating the whole circuit. It made no difference, in any of these experiments, which way the shock was discharged.

"When I laid a considerable quantity of the dust at the ends of two pieces of chain, through which the shock passed, at the distance of about three inches from one another, the dust was always dispersed over the whole interval, but chiefly laterally; so that the greatest quantity of it lay in arches, extending both ways, and leaving very little of it in the middle of the path. It is probable, that the electric power would have spread it equably, but that the vacuum made in the air, by the passage of the fluid from one heap of dust to the other, dispersed it from the middle part.

"I then insulated a jar of three square feet, and upon an adjoining glass-stand laid a heap of brass dust; and at the distance of seven or eight inches a brass rod communicating with the outside of the jar. Upon bringing another rod, communicating with the inside, upon the heap of dust, it was dispersed in a beautiful manner, but not one way more than another. However, it presently reached the rod communicating with the outside.

"Making two heaps, about eight inches asunder, I brought one rod communicatng with the inside upon one of them, and another rod communicating with the outside upon the other. But the heaps were dispersed in all directions, and soon met; presently after which the jar was discharged, by means of this dispersed dust, in one full explosion. When the two heaps were too far asunder to promote a full discharge at once, a gradual discharge was made through the scatterest particles of the dust.

"When one heap of dust was laid in the centre of the stand, and the two rods were made to approach on each side of it, they each attracted the dust from the side of the heap next to them, and repelled it again in all directions. When they came very near the heap, the discharge was made through it, without giving it any particular motion.

"All these experiments show, that light bodies possessed of a considerable share of electricity, disperse in all directions, carrying the electric matter to places not abounding with it; and that they sometimes promote a sudden discharge of great quantities of that matter from places where it was lodged, to places where there was a defect of it. But an accident led me to a much more beautiful, and perhaps a more satisfactory, manner of demonstrating the last part of this proposition, than any that I hit upon while I was pursuing my experiments with that design.

"Hanging a drop of water upon the knob of a brass rod communicating with the inside of my battery, in order to observe what variety it might occasion in the circular spots abovementioned, I was greatly surprised to find the explosion made all at once, at the distance of two inches.

Miscellaneous Experiments.

"I afterwards put some brass dust upon a plate of metal communicating with the inside of the battery; and making the discharge through the dust, it exploded at the distance of an inch and a half. The dust rose towards the discharged rod, and from thence was dispersed in all directions.

"These experiments are the more remarkable, as they demonstrate so great a difference between the distance at which the battery may be made to discharge at once, by the help of these light bodies, and without them. When the discharge of a battery by the knobs of brass rods, in the open air, is at the distance of about half an inch; it will, by this means, be made at about two inches."

126 Experiments concerning the velocity of the electric fluid.

The motions of the electric fluid, though prodigiously quick, are not instantaneous. The shock of the Leyden phial, indeed, hath been transmitted through wires of several miles in length, without taking up any sensible space of time. That is, supposing two persons to hold the ends of the wire, one communicating with the knob, and the other with the outside coating of the phial, both would feel the shock at the same instant; nor would it make any alteration though a considerable part of the surface of the ground was made part of the conductor. Dr Priestley relates several very curious experiments made with a view to ascertain this point soon after the Leyden phial was discovered. These experiments were planned and directed by Dr Watson, who was present at every one of them. His chief assistants were Martin Folkes, Esq; president of the royal society, Lord Charles Cavendish, Dr Bevis, Mr Graham, Dr Birch, Mr Peter Daval, Mr Trembley, Mr Ellicott, Mr Robbins, and Mr Short. Many other persons, and some of distinction, gave their attendance occasionally.

Dr Watson, who wrote the history of their proceedings, in order to lay them before the royal society, begins with observing (what was verified in all their experiments), that the electric shock is not, strictly speaking, conducted in the shortest manner possible, unless the bodies through which it passes conduct equally well; for that, if they conduct unequally, the circuit is always formed through the best conductor, though the length of it be ever so great.

The first attempt these gentlemen made, was to convey the electric shock across the river Thames, making use of the water of the river for one part of the chain of communication. This they accomplished on the 14th and 18th of July 1747, by fastening a wire all along Westminster bridge, at a considerable height above the water. One end of this wire communicated with the coating of a charged phial, the other being held by an observer, who, in his other hand, held an iron rod, which he dipped into the river. On the opposite side of the river stood a gentleman, who likewise dipped an iron rod in the river with one hand; and in the other held a wire, the extremity of which might be brought into contact with the wire of the phial.

Upon making the discharge, the shock was felt by the observers on both sides the river, but more sensibly by those who were stationed on the same side with the machine; part of the electric fire having gone from the wire down the moist stones of the bridge, thereby making several shorter circuits to the phial, but still all passing through the gentlemen who were stationed on the same side with the machine. This was, in a manner, demonstrated by some persons feeling a sensible shock in their arms and feet, who only happened to touch the wire at the time of one of the discharges, when they were standing upon the wet steps which led to the river. In one of the discharges made upon this occasion, spirits were kindled by the fire which had gone through the river.

Miscellaneous Experiments.

Upon this, and the subsequent occasions, the gentlemen made use of wires in preference to chains; for this, among other reasons, that the electricity which was conducted by chains was not so strong as that which was conducted by wires. This, as they well observed, was occasioned by the junctures of the links not being sufficiently close, as appeared by the snapping and flashing at every juncture where there was the least separation. The lesser snappings, being numerous in the whole length of a chain, very sensibly lessened the great discharge at the gun-barrel.

Their next attempt was to force the electrical shock to make a circuit of two miles, at the New River at Stoke Newington. This they performed on the 24th of July 1747, at two places; at one of which the distance by land was 800 feet, and by water 2000: in the other, the distance by land was 2800 feet, and by water 8000. The disposition of the apparatus was similar to what they before used at Westminster bridge, and the effect answered their utmost expectations. But as, in both cases, the observers at both extremities of the chain, which terminated in the water, felt the shock as well as when they stood with their rods fixed into the earth 20 feet from the water, as when they were put into the river; it occasioned a doubt, whether the electric circuit was formed through the windings of the river, or a much shorter way, by the ground of the meadow: for the experiment plainly showed, that the meadow-ground, with the grass on it, conducted the electricity very well.

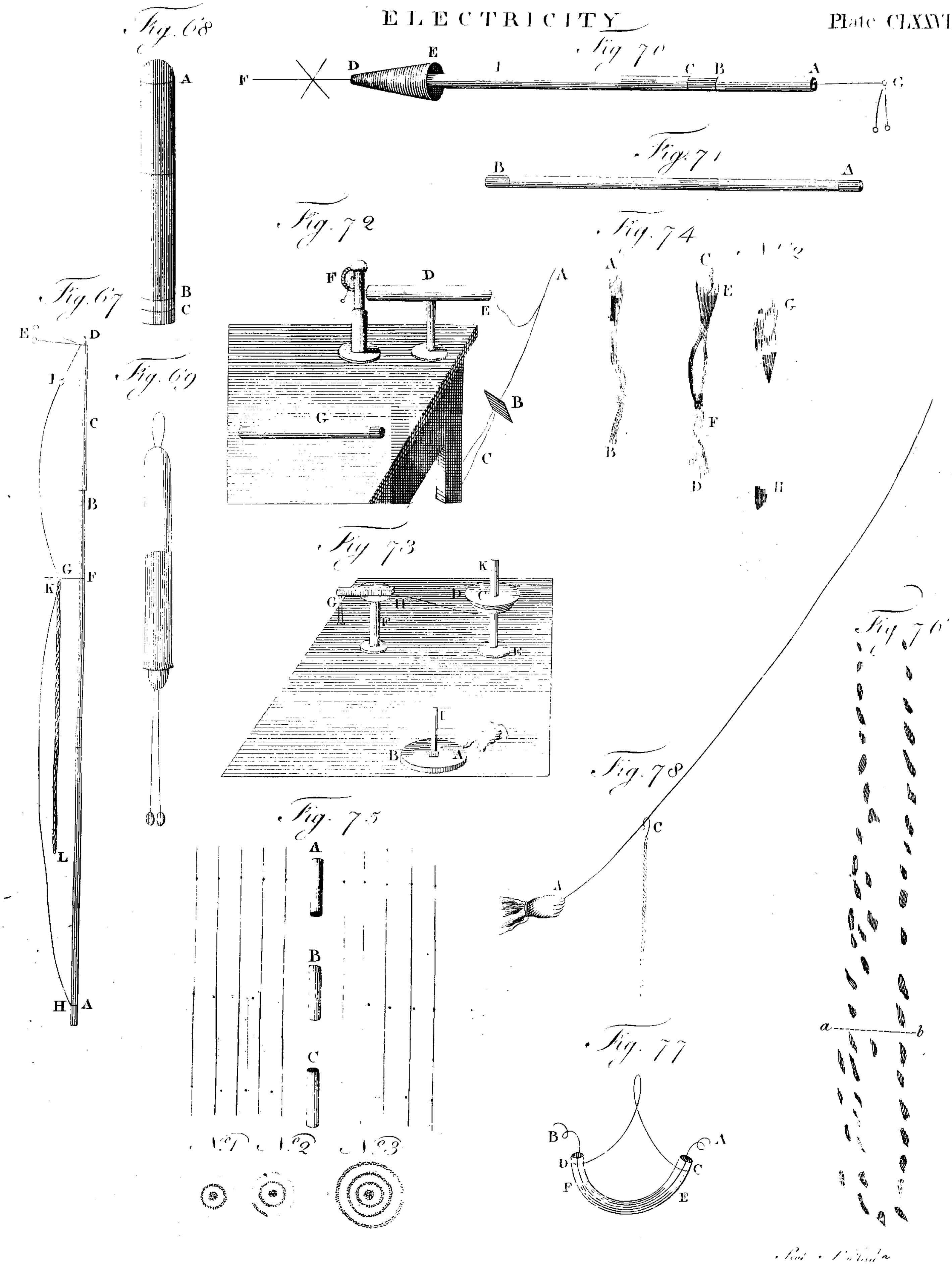
By subsequent experiments they were fully convinced, that the electricity had not in this case been conveyed by the water of the river, which was two miles in length, but by land, where the distance was only one mile; in which space, however, the electric matter must necessarily have passed over the New River twice, have gone through several gravel pits and a large stubble field.

July 28th, they repeated the experiment at the same place, which the following variation of circumstances. The iron wire was, in its whole length, supported by dry sticks, and the observers stood upon original electrics; the effect of which was, that they felt the shock much more sensibly than when the conducting wire had lain upon the ground, and when the observers had likewise stood upon the ground, as in the former experiment.

Afterwards, every thing else remaining as before, the observers were directed, instead of dipping their rods into the water, to put them into the ground, each 150 feet from the water. They were both smartly struck, though they were distant from each other above 500 feet.

The same gentlemen, pleased with the success of their former experiments, undertook another, the object of which was, to determine whether the electric virtue

ELECTRICITY Plate CLXXVII



Miscellaneous Experiments.

virtue could be conveyed through dry ground; and, at the same time, to carry it through water to a greater distance than they had done before. For this purpose they pitched upon Highbury-barn beyond Islington, where they carried it into execution on the 5th of August 1747. They chose a station for their machine almost equally distant from two other stations for observers upon the New River; which were somewhat more than a mile asunder by land and two miles by water. They had found the streets of London, when dry, to conduct very strongly for about 40 yards; and the dry road at Newington about the same distance. The event of this trial answered their expectations. The electric fire made the circuit of the water, when both the wires and the observers were supported upon original electrics, and the rods dipped into the river. They also both felt the shock, when one of the observers was placed in a dry gravelly pit, about 300 yards nearer the machine than the former station, and 100 yards distant from the river: from which the gentlemen were satisfied, that the dry gravelly ground had conducted the electricity as strongly as water.

From the shocks which the observers received in their bodies, when the electric power was conducted upon dry sticks, they were of opinion, that, from the difference of distance simply considered, the force of the shock, as far as they had yet experienced, was very little if at all impaired. When the observers stood upon electrics, and touched the water or the ground with the iron rods, the shock was always felt in their arms or wrists; when they stood upon the ground with their iron rods, they felt the shock in their elbows, wrists, and ancles; and when they stood upon the ground without rods, the shock was always felt in the elbow and wrist of that hand which held the conducting wire, and in both ancles.

The last attempt of this kind which these gentlemen made, and which required all their sagacity and address in the conduct of it, was to try whether the electric shock was perceptible at twice the distance to which they had before carried it, in ground perfectly dry, and where no water was near; and also to distinguish, if possible, the respective velocity of electricity and sound.

For this purpose they fixed upon Shooter's-hill, and made their first experiments on the 14th of August 1747; at time when, as it happened, but one shower of rain had fallen during five preceding weeks. The wire communicating with the iron rod which made the discharge, was 6732 feet in length, and was supported all the way upon baked sticks; as was also the wire which communicated with the coating of the phial, which was 3868 feet long, and the observers were distant from each other two miles. The result of the explosion demonstrated, to the satisfaction of the gentlemen present, that the circuit performed by the electric matter was four miles, *viz.* two miles of wire and two of dry ground, the space between the extremities of the wires; a distance which, without trial, as they justly observed, was too great to be credited. A gun was discharged at the instant of the explosion, and the observers had stop-watches in their hands, to note the moment when they felt the shock: but, as far as they could distinguish, the time in which the electric matter performed that vast circuit might have been instantaneous.

In all the explosions where the circuit was made of considerable length, it was observed, that though the phial was very well charged, yet that the snap at the gun-barrel, made by the explosion, was not near so loud as when the circuit was performed in a room; so that a by-stander, says Dr Watson, though versed in these operations, would not imagine, from seeing the flash, and hearing the report, that the stroke at the extremity of the conducting wire could have been considerable; the contrary whereof, when the wires were properly managed, he says, always happened.

Still the gentlemen, unwearied in their pursuits, were desirous, if possible, to ascertain the absolute velocity of electricity at a certain distance; because, though in the last experiment, the time of its progress was certainly very small, if any, they were desirous of knowing, small as that time might be, whether it was measurable; and Dr Watson had contrived an excellent method for that purpose.

Accordingly, on the 5th of August 1748, the gentlemen met once more, and the last time, at Shooter's hill; when it was agreed to make an electric circuit of two miles, by several turnings of the wire in the same field. The middle of this circuit they contrived to be in the same room with the machine, where an observer took in each hand one of the extremities of the wires, each of which was a mile in length. In this excellent disposition of the apparatus, in which the time between the explosion and the shock might have been observed to the greatest exactness, the phial was discharged several times; but the observer always felt himself shocked at the very instant of making the explosion. Upon this the gentlemen were fully satisfied, that through the whole length of this wire, which was 12,276 feet, the velocity of the electric matter was instantaneous.

127 Sometimes the fluid seems to move more slowly.

With all this surprising velocity, however, it is certain, that both sides of a charged phial may be touched so quickly, even by the best conductors, that all the electric matter hath not time to make the circuit, and the phial will remain but half charged. If the upper plate of an electrophorus also is very suddenly touched with the finger, or any other conductor, a very small spark will be obtained on lifting it up; though a very strong one would be got if the finger was kept longer upon it. But how this seeming slowness can be reconciled with the immeasurable velocity abovementioned, doth not appear. It is certain, indeed, that this fluid is considerably resisted in its passage through or over every substance. It will even prefer a short passage in the air where it is violently resisted to one along a wire of very great length; but here, as in every other case, it seems to divide its force, and to break out through several different passages at once. A method of ascertaining this hath been contrived by Dr Priestley, thus. Bend a wire, about five feet long, so that one part may come within half an inch of the other; then connect the extremities of the wire with the hook of the battery, and send a shock through it. On making the explosion, a spark will be seen between the two parts which approach nearest to each other; which shows that the fluid chooses a short passage through the air, rather than the long one through the wire. The charge, however, does not pass entirely between these two parts, but some of it goes also thro' the wire. This may be proved by putting a slender wire be-

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between the two approaching parts: for, on making the discharge with only this addition in the apparatus, the small wire will hardly be made red hot; whereas, if the large wire be cut so as to discontinue the circuit, the small wire will be melted, and even exploded, by the same shock that before made it scarcely red hot. But though we can easily show that the electric fluid always meets with resistance, it is by no means easy to show why the same resistance which puts a temporary stop to its motions in some cases, doth not so in all.

128 Water becomes electric by cold.

Another curious experiment in electricity is the converting of conducting substances into electrics by cold, and of changing electrics into conductors by heat. The first hath yet been done only in the instance of water. This is a discovery of Mr Achard's at Berlin, who, in the month of January 1776, observed, that water frozen to the 20th degree below the freezing point of Reaumur's thermometer, answering to the 13th below 0 of Fahrenheit's, is an electric. He tried his experiments in the open air, where he found, that a rod of ice two feet long and two inches thick, was a very imperfect conductor when Reaumur's thermometer was at six degrees below 0; and that it would not in the least conduct when the thermometer was sunk to 20°. By whirling a spheroid of ice in a proper machine, he even electrified the prime conductor so as to attract, repel, give sparks, &c. The ice made use of was free from air-bubbles, and quite transparent: to produce which, he used to set a vessel containing distilled water to be frozen, upon the window of a room which was rather warm with respect to the ambient air; so that the water began to freeze on the one side of the vessel, while on the other it was still liquid.

129 Electrics become conductors by heat.

To prove that glass and other electrics become conductors when very hot: Take a small glass tube of about one twentieth of an inch in diameter, and above a foot long; close it at one end, and introduce a wire into it, so that it may be extended through its whole length; let two or three inches of this wire project above the open end of the tube, and there fasten it with a bit of cork; tie round the closed end of the tube another wire, which will be separated from the wire within the tube only by the glass interposed between them. In these circumstances, endeavour to send a shock through the two wires, *i. e.* the wire inserted in the glass tube and that tied on its outside, by connecting one of them with the outside, and touching the other with the knob of a charged jar; and you will find that the discharge cannot be made unless the tube be broken; because the circuit is interrupted by the glass at the end of the tube, which is interposed between the two wires. But put that end of the tube to which the wire is tied into the fire, so that it may become just red-hot, then endeavour to discharge the jar again through the wires, and you will find that the explosion will be easily transmitted from wire to wire through the substance of the glass, which, by being made red-hot, is become a conductor.

In order to ascertain the conducting quality of hot resinous substances, oils, &c. bend a glass tube in the form of an arch *CEFD*, fig. 77. Plate CLXXVII; and tie a silk string *GCD* to it, which serves to hold it by when it is to be set near the fire; fill the middle part of this tube with rosin, sealing-wax, &c. then introduce two wires *AE*, *BF*, through its ends, so that they may touch the rosin, or penetrate a little way in it. This done, let a person hold the tube over a clear fire, so as to melt the rosin within it; at the same time, by connecting one of the wires *A* or *B* with the outside of a charged jar, and touching the other with the knob of the jar, endeavour to make the discharge through the rosin, and you will observe, that while the rosin is cold, no shocks can be transmitted through it; but it becomes a conductor according as it melts; and when totally melted, then the shocks will pass through it very freely.

To show that hot air is a conductor, electrify one of the cork-ball electrometers suspended upon the stand fig. 13. of Plate CLXXIV. or electrify the prime conductor with the quadrant electrometer; then bring a red-hot iron within a sufficient distance of the electrometer or prime conductor, and you will find that they soon loose their electricity, which is certainly conducted by the hot air contiguous to the iron; for if the experiment be repeated with the same iron when cold, *i. e.* by bringing it within the same distance of the electrified electrometer or prime conductor, their electricity will not be conducted away as before. It has been observed, that a battery may be discharged by introducing a red-hot iron between two knobs interposed, and standing at some distance from each other in the circuit: but if, instead of iron, there be introduced a piece of red-hot glass between the knobs (the distance between them remaining as at first), the battery cannot be discharged: whence we may infer, that either hot air is not so good a conductor as has been imagined; or else, that air heated by iron is stronger with respect to its conducting power, than when heated by the red-hot glass.

130 Non-conducting power of a perfect vacuum.

The impossibility of forcing the electric fluid thro' a perfect vacuum, is a doctrine which militates so directly against the theory laid down in Sect. VI. that we cannot by any means omit a very full consideration of it. As this, however, would lead us here into a theoretical disquisition, we shall not enter into any explanation in this place, but defer what is to be said on that subject to the last section, where the uses of the electric fluid in the system of nature are considered. The experiment on which this supposition is founded, was originally made by Mr Walsh; who found that it was possible to cleanse a barometrical tube so perfectly of air, that no electric light would be visible in it upon agitating the mercury, as is the case with the common barometers. It has since been repeated to more advantage by Mr William Morgan, who from his observations has deduced some conclusions concerning the action of the electric fluid very consistent with that extensive operation which many philosophers have ascribed to it, and which is ascribed to it in various articles of this work. His experiment is published in the Phil. Transf. for 1785, which we shall here extract.

131 Mr Morgan's experiment on this subject.

"The non-conducting power of a perfect vacuum, is a fact in electricity which has been much controverted among philosophers. The experiments made by Mr Walsh, F. R. S. in the double barometer tube clearly demonstrated the impermeability of the electric light through a vacuum; nor was it, I think, precipitate

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to conclude from them the impermeability of the electric fluid itself. But this conclusion has not been universally admitted; and the following experiments were made with the view of determining its truth or fallacy. When I first attended to the subject, I was not aware that any other attempts had been made besides those of Mr Walsh; and though I have since found myself to have been in part anticipated in one of my experiments, it may not perhaps be improper to give some account of them, not only as they are an additional testimony in support of this fact, but as they led to the observation of some phenomena which appear to be new and interesting.

Plate CLXXX. fig. 80.

"A mercurial gage B, about 15 inches long, carefully and accurately boiled till every particle of air was expelled from the inside, was coated with tin-foil five inches down from its sealed end A, and being inverted into mercury thro' a perforation D, in the brass cap E, which covered the mouth of the cistern H, the whole was cemented together, and the air was exhausted from the inside of the cistern thro' a valve C in the brass cap E just mentioned; which producing a perfect vacuum in the gage, afforded an instrument peculiarly well adapted for experiments of this kind. Things being thus adjusted, (a small wire F having been previously fixed on the inside of the cistern to form a communication between the brass cap E and the mercury G, into which the gage was inverted), the coated end was applied to the conductor of an electrical machine; and notwithstanding every effort, neither the smallest ray of light, nor the slightest charge, could ever be procured in this exhausted gage. I need not observe, that if the vacuum on its inside had been a conductor of electricity, the latter at least must have taken place; for it is well known, that if a glass tube be exhausted by an air-pump, and coated on the outside, both light and a charge may very readily be procured. If the mercury in the gage be imperfectly boiled, the experiment will not succeed; but the colour of the electric light, which, in air rarefied by an exhauster, is always violet or purple, appears in this case of a beautiful green; and what is very curious, the degree of the air's rarefaction may be nearly determined by this means: for I have known instances, during the course of these experiments, where a small particle of air having found its way into the tube B, the electric light became visible, and as usual of a green colour; but the charge being often repeated, the gage has at length cracked at its sealed end, and in consequence the external air, by being admitted into the inside, has gradually produced a change in the electric light from green to blue, from blue to indigo, and so on to violet and purple, till the medium has at last become so dense as no longer to be a conductor of electricity. I think there can be little doubt from the above experiments, of the non-conducting power of a perfect vacuum; and this fact is still more strongly confirmed by the phenomena which appear upon the admission of a very minute particle of air into the inside of the gage. In this case the whole becomes immediately luminous upon the slightest application of electricity, and a charge takes place, which continues to grow more and more powerful in proportion as fresh air is admitted, till the density of the conducting medium arrives at its maximum, which it always does when the colour of the electric light is indigo or violet. Under

132 Changes of colour in the electric light by the admission of air.

these circumstances the charge may be so far increased as frequently to break the glass. In some tubes, which have not been completely boiled, I have observed that they will not conduct the electric fluid when the mercury is fallen very low in them; yet upon letting in air into the cistern, so that the mercury shall rise in the gage, the electric fluid, which was before latent in the inside, shall now become visible; and as the mercury continues to rise, and of consequence the medium is rendered less rare, the light shall grow more and more visible, and the gage shall at last be charged, notwithstanding it has not been near an electrical machine for two or three days. This seems to prove, that there is a limit even in the rarefaction of air, which sets bounds to its conducting power; or, in other words, that the particles of air may be so far separated from each other as no longer to be able to transmit the electric fluid; that if they are brought within a certain distance of each other, their conducting power begins, and continually increases till their approach also arrives at its limit, when the particles again become so near as to resist the passage of the fluid entirely, without employing violence, which is the case in common and condensed air, but more particularly in the latter.

133 Surprising ease with which an exhausted tube is charged with electricity.

"It is surprising to observe how readily an exhausted tube is charged with electricity. By placing it at 10 or 12 inches from the conductor, the light may be seen pervading its inside, and as strong a charge may sometimes be procured as if it were in contact with the conductor: nor does it signify how narrow the bore of the glass may be; for even a thermometer tube, having the minutest perforation possible, will charge with the utmost facility; and in this experiment the phenomena are peculiarly beautiful.

"Let one end of a thermometer tube be sealed hermetically; let the other end be cemented into a brass cap with a valve, or into a brass cock, so that it may be fitted to the plate of an air-pump. When it is exhausted, let the sealed end be applied to the conductor of an electrical machine, while the other end is either held in the hand or connected to the floor. Upon the slightest excitation the electric fluid will accumulate at the sealed end, and be discharged through the inside in the form of a spark, and this accumulation and discharge may be incessantly repeated till the tube is broken. By this means I have had a spark 42 inches long; and had I been provided with a proper tube, I do not doubt but that I might have had a spark of four times that length. If, instead of the sealed end, a bulb be blown at that extremity of the tube, the electric light will fill the whole of that bulb, and then pass through the tube in the form of a brilliant spark, as in the foregoing experiment: but in this case I have seldom been able to repeat the trials above three or four times before the charge has made a small perforation in the bulb. If, again, a thermometer filled with mercury be inverted into a cistern, and the air exhausted in the manner I have described for making the experiment with the gage, a Torricellian vacuum will be produced; and now the electric light in the bulb, as well as the spark in the tube, will be of a vivid green; but the bulb will not bear a frequent repetition of charges before it is perforated in like manner as when it has been exhausted by an air pump. It can hardly

134 Tubes perforated by the electric spark.

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be necessary to observe, that in these cases the electric fluid assumes the appearance of a spark (D), from the narrowness of the passage through which it forces its way.

135 Why the fluid assumes the form of a spark.

If a tube 40 inches long be fixed into a globe 8 or 9 inches in diameter, and the whole be exhausted, the electric fluid, after passing in the form of a brilliant spark throughout the length of the tube, will, when it gets into the inside of the globe, expand itself in all directions, entirely filling it with a violet and purple light, and exhibiting a striking instance of the vast elasticity of the electric fluid.

"I cannot conclude this paper without acknowledging my obligations to the ingenious Mr Brook of Norwich, who by communicating to me his method of boiling mercury, has been the chief cause of my success in these experiments (E). I have lately learned from him, that he has also ascertained the non-conducting power of a perfect vacuum; but what steps he took for that purpose, I know not. Of his accuracy, however, I am so well convinced, that had I never made an experiment myself, I should, upon his testimony alone, have been equally assured of the fact. To most of the preceding experiments Dr Price, Mr Lane, and some others of my friends, have been eye-witnesses, and I believe that they were as thoroughly satisfied as myself with the results of them.

136 Great difficulty in making this experiment.

I must beg leave to observe to those who wish to repeat them, that the first experiment requires some nicety, and no inconsiderable degree of labour and patience. I have boiled many gages for several hours together without success, and was for some time disposed to believe the contrary of what I am now convinced to be the truth.

137 Electric fluid supposed not to reach beyond the atmosphere of the earth.

Indeed, if we reason *à priori*, I think we cannot suppose a perfect vacuum to be a perfect conductor without supposing an absurdity: for if this were the case, either our atmosphere must have long ago been deprived of all its electric fluid, by being every where surrounded by a boundless conductor, or this fluid must pervade every part of infinite space; and consequently there can be no such thing as a perfect vacuum in the universe. If, on the contrary, the truth of the preceding experiments be admitted, it will follow, that the conducting power of our atmosphere increases only to a certain height, beyond which this power begins to diminish, till at last it entirely vanishes; but in what part of the upper regions of the air these limits are placed, I will not presume to determine. It would not perhaps have been difficult to have applied the results of some of these experiments to the explanation of meteors, which are probably owing to an accumulation of electricity. It is not, however, my present design to give loose to my imagination. I am sensible, that by indulging it too freely, much harm is done to real knowledge; and therefore, that one fact in philosophy well ascertained, is more to be valued than whole volumes of speculative hypotheses."

A fact so contrary to the generally received opinion of the conducting powers of a vacuum, could not but excite a general surprise, and attempts to repeat the experiment would no doubt be ardently wished for. Unfortunately, however, the experiment itself, as must evidently appear from the account given of it by Mr Morgan, is of such a precarious nature, as must undoubtedly discourage any ordinary electrician from attempting it; for in the first place, there is no hope of success without a very tedious boiling of mercury in a tube for several hours; and even when this is done, the instrument will not remain in a state of perfection for any length of time.

138 Cavallo's experiments with an improved air-pump.

Mr Cavallo, who has greatly improved the air-pump, gives an account of some very curious experiments made with this instrument, in order to ascertain the truth of Mr Morgan's position; which we shall likewise give in his own words, with the conclusions he draws from them.

"I. In a glass receiver, of six inches diameter and nine inches in height, having a brass cap, a brass wire of two-tenths of an inch in diameter was fixed to its cap, and proceeding through the middle of the receiver, its lower extremity was five inches distant from the aperture of the receiver, and of course of the plate of

(D) "By cementing the string of a guittar into one end of a thermometer tube, a spark may be obtained as well as if the tube had been sealed hermetically."

(E) "Mr Brook's method of making mercurial gages is nearly as follows: Let a glass tube *L*, (fig. 81.) sealed hermetically at one end, be bent into a right angle within two or three inches of the other end. At the distance of about an inch or less from the angle, let a bulb *K*, of about $\frac{3}{4}$ths of an inch in diameter, be blown in the curved end, and let the remainder of this part of the tube be drawn out *I*, so as to be sufficiently long to take hold of when the mercury is boiling. The bulb *K* is designed as a receptacle for the mercury, to prevent its boiling over; and the bent figure of the tube is adapted for its inversion into the cistern: for by breaking off the tube at *M* within $\frac{1}{8}$th or $\frac{1}{4}$th of an inch of the angle, the open end of the gage may be held perpendicular to the horizon when it is dipped into the mercury in the cistern, without obliging us to bring our finger or any other substance into contact with the mercury in the gage, which never fails to render the instrument imperfect. It is necessary to observe, that if the tube be 14 or 15 inches long, I have never been able to boil it effectually for the experiments mentioned in this paper in less than three or four hours, although Mr Brook seems to prescribe a much shorter time for the purpose; nor will it even then succeed, unless the greatest attention be paid that no bubbles of air lurk behind, which to my own mortification I have frequently found to have been the case: but experience has at length taught me to guard pretty well against this disappointment, particularly by taking care that the tube be completely dry before the mercury is put into it; for if this caution be not observed, the instrument can never be made perfect. There is, however, one evil which I have not yet been able to remedy; and that is, the introduction of air into the gage, owing to the unboiled mercury in the cistern; for when the gage has been a few times exhausted, the mercury which originally filled it becomes mixed with that into which it is inverted, and in consequence the vacuum is rendered less and less perfect, till at last the instrument is entirely spoiled. I have just constructed a gage so as to be able to boil the mercury in the cistern, but have not yet ascertained its success."

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of the air-pump, when the receiver was placed upon it. A fine linen thread was faſtened towards the top of the wire, and about four inches of it hanged freely along the braſs wire, and almoſt in contact with it. The extremity of the wire, which paſſing through the braſs cap projected out of the receiver, was furniſhed with a ball. Thus prepared, the receiver was placed upon the plate of the pump, without any leather, or any thing elſe beſides a little oil on its outſide edge, which muſt be always underſtood in all the other experiments related in the courſe of this chapter. Then the exhauſtion was commenced, and at intervals ſome electricity was communicated, either by the approach of the conductor of an electrical machine, or the knob of a charged jar, to the braſs ball of the wire, in order to obſerve the ſtrength of the repulſion of the thread from the wire in different degrees of rarefaction; which degrees were aſcertained by the ſhort barometrical gage. Proceeding in this manner, it was obſerved, that till the rarefaction did not exceed one hundred, to wit, till the air remaining within the receiver was not leſs than the hundredth part of the original quantity, whenever the electricity was communicated to the braſs ball, the thread firſt adhered to the wire, and then was repelled by it; though this repulſion became ſmaller and ſmaller, according as the exhauſtion came nearer to the abovementioned degree. The clinging of the thread to the wire firſt, was becauſe being dry, it required ſome time before it acquired a ſufficient quantity of electricity from the wire, and conſequently it was not immediately repelled. When the air within the receiver was exhauſted above 100 times, the thread was not firſt attracted and then repelled as before, but only vibrated a little backwards and forwards, and then remained in the ſituation in which it ſtood when electricity was not concerned. By exhauſting the receiver ſtill farther, the vibration of the thread when electrified was gradually diminiſhed; ſo that when the degree of rarefaction was above 500, ſparks and the diſcharge of a jar only made the thread vibrate in a manner juſt ſenſible; but this vibration, however ſmall, did never become quite inſenſible, even when the receiver was exhauſted to the utmoſt power of the pump, which was very near 1000. After this the air was gradually admitted into the receiver, and at various intervals the ball of the braſs wire was electrified, in order to obſerve whether the ſame phenomena appeared at the different degrees of exhauſtion as had done before; and they were found to agree with ſufficient exactneſs.

"II. The braſs wire within the ſame glaſs receiver was made very ſhort, and from its extremity a fine linen thread, ſix inches long, was ſuſpended; and upon the plate of the pump a ſmall braſs ſtand with a braſs pillar was placed: ſo that when the receiver was put upon the plate, and over the braſs ſtand, about one inch length of the thread ſtood parallel to, and at various required diſtances from, the braſs pillar (F). In this diſpoſition of the apparatus, whenever any the leaſt quantity of electricity was communicated to the knob of the braſs wire, the thread was immediately attracted by the braſs pillar, and adhered to it ſome time, becauſe, being dry, it did not immediately part with the acquired electricity. At various degrees of exhauſtion, the electricity being communicated to the braſs ball of the wire, it was found, that the thread was always attracted by the braſs pillar, though from a greater or leſs diſtance, according as a greater or leſs quantity remained within the receiver. Thus when the air was rarefied about 100 times, the thread was attracted from about one inch; when the air was rarefied 200 times, it was attracted from about $\frac{1}{8}$th of an inch; when the air was rarefied 300 times, it was attracted from about $\frac{1}{16}$th; and after this it was always attracted from about $\frac{1}{16}$th, even when the air within the receiver was rarefied about 1000 times. It is remarkable, that when the air in the receiver is rarefied about 300 times, if a jar is diſcharged thro' the vacuum, by touching its knob with the ball of the wire on the receiver, the thread is not in conſequence of it attracted by the braſs pillar: the reaſon of which ſeems to be, becauſe that large quantity of electricity opens a way thro' the vacuum, and paſſes thro' every part of it; whereas a ſmall quantity of electricity, even the action of a ſmall electrical machine in the ſame room, at no very great diſtance from the apparatus, will cauſe the thread being attracted by the braſs pillar.

III. "The braſs ſtand, with the pillar, and the thread which proceeded from the wire, being removed from under the receiver, a very ſenſible electrometer was faſtened, inſtead of the thread, to the extremity of the braſs wire. This electrometer conſiſted of two very fine ſilver wires, each about one inch long, and having a ſmall cone of cork at its extremity. The ſenſibility of ſuch an electrometer is really ſurpriſing; for even the electricity of a ſingle hair excited, does ſenſibly affect it; and, as its ſuſpenſion is almoſt without any friction or other impediment, it never deceives one by appearing to be electrified when in reality it is not ſo. With this preparation, the receiver being placed upon the plate of the air-pump, the air was gradually exhauſted, and at intervals ſome electricity was communicated to the ball on the outſide of the receiver, either by an excited electric or by a charged jar; and it was found that the corks of the electrometer were always made to diverge by it, even when the air was exhauſted as much poſſible. Indeed their divergency was ſmaller and ſmaller, and laſted a ſhorter time, according as the air was more exhauſted, but it was viſible to the laſt.

"In this experiment, analogous to what has been obſerved in the preceding, when the air was exhauſted above 300 times, if a jar was diſcharged through the vacuum, or a ſtrong ſpark was given to the knob on the top of the receiver, the corks of the electrometer diverged very little indeed, and but for an inſtant; whereas a ſmall quantity of electricity made them diverge more, and remain much longer in that ſtate.

139 His concluſions from them.

"It ſeems deducible from thoſe experiments, that electric attraction and repulſion take place in every degree of rarefaction, from the loweſt to about 1000, but that the power diminiſhes in proportion as the air

(F) This diſtance was altered by turning the braſs wire which paſſed through a collar of leather in the braſs cap of the receiver.

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air is more and more rarefied; and by following the law, we may perhaps conclude with F. Beccaria, that there is no electric attraction nor repulsion in a perfect vacuum: though this will perhaps be impossible to be verified experimentally; because when in an exhausted receiver no attraction or repulsion is observed between bodies to which electricity is communicated, it will be only suspected, that those bodies are not sufficiently small and light. But if we consult reason, and which alone ought to assist us when decisive experiments are not practicable, it seems likely that electric attraction and repulsion cannot take place in a perfect vacuum, by which I only mean a perfect absence of air; because either this vacuum is a conductor or a non-conductor of electricity. If a conductor, and nearer to perfection as it becomes more free from air, it must be a perfect conductor at the same time that it becomes a perfect vacuum; in which case electric attraction or repulsion cannot take place amongst bodies inclosed in it: for, according to every notion we have of electricity, those motions indicate or are the consequence of the intervening space in some measure obstructing the free passage of the electric fluid. And if the perfect vacuum is a perfect non-conductor, then neither electric attraction nor repulsion can happen in it.

140 Electric light always visible in the most perfectly exhausted receiver.

"IV. In my former experiments, having always observed the electric light in the receiver of the air-pump, even when the air was rarefied to the utmost power of that machine, I thought proper to repeat that experiment with receivers of various sizes; and accordingly have used receivers of above two feet in height, and some of as large a diameter as the plate of the pump could admit, which is about 14 inches; but the light in it was always visible, only with different colours in different degrees of exhaustion, and always more diffused, and at the same time less dense, when the air was more rarefied; which seems to render it probable, that when the air is quite removed from any space, the electric light is no longer visible in it, as must have been the case with the experiment of Mr Walsh's double barometer; for it is a maxim very well established in electricity, that the electric light is only visible when the electric fluid, in passing from one body to another, meets with some opposition in its way; and according to this proposition, when the air is entirely removed from a given receiver, the electric fluid passing through that receiver cannot show any light, because it meets with no opposition; but this will not account for the receiver ever becoming a non-conductor.

"Having just mentioned, that according as the air is more and more rarefied in a receiver, so the electric light becomes gradually more faint, it will be proper to add, that the electric light is more diffused and less bright in an exhausted receiver than in air: Thus, when the receiver is not exhausted, the discharge of a jar through some part of it will appear like a small globule exceedingly bright; but when the receiver is exhausted, the discharge of the same jar will fill the whole receiver with a very faint light: whereas some persons, by seeing the whole receiver illuminated, are apt to say that the light of electricity is rendered stronger and greater by the exhaustion.

"V. It is mentioned by Mr Nairne, in the 67th vol. of the Phil. Trans. that having put a piece of leather, just as it comes from the leather-sellers, into the receiver of an air pump, and afterwards having rarefied the air in it 148 times, the electric light appeared very faint in it; whereas, without the leather, and even when the air was much more rarefied, the light of the electric fluid, when made to pass through the receiver, was much more apparent. In consequence of this observation, I suspected that a little moisture in the receiver, or some other effluvia of substances, might perhaps prevent the appearance of the electric light in rarefied air; and with this view I began to put various substances successively into the receiver; and after rarefying the air by working the pump, some electric fluid was made to pass through the receiver.

141 Experiments by introducing various substances into the receiver.

"When a piece of moist leather was put into the receiver, the air could not be rarefied above 100 times, and the electric light appeared divided into a great many branches; though at the same time another sort of faint light filled up the whole cavity of the receiver.

"When a linen rag, moistened with a mixture of spirit of wine and water, was put into the receiver, the pump could not exhaust above 40 times, and the light of electricity appeared divided into many branches.

"A wine-glass full of olive oil placed under the receiver, prevented very little the exhaustion of the pump, the air being rarefied above 400 times. The electric light appeared exactly as it usually does in the same degree of rarefaction when no oil is under the receiver, *viz.* a uniform faint light inclining to purple or red.

"Concentrated vitriolic acid placed in a glass under the receiver, produced no particular effect. As for the other mineral acids, they were not tried, because, being volatile, they would have damaged the pump.

"Dry solids, that had a considerable smell, as sulphur, aromatic woods previously made very dry, and some resins, produced no particular effect, any more than some of them prevented a very great degree of exhaustion, owing to some moisture which still adhered to them,

142 The light, attraction, and repulsion, diminish in great degrees of rarefaction.

"From these experiments it appears, first that in the utmost rarefaction that can be effected by the best air-pump, which amounts to about 1000, both the electric light and the electric attraction, though very weak, are still observable: but, secondly, that the attraction and repulsion of electricity become weaker in proportion as the air is more rarefied, and in the same manner the intensity of the light is gradually diminished. Now by reasoning on this analogy we may conclude, that both the attraction and the light will cease in a perfect absence of air: but this will never account for this perfect vacuum ever becoming a non-conductor of electricity; for since the electric fluid is very elastic, and expands itself with more and more freedom in proportion as the resistance of the air is removed, it seems unnatural that it should be incapable of pervading a perfect vacuum: however, the fact seems to be fully ascertained by Mr Walsh and Mr Morgan; and the only thing that remains to be done is to investigate the cause of so remarkable a property."

With

Miſcellaneous Experiments.

With regard to the power of the electric fluid, we have already had occaſion to ſpeak in various parts of this treatiſe, and particularly to mention the machine in Teyler's Muſeum at Haarlem, as that which was capable of accumulating the greateſt quantity of electricity that had ever been done artificially. Some of the effects of this machine, without any battery, have already been deſcribed; and thoſe which follow are equally calculated to give an idea of its vaſt power. A battery of 135 vials, containing among them about 130 ſquare feet of coated ſurface, was charged by about 100 turns of the glaſs plates; the diſcharge of which melted an iron wire 15 feet long and $\frac{1}{151}$ of an inch diameter; and another time they melted a wire of the ſame metal 25 feet long and $\frac{1}{140}$th of an inch in diameter.

143 Prodigious power of the battery applied to the great machine in Teyler's muſeum.

With ſuch an extraordinary power they tried to give polarity to needles made out of watch-ſprings of three and even ſix inches in length, and likewiſe to ſteel bars nine inches long, from a quarter to half an inch in breadth, and about the twelfth-part of an inch in thickneſs. The reſult was, that when the bar or needle was placed horizontally in the magnetic meridian, whichever way the ſhock entered, the end of the bar that ſtood towards the north acquired the north polarity, or the power of turning towards the north when freely ſuſpended, and the oppoſite end acquired the ſouth. If the bar, before it received the ſhock, had ſome polarity, and was placed with its poles contrary to the uſual direction, then its natural polarity was always diminiſhed, and often reverſed; ſo that the extremity of it, which in receiving the ſhock looked towards the north, became the north pole, &c.

When the bar or needle was ſtruck ſtanding perpendicularly, its loweſt end became the north pole in any caſe, even when the bar had ſome magnetiſm before, and was placed with the ſouth pole downwards. All other circumſtances being alike, the bars ſeemed to acquire an equal degree of magnetic power, whether they were ſtruck whilſt ſtanding horizontally in the magnetic meridian, or perpendicular to the horizon.

When a bar or needle was placed in the magnetic equator, whichever way the ſhock entered, it never gave it any magnetiſm; but if the ſhock was given through its width, then the needle acquired a conſiderable degree of magnetiſm, and the end of it which lay towards the weſt became the north pole, and the other end the ſouth pole.

If a needle or bar, already magnetic, or a real magnet, was ſtruck in any direction, its power was always diminiſhed. For this experiment, they tried conſiderably large bars; one being 7,08 long, 0,26 broad, and 0,05 thick.

When the ſhock was ſo ſtrong, in proportion to the ſize of the needle, as to render it hot, then the needle generally acquired no magnetiſm at all, or very little.

The experiments laſtly tried with this very powerful battery were concerning the calcination of metallic ſubſtances, and the revivification of their calces. It appears that the electric ſhock produced both theſe apparently contradictory effects.

The metallic calces uſed in thoſe experiments were of the pureſt ſort; they were confined between glaſſes whilſt the ſhock was paſſed over them. By this means the calces were ſo far revivified as to exhibit ſeveral grains of the metal, large enough to be diſcerned by the naked eye, and to be eaſily ſeparated from the reſt.

Miſcellaneous Experiments.

As to the calcination of metals, whenever a ſhock was employed much greater than that which was neceſſary to fuſe the metal, part of the metal was calcined, and diſperſed into ſmoke. It is remarkable, that this calcination or ſmoke generally produced ſeveral filaments, of various lengths and thickneſſes, which ſwam in the air. It was farther obſerved, that thoſe flying filaments of metallic calx, if a conductor was preſented to them, were ſoon attracted by it; but after the firſt contact, they were inſtantly repelled, and generally broke into diverſe parts.

Even this vaſt power was not the utmoſt effect of the machine. Dr Van Marum, whom we have already mentioned as principally concerned in making the experiments, thinking that it was capable of charging a larger ſurface, added to it 90 jars, each of the ſame ſize with the former; ſo that his grand battery is now a ſquare of 15 jars every way, and contains 225 ſquare feet of coated glaſs. To aſcertain the degree of the charge, he uſes the electrometer invented by Mr Brook, to be afterwards deſcribed, which is fixed in the centre of the battery, at the height of four feet above the knobs of the jars.

144 The battery augmented.

His firſt object was to try whether this battery could be fully charged by the machine, and whether its increaſe of power was proportional to the augmentation of its ſurface. In theſe reſpects, his expectations were fully anſwered. The former battery diſcharged itſelf over the uncoated part of the jars after 96 revolutions; and the preſent did the ſame after 160 turns of the machine. With the former battery, the Doctor had ſplit a cylinder of box three inches in diameter and three inches in length, the ſection of which, through its axis, contained nine ſquare inches. With the 225 jars, he ſplit a ſimilar cylinder, four inches in diameter and four inches in height, the ſection of which was 16 ſquare inches. He found that to ſplit a ſquare inch of this wood in the ſame direction, required a force equal to 615 pounds; and hence calculates that the power of this exploſion was not leſs than 9840 pounds.

145 Calculation of the force of its exploſion.

The apparent reſemblance between the effects of electricity and of fire, eſpecially in melting metals, has led many to ſuppoſe that they act upon bodies in a ſimilar manner. In order to examine whether this ſuppoſition is juſt, Dr Van Marum cauſed wires of different metals to be drawn through the ſame hole, of one thirty-eighth part of an inch in diameter, and obſerved how many inches of each could be melted by the exploſion of his battery; taking care, in all theſe experiments, to charge it to the ſame degree as aſcertained by his electrometer. The reſults were as follow:

146 Lengths of wire of different kinds melted by it.

Of lead he melted.	-	120 inches.
Of tin	- - -	120
Of iron	- - -	5
Of gold	- -	$3\frac{1}{4}$

Of ſilver, copper, and braſs, not quite a quarter of an inch.

Theſe ſeveral lengths of wire, of the ſame diameter, melted by equal exploſions, indicate, according to our author, the degree in which each metal is fuſible by the

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the electrical diſcharge; and if theſe be compared with the fuſibility of the ſame metals by fire, a very conſiderable difference will be obſerved. According to the experiments of the academicians of Dijon, to melt tin required a heat of 172 degrees of Reaumur's thermometer.

Lead	230
Silver	430
Gold	563
Copper	630
Iron	696

Thus tin and lead appear to be equally fuſible by electricity, but not by fire: and iron, which by fire is leſs fuſible than gold, is much more ſo by the electrical explosion. From theſe and ſome other experiments of the ſame kind, Dr Van Marum concludes, that, in melting metals, the electrical fluid acts upon them in a manner very different from the action of fire, and that the ſuppoſed analogy between theſe two powerful agents cannot be proved, either from the fuſion of metals, or the ignition of combuſtible ſubſtances.

147 **Electrical fluid ſuppoſed to act in a different manner from fire.**

By theſe experiments on the fuſibility of metals, Dr Van Marum was induced to make trial of the comparative efficacy of lead, iron, braſs, and copper, as conductors to preſerve buildings from lightning. In this reſpect, he found that a leaden conductor ought to be four times the ſize of one of iron, in order to be equal in point of ſafety. He has alſo fully proved the ſuperiority of rods to chains, and of copper to iron, for this important uſe.

148 **Comparative efficacy of the different metals as conductors.**

When iron wire is melted by the exploſion of the battery, the red-hot globules are thrown to a very conſiderable diſtance, ſometimes to that of 30 feet: this the Doctor juſtly aſcribes to the lateral force exerted by the electrical fluid. It is, however, remarkable, that the thicker the wire is which is melted, the further are the globules diſperſed: but this is accounted for, by obſerving, that the globules, formed by the fuſion of thinner wires being ſmaller, are leſs able to overcome the reſiſtance of the air, and are therefore ſooner ſtopped in their motion.

Two pieces of iron wire being tied together, the fuſion extended no further than from the end connected with the inſide coating of the jars to the knot; tho' wire of the ſame length and thickneſs, when in one continued piece, had been entirely melted by an equal exploſion.

149 **Wires ſhortened by the diſcharge.**

When a wire was too long to be melted by the diſcharge of the battery, it was ſometimes broken into ſeveral pieces, the extremities of which bore evident marks of fuſion; and the effect of electricity in ſhortening wire was very ſenſible in an experiment made with 18 inches of iron wire $\frac{1}{55}$th of an inch in diameter, which, by one diſcharge, loſt a quarter of an inch of its length. An exploſion of this battery through very ſmall wires, of nearly the greateſt length that could be melted by it, did not entirely diſcharge the jars. On tranſmitting the charge through 50 feet of iron wire of $\frac{1}{140}$th of an inch diameter, the Doctor found that the reſiduum was ſufficient to melt two feet of the ſame wire; but this reſiduum was much leſs when the wire was of too great a length to be melted by the firſt diſcharge. After an exploſion of the battery through 180 feet of iron wire, of equal diameter with the former, the reſiduum was diſcharged through 12 inches of the ſame wire, which it did not melt, but only blued.

150 **Very ſmall wires cannot diſcharge the battery entirely.**

Twenty-four inches of leaden wire $\frac{1}{38}$th of an inch in diameter, were entirely calcined by an exploſion of this battery; the greater part of the lead roſe in a thick ſmoke, the remainder was ſtruck down upon a paper laid beneath it, where it formed a ſtain, which reſembled the painting of a very dark cloud. When ſhorter wires were calcined, the colours were more varied. A plate is given of the ſtain made by the calcination of eight inches of this wire, in which the cloud appears variouſly ſhaded with different tints of green, gray, and brown, in a manner of which no deſcription can give an adequate idea.

151 **Curious phenomena with tin-wire**

On diſcharging the battery through eight inches of tin wire $\frac{1}{38}$th of an inch diameter, extended over a ſheet of paper, a thick cloud of blue ſmoke aroſe, in which many calcareous filaments were diſcernible; at the ſame time a great number of red hot globules of tin, falling upon the paper, were repeatedly thrown up again into the air, and continued thus to rebound from its ſurface for ſeveral ſeconds. The paper was marked with a yellowiſh clouded ſtain immediately under the wire, and with ſtreaks or rays of the ſame colour iſſuing from it in every direction: ſome of theſe formed an uninterrupted line, others were made up of ſeparate ſpots. In order to be certain that the colour of theſe ſtreaks was not cauſed by the paper being ſcorched, the experiment was ſeveral times repeated, when a plate of glaſs and a board covered with tin were placed to receive the globules. Theſe however, were ſtained exactly like the paper. On calcining five inches of the ſame kind of wire, the red-hot globules were thrown obliquely to the height of four feet, which afforded an opportunity of obſerving that each globule, in its courſe, diffuſed a matter like ſmoke, which continued to appear for a little while in the parabolic line deſcribed by its flight, forming a track in the air of about half an inch in breadth.

152 **Accounted for.**

From this phenomenon, Dr Van Marum conjectures, that when the globules approach the paper on which they fall, the matter iſſuing from their lower part ſtrikes againſt its ſurface, and being elaſtic, forces them upwards again by its reaction. The clouded ſtain immediately under the wire, the Doctor attributes to the inſtantaneous calcination of its ſurface; whereas the remainder of the metal is melted into globules, which, while they retain their glowing heat, continue to be ſuperficially calcined, and, during the proceſs, part with this calcareous vapour.

153 **With wire compoſed of equal parts of tin and lead.**

Phenomena ſomething ſimilar to the above were obſerved on the calcination of a wire of equal parts of tin and lead, eight inches long, and $\frac{1}{52}$d of an inch in diameter. This alſo was melted into red globules, which were repeatedly driven upwards again from the paper on which they fell, and marked it with ſtreaks of the ſame kind, but of a brown colour, edged with a yellow tinge. Some of theſe globules, though apparently not leſs hot, moved with leſs velocity than others, and were ſoon ſtopped in their courſe by their burning a hole in the paper. In this caſe, a yellow matter was ſeen to riſe from their ſurface to the height of one or two lines, which extend itſelf to the width of a quarter of an inch. This matter continued, during

3

five

Miscellaneous Experiments.

five or six seconds, to issue from the globules, and formed, on their surface, a kind of efflorescence, resembling the flowers of sulphur produced by the *solfaterra*. The globules, from which these calcareous flowers had issued, were found to be entirely hollow, and to consist of only a thin shell. When this mixed metal is calcined with a less charge of the battery, it leaves a stain upon the paper, something similar to that made by lead, and does not run into globules.

154 **Stain upon paper by the calcination of metals.**

The Doctor has also given plates of the stains made upon paper, by the calcination of iron, copper, brass, silver, and gold. Those made by copper and brass wires are remarkably beautiful, and are variegated with yellow, green, and a very bright brown. Eight inches of gold-wire, $\frac{1}{60}$th of an inch in diameter, were, by the explosion reduced to a purple substance, of which a part rose like a thick smoke, and the remainder, falling on the paper, left a stain diversified with different shades of this colour. Gold, silver, and copper, cannot easily be melted into globules. Our author has once accidentally succeeded in this; but it required a degree of electrical force so very particular, that the medium between a charge, which only broke the wire into pieces, and one which entirely calcined it, could not be ascertained by the electrometer.

155 **Effects upon metals confined in phlogisticated air.**

Though Dr Van Marum was convinced, by M. Lavoisier's experiments, that metals, calcined in atmospherical air, absorb from it that principle which renders it fit for respiration; yet he resolved further to investigate this point, by trying what would be the effect of a discharge of the battery through a piece of wire confined in phlogisticated air. For this purpose, he took air, in which a burning coal had been extinguished, and which had afterwards stood eight days upon water, that it might be entirely cleared from fixed air; with this he filled a glass cylinder, four inches in diameter, and six inches high, closed at the upper end with a brass-plate; from the centre of this plate the wire was suspended, on which the experiment was made. The cylinder was set in a pewter dish filled with water; and to prevent its being broken by the expansion of the air, its lower edges were supported by two pieces of wood half an inch high. The lower end of the wire rested on the dish, which was connected with the outside coating of the battery.

156 **In dephlogisticated air.**

On transmitting the charge, in this manner, through wires of lead, tin, and iron, of only half the length of those which were calcined by an equal explosion in atmospheric air, no calcination took place. The first was reduced to a fine powder, which, upon trial by spirit of nitre, appeared to be merely lead; the two other metals were melted into small globules.

The Doctor then tried the same experiment in pure or dephlogisticated air, obtained from red precipitate; thinking, that, in this, the metals would be more highly calcined than in common air. His expectation was answered only by the lead, which was entirely reduced to a yellow calx, perfectly resembling massicot. The other metals were not more highly calcined in this than in common air; but the globules of iron acquired so great a heat, as to retain it for some seconds, even in the water, and to melt holes in the pewter dish into which they fell.

In nitrous air, calcination took place as easily as in common or in dephlogisticated air. This was contrary to Dr Van Marum's expectation; but he accounts for it, by observing that, from the experiments of Mr Cavendish and of M. Lavoisier, pure air appears to be one of the component parts of the nitrous acid.

157 **Phenomena from the calcination of metals in water.**

In order to illustrate M. Lavoisier's theory, Dr Van Marum resolved to examine the phenomena resulting from the calcination of metals in water. This he tried with both iron and lead; and found that, in the moment of the explosion, a number of air-bubbles appeared on the surface, and the calx rose, like a cloud, through the water. This, he thinks, is not so easily accounted for by the theory of Stahl as by that of M. Lavoisier; because, according to the former, water does not readily either receive or part with phlogiston; whereas the latter supposes this fluid to be composed of the oxigenous principle, united with that of inflammable air. If this be true, nothing more is necessary to calcination, than that the metal should acquire a greater affinity with the oxigenous principle, that subsists between this and that of inflammable air, united with it in the composition of water. To collect the air generated by these calcinations was no easy matter; as the violence of the shock broke the glass receivers employed for this purpose: at last, however, the Doctor contrived a method of receiving it in a glazed stone bason. From the first calcination of lead, about a quarter of a cubic inch of air was produced, which showed no signs of inflammability; but, on every repetition of the experiment, a less quantity of air was generated; and on an accurate trial of that produced by the fourth calcination in the same water, it was found to consist of one part of inflammable and three of atmospherical air. Our author designs to repeat these experiments with water deprived of its air, by being boiled.

158 **Phenomena of earthquakes imitated.**

In order to imitate the phenomena of earthquakes, this ingenious philosopher followed Dr Priestley's method, and made the electrical explosion pass over a board, floating on water, on which several columns of wood were erected; but this succeeded only once. Reflecting that the electric explosion exerts the greatest lateral force when it passes through imperfect conductors, and that water is probably its principal subterraneous conductor, he laid two smooth boards upon each other, moistening the sides in contact with water: upon the uppermost, he placed pieces of wood, in imitation of buildings, the bases of which were 3 inches long and $1\frac{3}{4}$ broad. When the charge of the battery was transmitted between the boards, all these were thrown down by the tremulous and undulatory motion of that on which they stood.

159 **Brookes's experiments on the force of batteries.**

Mr Brookes, electrician at Norwich, has made a great number of experiments, with a view to determine exactly the force of batteires of an inferior size in melting fine wires of different kinds. In these he was particularly careful to ascertain the degree to which his batteries were charged; and this he did by the method which shall afterwards be shown to be the best, viz. that of determining the power of the electricity by the weight which it was capable of raising by its repulsive power; and therefore, in the following experiments, the phrase of batteries being charged to so many grains, implies that the repulsive power of the knob of the battery was able to raise that weight.

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Some of the most remarkable of these experiments were as follow:

" 1. With a battery of nine bottles, containing about 16 square feet of coated surface, charged to 32 grains of repulsion, which charge was sent through a piece of steel wire 12 inches long and $\frac{1}{50}$th of an inch thick 11 times; the wire was shortened one inch and a half, being then about ten inches and an half long; the 12th time the wire was melted to pieces.

" 2. A charge, with the same nine bottles, to 32 grains of repulsion, being sent through a piece of steel wire 12 inches long and $\frac{1}{170}$th of an inch thick, the first time melted the whole of it into small globules.

" 3. A charge of the same nine bottles charged to 32 grains, being sent through a piece of *brass* wire 12 inches long, $\frac{1}{170}$th of an inch thick, the whole of it was melted, with much smoke, almost like gunpowder; but the metallic part of it, after it was melted, formed itself, in cooling, chiefly into concave hemispherical figures of various sizes.

" 4. With only eight of the above bottles charged to 32 grains, the charge did but just melt 12 inches of the steel wire $\frac{1}{170}$th of an inch thick, so as to fall into several pieces; which pieces in coolling formed themselves into oblong lumps joining to each other by a very small part of the wire between each lump, which was not melted enough to separate, but appeared like oblong beads on a thread at different distances.

" 5. The same eight bottles charged to 32 grains, so perfectly heated 12 inches of brass wire, about $\frac{1}{170}$th of an inch thick, as to melt it, or soften it enough for it to fall down by its own weight (from the forceps with which it was held at each end) upon a sheet of paper placed under to catch it; and when it fell down, it was so perfectly flexible, that by falling, it formed itself into a bent or rather vermicular shape, and remained entire its whole length, *i. e.* about 12 inches when it was put into the forceps; but after it was fallen on the paper, it sagged so much as to be stretched by its own weight from 12 to about 15 inches long; and by falling on the paper it flattened itself the whole length of it, so that when it was examined with an half inch magnifier, it appeared about five or six times broader than it was in thickness.

" 6. With nine bottles again, charged only to 20 grains, the charge was sent through 12 inches of steel wire $\frac{1}{176}$th of an inch thick, which heated it enough to melt it so as to be separated in many places; and the pieces formed themselves into strung-bead-like shapes, as in experiment 4.

" 7. With the same nine bottles, charged to 20 grains, the charge was sent through 10 inches of brass wire $\frac{1}{170}$th of an inch thick; the wire was heated so red hot as to be very flexible, yet it did not separate, but was shortened near $\frac{3}{8}$ths of an inch.

" 8. A charge of nine bottles, charged to 20 grains, sent a second time through the last piece of wire, melted it asunder in three places.

" 9. Nine bottles charged to 30 grains, and the charge sent through 12 inches of brass wire $\frac{1}{170}$th of an inch thick, treated it nearly as in experiment 5. except that it was separated in two places, and the pieces measured about 16 inches and an half long; but perfectly flattened by its fall on the paper, as before.

" 10. Nine bottles charged to 30 grains, and the charge being sent through eight inches and a half of brass wire the size of the last, wholly dispersed it in smoke, and left nothing remaining to fall on the sheet of paper placed under it.

" 11. With 12 bottles, charged to 20 grains, the charge was sent through ten inches of steel wire one-hundredth of an inch thick, which made the wire red hot, but did not melt it.

" 12. A second charge, the same as the last, was sent through the same piece of wire, which heated it red hot as the first did, but it was not separated; this piece of wire was now shortened five-sixteenths of an inch.

" 13. A charge to 25 grains, with the same 12 bottles, was sent through the last piece of wire which melted it into many pieces, and many globules of calcined metal.

" 14. A charge of 15 bottles, charged to 25 grains, was sent through ten inches of steel wire one-hundredth of an inch thick, which melted it the first time, and dispersed a great part of it about the room.

" 15. A charge with the last 15 bottles, charged to 23 grains, just melted ten inches of steel wire the size of the former, so as to run into beautiful globules, nearly as in exp. 13.

" 16. A charge of 15 bottles, charged to 15 grains, being sent through ten inches of steel wire the size of the last, it was barely made red hot; but it was shortened one-tenth of an inch by the stroke passing through it.

" 17. The last piece of wire having a charge of 15 bottles, charged to twelve and a half grains, sent thro' it, was not made red hot.

" 18. A charge of the same 15 bottles, charged to 25 grains, was sent through the same piece of wire, which seemingly tore the wire into splinters.

" 19. Four bottles, charged to 30 grains, just melted three inches of steel wire one hundred and seventieth of an inch thick, so as to fall into pieces.

" 20. Five bottles, charged to 25 grains, most beautifully melted three inches of such wire as the last into large globules.

" 21. Eight bottles, charged to 15 grains, melted three inches of steel wire one hundred and seventieth of an inch thick, similar to the five in the last experiment; so nearly alike both in appearance and effect, that it might have been said to be the same.

" 22. Ten bottles charged to twelve and a half grains, rather exceeded exp. 19. but scarcely came up to exp. 20. and 21.

" 23. Suspecting something in exp. 19. I found, that though my bottles hitherto were as nearly of the same size as I could procure them, yet some of them were a little larger than others, and, which was the case in exp. 19. one of the four was smaller than the other three; so that I repeated the experiment with four bottles more equal in size, and charged them to 30 grains, and the fusion was as perfect as in any.

" 24. A charge to 20 grains, with the last eight bottles, very finely melted six inches of steel wire one hundred and seventieth of an inch thick.

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" 25. With two bottles, charged to 45 grains, the charge was sent through one inch of such sized steel wire as the last, which only changed its colour.

" 26. Three bottles, with a 40 grains charge, dispersed one inch and a half of steel wire, the size of the last, all about the room.

" 27. As a steel wire of one hundredth of an inch thick has nearly double the quantity of metal of a wire one hundred and seventieth of an inch thick, so I took three inches of the former, and sent a 25 grains charge with ten bottles through it, which melted it just as the five bottles did in exp. 20.

" 28. Twenty bottles, charged to twelve grains and a half, melted three inches of steel wire, the size of the last, exactly similar to the foregoing experiment.

" 29. As a steel wire of one-eightieth of an inch thick contains nearly twice the quantity of metal in the same length as a steel wire of one-hundredth, or four times the quantity of a steel wire of one hundred and seventieth of an inch thick; so it might, from the foregoing experiments, he expected that 20 bottles, charged to 25 grains, would melt three inches of steel wire one-eightieth of an inch thick; but on a great many trials 20 bottles could not be procured that would bear the discharge, when charged to 25 grains: for at the discharge there would be always one or more bottles broken or perforated. I was now reduced to the necessity of being content with getting bottles of any size that would bear the required charge, from one to three gallons each, or that contained from about 150 to 300, or more, square inches of coated surface, each; but all in vain, my only resource left (as I was not near any glass-house), was to increase the quantity of surface, and not to charge so high, and to proportion the one to the other: a third part was concluded on to be tried; that is, instead of about 36 feet of coating, I added one third, or 12 feet, which made it 48 feet: and that, instead of charging to 25 grains, or 24 grains, which divides by 3 better, to omit one-third of the height of the charge, which leaves 16 grains: and thus I succeeded perfectly well; for 3 inches of steel wire one-eightieth of an inch thick was as curiously melted with 48 feet of coated surface, charged to 16 grains, as any of the former.

" These bottles, thus broken in large discharges, seem always to break, or to be struck through, nearly in the thinnest, but never in the thickest place, which shows the necessity of the substance in the glass.

" 30. As in exp. 19. and 21. where the former is but half the quantity of coated surface of the latter, charged to 30, and the latter to 15 grains, to know how high 48 feet of coating must be charged to produce the same effect exactly: and as the quantity of coating in four bottles, consisting of a little more than six feet and a half, is contained in 48 feet a little more than seven times; so I tried by charging 48 feet only to a little more than four grains, or only about one seventh part so high, as four times seven is 28; that is, but two less than 30: and this had exactly the same effect on the wire, which was one hundred and seventieth of an inch thick, and three inches long, as the former.

" 31. As the last experiment agreed so exactly with exp. 19. and 20. the next thing tried was to see the effect of 48 feet of coated surface charged to a little more than four grains, upon six inches of steel wire, the size of the last; but this was only made very faintly red.

" 32. A repetition of the last experiment with the same length of the same wire, to see how often the same charge might be sent through before it would be melted, and to observe the appearance of the wire after each stroke; the eighth stroke melted it into several pieces. After the first stroke, the redness grew less every time, even the last time, when it was separated. The first stroke, though little more than fairly red, made it so flexible, that by a little more than its own weight (about a penny-weight more), it was apparently made perfectly straight when it was cooled: about the third or fourth stroke it began to appear zigzagged; after the sixth stroke the surface of it appeared rough; after the seventh stroke the surface was very roughly scorified or scaly; and some of the scales had fallen upon a piece of white paper, placed under it, at about half an inch distance below it. The eighth stroke melted it in three places; and at those places where the angles appeared the sharpest or most acute, a great number of the scaly appearances were driven off about the paper, which appeared like splinters (see exp. 18.); some of them were almost one-tenth of an inch long, and some of them about a third or a fourth part of the diameter of the wire in breadth, and very thin: after the seventh stroke it was shortened seven-sixteenths of an inch: the wire was one hundred and seventieth of an inch thick.

" 33. Repeating exp. 31. again with the same size and length of wire, and the same battery charged the same, in order to observe the method of the wire shortening, having fixed an insulated gage parallel to and about a quarter of an inch distant from it: after the first stroke, which made the wire fairly red, (it being fixed at one end, that the shortening might appear all at the other, which was held so as either to contract or dilate), I observed that it shortened considerably as it cooled; repeating the stroke, it did the same, and so on till it was melted, which was by the eighth stroke, as before. At the instant that the stroke passed thro' the wire it appeared to dilate a little, and after it was at its hottest, it gradually contracted after every stroke as it cooled, about one-sixtieth of an inch each time; the dilating was so very little, as to bear but a very small proportion to its contraction, and sometimes it was doubtful whether or not it did dilate at all; but after all the observations it appeared oftener as if it did dilate, than as if it did not.

" 34. The same 48 feet, negatively charged to a little more than four grains, melted three inches of steel wire one hundred and seventieth of an inch thick, the same as the positive charge did in exp. 30.

" 35. The same battery of 48 feet of coated surface, charged to a little more than eight grains, melted three inches of steel wire one-hundredth of an inch thick. This is very nearly in proportion to exp. 27. but here the charge was negative, and the fusion was the most pleasing of any I have hitherto had; probably owing to the charge, by chance, happening to be so well adjusted as to be exactly sufficient to melt the wire and no more: it held hot the longest, and the fused metal ran into the largest globules: probably the

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length of the time that the heat continued, was owing to the charge being just sufficient, and to the size of the lumps that the fused metal formed itself into.

"36. A repetition of exp. 1. with twelve inches of steel wire, one-hundredth of an inch thick, but with this difference, that as then I used only nine bottles, containing about 16 square feet of coated surface charged to 32 grains, I here used 18 bottles containing about 32 square feet of coating charged to only 16 grains. This was done, to observe the progress of the destruction of the wire, as in exp. 32, as well as to prove the similarity of the effect. The wire being the same size, sort of metal, and length, as recited just above; the first stroke made it fairly red-hot the whole length of it with smoke and smell, changed its colour to a kind of copperish hue, and shortened it considerably; the second stroke made it of a fine blue, but it did not appear red, and shortened it more; at the third stroke, it became zigzagged, many radii were very visible at the bendings, and continued to shorten till the eleventh stroke, when one of the bottles in the second row of the battery was struck through: the fracture was covered over with common cement, its place supplied by changing place with one in the third row, supposing the mended one to be the weakest; and thus, with the battery in this state, I made the twelfth stroke, which separated the wire, as in exp. 1. but this wire was shortened only one inch.

"37. A charge of 48 feet to eight grains, sent through three inches of copper wire one hundred and seventieth of an inch thick, seven times, made it zigzagged, but not much shorter; the eighth stroke separated it at one end, close to the forceps which held it, but it did not appear to be made sensibly red-hot at all, notwithstanding it must have been often so at the place where it was melted: which space was so very small as barely to be perceptible, like as when a point is set upon any flat surface of iron, and a stroke from a pound phial being sent through, both the point and the flat surface where the point rested, if examined with a magnifying glass, will be found to have been melted, and a speck may be seen: but the redness of the metal will scarce be visible.

"38. A charge of 48 feet, to 16 grains, was sent through six inches of lead wire one-fiftieth of an inch thick, which melted it into many pieces.

"39. A charge of 48 feet, to 15 grains, was sent through six inches of wire like the last, which did not separate it, but made it smoke.

"40. A charge like the last was sent through the last piece of wire a second time; which melted it into several pieces.

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Lead more easily destructible than any other metals.

"The law by which wires resist destruction, in proportion to the thickness of the wire, does not seem to be so equable, by much, in the lead as in the steel wire. For a charge of four grains, in exp. 34. melted three inches of lead wire one sixty-fifth of an inch thick: but it took a charge of about three times that power to destroy three inches of lead wire one-fiftieth of an inch thick; which is about double the quantity of metal in the same length as in that of one sixty-fixth of an inch thick. Thus it is easy to find, what different resistance a wire of any of the foregoing metals, of equal size and length, will make to the electrical stroke or to lightning.

"The length of the electric circuit, in which the different wires were placed, in the foregoing experiments, from the nearest part of the inside to the nearest part of the outside of the battery, exclusive of the length of the said wires, was about eight feet.

"Notwithstanding the easy destruction of the lead wire by the electrical stroke, it seems greatly to be doubted, whether any thunder strokes happen in any place whatever, strong enough to destroy a strip of lead four inches broad and of the thickness of about eight pounds to the foot. Whence it may be presumed, that such a strip of lead may be perfectly safe for conductors through buildings of any kind whatever: as it is not much subject to decay in any common exposure.

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Violent explosion from an electric battery.

"41. Two gentlemen coming in to see a piece of wire melted by electricity, I proceeded to show it them, by fixing 12 inches of steel wire one-hundred and seventieth of an inch thick, in the forceps, and then (supposing the electrometer and all other things ready placed) to charge the battery, but the electrometer did not move; nevertheless I continued charging as I supposed; but still the electrometer remained as it was, although I had been charging much longer than would have been necessary, contrary to my design, which was to take a small wire, that a small charge might be sufficient. Having been charging a long time, I left off to look about the apparatus, in order to see if any thing was not right: as I was looking, I found there was no communication to the electrometer, and heard a small crackling in the battery, which convinced me that it was charged. Accordingly I made the discharge, expecting nothing unusual; but the wire was dispersed seemingly in a very violent manner. The report was so very loud that our ears were stunned, and the flash of light so very great, that my sight was quite confused for a few seconds. The singularity of the appearances attending this experiment led me to insert it."

Though from what has been said under section VI. the direction of the electric fluid *outwards* from a body positively electrified, and inwards from one negatively so, seems to be sufficiently ascertained, yet some experiments related by Mr Nicholson in the last volume of the Philosophical Transactions, which seem to militate against this doctrine, require a particular consideration; and for this reason we shall here not only give an account of these, but of some others made on the subject of excitation, and the state of a charged phial in general, which seem to throw some light upon the subject. Mr Milner, who has been at great pains to inquire into this matter, makes the following observations:

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Milner's account of the Leyden phial.

"I. In the charged phial, when the inside has either kind of electricity communicated to it, the outside is found to possess a contrary power. It appears also from the preceding experiments, that either kind of electricity always produces the other on any conducting substance placed within the sphere of influence. And as the same effect is also produced on electrics themselves, in the same situation, and as some portion of the air, supposing no other substance to be near enough, must be unavoidably exposed to such influence, it necessarily follows, that neither power can exist without the other; and therefore, in every possible case, positive

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positive and negative electricity are inseparably united.

"II. A phial cannot be fully charged, by which the outside acquires a contrary electricity, unless the external coating has a communication by some conductor with the earth. In the same manner, a full charge of the contrary electricity cannot readily be procured in these experiments without a similar communication.

"III. In both cases the interposition of an electric body between the contrary powers is absolutely necessary. In one case that body is glass, in the other it is air; and the experiment will not succeed in either, unless both the glass and the air be tolerably free from moisture.

"IV. It appears from the 18th experiment, that the influence of electricity acts in the same manner through glass as it does through the air, and produces a contrary power in both cases.

"V. A communication of the electric matter is more easily made through the fluid yielding substance of the air than through glass; which is so hard and solid a body, as to require a very considerable degree of power to separate its component particles: this, however, sometimes happens, and a hole is made thro' the glass itself, without design, in attempting to charge a very thin phial as high as possible, in the most favourable state of the atmosphere.

"VI. A conducting body receives the strongest charge of the contrary electricity, in these experiments when it is brought as near as possible to the electric power, without being within the communicating distance. And it is well known that the thinnest phial, if it be strong enough to prevent a communication between the two surfaces, will always receive the highest charge.

"VII. The electricity of the external surface of the charged phial cannot be destroyed, so long as the internal surface remains in force, and continues to exert its influence through the glass; because this influence was the cause of the contrary electricity on the external surface, and must therefore preserve it.

"VIII. If part of the course which the electric matter takes in discharging a phial be through the air, a small part of the charge will always remain; because the whole of the redundancy on one surface is not capable of forcing a passage through the resisting medium of the air, in order to supply the deficiency on the other surface. But if every part of the circuit from the internal to the external coating, consists of the best conductors, and if the coated surfaces be nearly equal, and directly opposite to each other, the phial will then appear to have retained no part of the charge, so far as it is covered with tin-foil; but the parts of it above the coating on both sides will, however, still retain the contrary electricities, after the circuit has been completed (G). A residue of the charge may also be observed in every other instance of electrification, in which the degree of electricity is sufficient to force a communication between the electrified body and a conductor not insulated, through a small portion of the air: and if the experiment be carefully made, it will appear, that the whole of the redundancy is not capable of passing through the resisting intermediate air, in any case, and therefore a part of the charge must always remain. This may be conveniently shown by using a well excited electrophorus of about five inches diameter, the metal cover of which may be so strongly electrified, as to force a communication through the air, to any good conductor not insulated, at the distance of three quarters of an inch. After this, a second communication much weaker than the first may be made at the distance of about the twentieth-part of an inch, which is the residue of the charge, or rather a part of it: for if the second communication be carefully made through the air, without touching the cover, it will be found still to have retained enough of the first charge to electrify a pair of vertical needles.

"As it appears from this view, that both these cases are similar in so many remarkable particulars, it follows, that they are essentially the same, notwithstanding they differ in the degree of power and some other circumstances, which may alter the form of an experiment without changing its nature. It is apprehended, therefore, that the abovementioned distinction will not only appear to be unnecessary, but also that either power cannot possibly exist without the other, as it has been shown under the first particular, that positive and negative electricity were inseparably united. But here it will be proper to examine more particularly the nature of charged glass.

163. A phial is not brought to its natural state by being discharged.

"1. When a plate of coated glass has been charged, and the circuit between the coatings has been completed, by the mediation of a good conducting substance, no part of the coated surface is supposed to retain any part of the charge; but, according to the commonly received doctrine, the whole of it is said to be discharged; or in other words, to be brought into its natural state. This, however, is not really the case, as will evidently appear from the following experiment; the design of which is to show the effects produced by charging and discharging a plate of glass.

"2. Let the middle of a piece of crown window-glass, seven inches square, be placed between two circular plates of brass, about the 16th part of an inch thick, and five inches in diameter. In order to enable these plates to retain a greater degree of power, it will be proper to terminate each of them with a round bead the third part of an inch thick; and the whole of the bead should be formed on one side of the plate, that the other side may remain quite flat, and apply well to the surface of the glass. Let the whole be insulated,

"(G) The whole remainder of the charged phial must not, however, be ascribed to the cause abovementioned: for after taking away that part of it belonging to the coated surface, which could not force a passage through the air, if the phial be allowed to stand a short time on the table, the coated surface will again gradually acquire some power, which must be derived from the charge of the phial above the coating. Another source of the residuum will appear in the next experiment."

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lated about four inches above the table, and in an horizontal position, by fastening one end of a cylindrical piece of some good insulating substance to the middle of the under plate, the other end of it being fixed in any convenient stand. Let a like insulating stem be fastened to the middle of the upper plate. Let a brass chain, which may easily be removed, reach from the under plate to the table. In the last place, bend a piece of brass wire into such a shape that it may stand perpendicularly on the upper plate; and let the upper extremity of this wire be formed into an hook, that it may be removed at any time by the assistance of a silk string, without destroying the insulation of the plate.

"3. The glass being thus coated with metal on both sides, and having also a proper communication with the table, will admit of being charged; and both coatings may be separated from the glass, and examined apart, without destroying the insulation of either: for the upper coating may be separated by the means of its own proper stem; and the under coating may be separated by taking hold of the corners of the glass, and lifting the glass itself. As glass readily attracts moisture from the atmosphere, it will therefore be necessary to warm it in the beginning, and to repeat it several times in the course of the experiment, unless the air should be very dry.

"4. Excite a smooth glass tube, of the common size, by rubbing it with silk, and apply it repeatedly to the bent wire until the glass be well charged. Then remove the chain, which reaches from the lower plate to the table, and also the charging wire from the upper plate, by laying hold of its hook with a silk string. It necessarily follows, from considering the quality of the power employed in the present case, that the upper surface of the glass, together with the upper coating, must be electrified positively; and that the under surface and coating must be electrified negatively: but as it is designed in this experiment to examine the powers of charged glass, that no virtue may be imputed to the glass but what really belongs to it, let both coatings be separated from it; and after they have been brought to their natural state, by touching them with a conducting body not insulated, let the glass be replaced between them; and whatever effects may now be produced, must be ascribed solely to the powers of the charged glass. On bringing a finger near the upper coating, a small electrical spark will appear between that coating and the finger, attended with a snapping noise. Apply a finger in the same manner to the under coating, and the same thing will happen. This effect cannot be produced twice, by two succeeding applications to the same coating; but it may be repeated several hundred times over, in a favourable state of the atmosphere, by alternate applications to the two coatings; and the powers of the glass will be thus gradually weakened.

"5. This part of the experiment may be explained, by observing, that the contrary electricities have a natural tendency to produce, and to preserve each other, on the opposite sides of a plate of glase; and therefore, the increase or decrease of power, on either surface, must be regulated by the increase or decrease of the contrary power on the other side: and as in charging a plate of glass positively, no gradual addition of electric matter can be made to the upper surface, without a proper conveyance for a proportionable part to pass away from the lower surface; so in this method of uncharging it, the electric matter cannot be gradually taken away from the upper surface, without adding a proportionable part to the under surface: one operation is the revese of the other, and so are the effects; one case being attended with an increase and the other with a decrease of power.

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"6. Let the glass be again fully charged, and after bringing both coatings to their natural state as before, let the glass be replaced between them; and on touching the upper coating with a finger, and then separating it from the upper and positive surface of the glass by the insulating stem, this coating will acquire a weak negative power, which will be sufficient to produce a small spark while the glass is in full force,, though after the power of the glass has been reduced, it will give little or no spark: but, in both cases, on touching the coatings alternately two or three times, the negative power of this coating, when separated from the positive surface of the glass, will be so considerably increased, as to produce strong negative sparks.—This effect may now be repeated several times, by only touching the upper coating, but the sparks will grow weaker every time; and they may be restored again to nearly their former strength, by alternate applications to both coatings, as before. The same things will also happen to the under coating, in the same circumstances; but with this difference, that the power of the under coating, on being separated from the under and negative surface of the glass, will be positive. And thus a long succession of both positive and negative sparks may be produced in favourable weather; or at any time by keeping the glass moderately warm.

"7. It appears from this part of the experiment, that each of the surfaces of the charged glass has a power of producing a contrary electricity in the coating in contact with it, by a momentary interruption of the insulation. It necessarily follows in producing these effects, that more electrical matter must have passed away from the upper coating, at the time of touching it, than the same coating could receive from the upper surface of the glass; and therefore, the upper coating, by losing some of its natural quantity, will be negatively electrified: and also, that more electric matter must have been added to the under coating at the time of touching it, than the under surface of the glass could receive from it; and therefore the under coating, by receiving some addition to its natural quantity, will be positively electrified. It appears further, that the greatest degree of this influential power, which may be consistent with the circumstances of the case, will be produced in either coating, by taking care at the same time to bring the opposite coating into a like state of influential electricity: and thus it is evident, that the influential powers of the two coatings have the same relation to each other as the contrary powers of the glass itself, and will therefore always increase or decrease together.

"8. The glass being again well charged as at first, let a brass wire bent in the form of a staple he brought into contact with the upper and lower coating at the same time. By this the common discharge will be made: but the equilibrium of the coated glass will be only

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only restored in part; of a considerable degree of attraction will happen at the same time between the upper coating and the glass, which has frequently been strong enough to lift a piece of plate-glass weighing ten ounces (H). Neither coating will now show the least external sign of electricity while it is in contact with the glass; but on separating either of them from it, if care be taken to preserve their insulations, the upper coating will be strongly electrified negatively, and the under coating will be strongly electrified positively. Let then both coatings be brought to their natural state, by touching them when separated from the glass, with a conducting body not insulated, and let the glass be replaced between them as before. In this state of things, on touching the upper coating only, and separating it from the glass, it will not be capable of giving any spark; but on touching the coatings alternately five or six times, it will then give a weak spark; and this may now be repeated several times by only touching the upper coating: but on a second application of the bent wire to both coatings at the same time, a second discharge may be perceived, though much weaker than the first, and the coatings will be again brought into the same electrical state as immediately after the first discharge. This may frequently be repeated; and a considerable number of strong negative sparks may be taken from the coating when it is separated from the positive surface of the glass. If the glass in replacing it between the two plates be turned upside down, the electrical powers of both coatings will be changed by the next application of the discharging wire to complete the circuit; and a succession of strong positive sparks may be taken from the coating when it is separated from the negative surface of the glass.

"9. It appears from this part of the experiment, that the coated part of the charged glass was not brought into its natural state by completing the circuit between the coatings; but that it still retained a degree of permanent electricity; that the powers of both coatings were actually changed at the time of the first discharge, and that a succession of the same powers may be produced in the coatings, without renewing the least application of electricity to the glass itself.

"10. The whole quantity of electric matter added to the glass in charging it, is evidently distinguished into two parts in this experiment. The first part, which is by far the most considerable, appears to have been readily communicated from one surface of the glass to the other, along the bent wire, when it was first brought into contact with both coatings at the same time. The second part of the charge appears to be more permanent, and remains still united with the glass, notwithstanding the circuit has been completed (I). This permanent electricity, as well as the other, must be positive on the upper surface, and negative on the lower surface; because, in the present experiment, the charge was given by a smooth glass tube excited with a silk rubber. Now, the influence of the opposite and permanent powers on the different sides of the glass (each side having a tendency to bring the coating in contact with it into a state of electricity contrary to its own) must assist each other, in causing part of the electric matter naturally belonging to the upper coating to pass away from it to the under coating, along the discharging wire, and at the same time the surcharge to pass the same way. The upper coating, therefore, by losing some part of its natural quantity, must be negatively electrified; and the under coating, by receiving an addition to its natural quantity, must be positively electrified. The whole quantity of electric matter, which the influence of the permanent electricity of the glass is capable of taking from one coating and of adding to the other, bears but a small proportion to the whole charge: and therefore the seccond and every subsequent discharge must be considerably weaker than the first.

"11. It appears from several of the preceding experiments, that a considerable degree of influential power may be produced at some distance by an electric in full force; and therefore a small excited body of a cylindrical shape was sufficient to answer that purpose: but when the excited electric has been so far weakened that it cannot communicate its own power, nor produce this influential power in any body, unless it be brought very near or in contact with it, bodies of a cylindrical form must then act to great disadvantage, and a small degree of power only can be produced; because the strength of the influential electricity in this case will be in proportion to the surface of the electric and conducting bodies, which are brought near together, or in contact with each other; and therefore a plate of glass in the same circumstances, whether its permanent power be derived from excitation or communication, is enabled from its shape to produce a considerable degree of the influential powers in the coatings in contact with it.

164 Hypothesis concerning the electrophorus.

"12. It appears from this experiment, that the ingenious professor Volta's electrophorus is, in reality, a resinous plate charged with permanent electricity by friction; and because there is a less disposition in a body of this kind to attract moisture from the atmosphere than there is in glass; it will retain the power better, and consequently be the longer capable of producing a contrary electricity in the insulated metal cover. If it should be thought necessary to support this observation by a direct experiment, it may easily be done by making a thin flat plate of any resinous electric substance, and larger than the insulated cover, but without fastening a

"(H) The whole of this effect must not be ascribed to the attraction of electricity. Perhaps the passage of electric matter between the coating and the glass may help to exclude the air; and then the attraction of cohesion, and the pressure of the external air both above and below, may be supposed to have the most considerable share in producing this effect.

"(I) Some new terms seem to be wanted in order to express with precision the different parts of the charge. And if that part of it which cannot be destroyed by completing the circuit, should be called *the permanent part of the charge*, or more simply *the charge*; then might the other part, or that which may be destroyed by completing the circuit, be named the *surcharge*.

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a coating to either surface; and then, whether this plate be charged by excitation or communication, one of its sides will be positive and the other side negative; and a succession of positive sparks may be produced on the negative side, and of negative sparks on the positive side, by a proper application of the insulated metal cover. It will be also found, that this resinous plate cannot be well charged, either by excitation or communication, unless a coating of some conducting matter should be kept in contact with the under surface; and it should also have some communication with the floor.

"13. It has been very properly recommended to use a particular kind of rubber, and to attend to the state of it, in order to excite glass well; but it will not be necessary to pay the least regard to these circumstances in the following experiments, in which a method will be shown of charging a small phial and a plate of glass at the same time, by a gradual accumulation of power; that power being entirely derived from the glass itself, and with no other degree or kind of friction than is necessarily connected with the form of the experiment.

165 How to charge a phial without friction.

"14. Place a circle of tin-foil five inches in diameter on the table, between a soft piece of baize and the middle of the same plate of glass that was used in the last experiment, which will thus be coated on the under side; and in order to preserve a proper communication with this coating, let a fillet of tin-foil reach from it beyond the extremity of the glass. The same insulated metal cover is to be used for the upper coating as before. Let a thin ounce-phial of glass be filled with brass-filings, and coated with tin-foil on the outside to about one inch from the top. Let a large brass wire, the fifth part of an inch in diameter, pass through the cork of the phial into the filings, about an inch of it being left above the cork, and let the upper extremity of this wire be well rounded. This experiment requires, that the whole construction should be well warmed at first; and it will be necessary to repeat it at proper intervals, unless the atmosphere should be very dry.

"15. Taking hold of the wire of the phial with one hand, let it be placed on the upper surface of the glass, and its bottom carried in contact over the middle of the upper surface, as far as the tin-foil coating reaches on the under side: and during this part of the operation, a finger of the other hand must be kept in contact with the fillet of tin-foil. Then lifting the phial by the wire with one hand, let it be placed on the insulated metal cover, suspended in the air with the other hand; and after shifting the hand from the wire to the coating, let the bottom of the phial be placed on the end of the tin-foil fillet. Place the insulated metal cover on the middle of the glass, and touch it with a finger of one hand, while the other hand touches the tin-foil fillet. Now lift the insulated cover by its stem, and bring the head of the cover in contact with the wire of the phial, and a very small spark of light will appear between them. Let this be repeated in the same manner about 15 times, taking care to preserve a proper communication between the coating and the floor. Then taking hold of the phial by the coating, let it be replaced on the insulated cover while it is suspended in the air; and after shifting the hand from the coating to the wire, let it be again placed on the middle of the glass, and let the bottom be again carried in contact over the middle of the glass, holding the wire in one hand, while the other has a proper communication with the tin-foil coating. Let the phial be again returned to the tin-foil fillet as before, and let the insulated cover be applied repeatedly to the wire, immediately after every separation from the glass; and a brighter spark, together with a weak snapping, will now attend each application, if it be carefully observed to touch the cover with one hand before every separation, while the other hand rests on the fillet of tin-foil. By proceeding in this manner, after the third application of the phial to the glass, a very weak shock will be felt in those fingers which are used in completing the circuit of the glass; and after repeating two rounds more in the manner before mentioned, the phial will be fully charged. By applying the coating of the phial when it is in full force to the upper surface as before, the glass plate will get the greatest power it is thus capable of receiving, and will then give a shock as high as the elbows. After this, on attempting to lift the insulated cover, the glass itself will generally be lifted at the same time, with the tin-foil coating adhering to the under surface: but by continuing the separations of the cover from the glass, a succession of strong negative sparks may be produced by the influence of the upper surface; and by turning the glass over, and leaving the tin-foil coating on the baize, a succession of strong positive sparks may be produced by the influence of the other side.

"16. This experiment may be performed more steadily by placing the glass, together with the tin-foil coating and baize, on a plate of metal about $\frac{1}{10}$th of an inch thick, and of the same square as the glass. The whole may be fastened together by two small holdfasts placed at the opposite corners, which will prevent the glass from being lifted. This plate of metal will be useful in another view; for after it has been sufficiently warmed by retaining heat well, it will help to keep the glass dry, and consequently fit for use so much the longer. But when it shall be required to show the contrary powers of the opposite sides of the glass, it will be more convenient not to fasten the parts together, and the whole may be kept sufficiently steady, by the operator's keeping down one corner of the glass with a finger, and by placing a proper weight on the opposite corner.

"17. The bottom of the phial cannot be carried in contact over the glass without producing some little degree of friction; from which the power in this experiment is originally derived. The cover will appear on examination to be electrified negatively after every separation from the glass: but as it was touched in completing the circuit between the coatings before every separation, it necessarily follows, that the cover can have only an influential electricity, and consequently that the permanent power of the upper surface of the glass must be positive. The negative power of the cover is communicated to the wire of the phial, by which the inside is electrified negatively and the outside positively; and both these powers will increase with every application, because the circumstances of the phial are favourable to its charging. The phial must be insulated every time it is required to shift the hand from the wire to the coating, or from the coating to the wire; for

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for without this precaution the phial would be discharged. By applying the outside of the phial to the upper surface of the glass, in the manner abovementioned, the phial will be partly discharged on that surface: and though it must be therefore weakened, the power of the glass will be increased, and consequently enabled to produce a proportionably stronger effect on the brass cover, which by the next round of applications will give the phial a stronger charge than it had before. And thus a very small degree of original power is first generated, and then employed in forming two different accumulations: and by making each of these subservient to the increase of the other, the phial is at last fully charged, and the glass plate acquires such a degree of the surcharge, as to give a pretty smart shock; and after that, it remains capable, by the influence of its permanent powers, of producing a succession of positive and negative sparks on the opposite surfaces.

"18. The contrary charge may be given to the phial by taking hold of the coating, and carrying the wire in contact over the middle of the upper surface of the glass, and by applying the power of the insulated cover to the coating; for if the operation be conducted in every other respect in the same manner as before, then will the inside be electrified positively, and the outside negatively. The powers of the glass plate will be the same as they were in the former case.

"19. After the phial has been fully charged negatively, by the process of the last experiment, let it be insulated; and taking hold of the wire, let the bottom be held uppermost, and let the hand which holds it rest on the fillet of tin-foil. Apply the insulated cover to the glass, and after touching it with a finger of the other hand, separate it from the glass; and on bringing it towards the coating of the phial, a strong spark will pass between them. After repeating this between 20 and 30 times, the powers of the phial will be destroyed; and by continuing the same operation, they will be inverted; for the inside will be at last fully charged positively, and the outside negatively.

"20. The same effect may be produced, by turning the glass over, and by repeatedly applying the influential electricity, produced on that side, to the wire of the phial.

"21. When the phial has been fully charged negatively, as in the last experiment, take hold of the coating of the phial with one hand, and while the other hand rests on the tin-foil fillet, apply the wire to the middle of the upper surface of the glass, as far as the tin-foil coating extends on the other side. By this the powers of the glass plate will be changed.

"22. Another, and perhaps a better method of applying the phial, is to place the insulated cover on the surface of the glass, and then holding the phial by the coating in one hand, to apply the wire to the cover, while the other hand touches the fillet of tin-foil; by which a shock will be given, and the same change of powers will be produced in an instant, which before took up some little time. On lifting the insulated cover by its stem immediately after the shock, it will be negative, or have the same power as the inside of the phial; but on replacing the cover, and completing the circuit of the glass plate the surcharge will be destroyed; another shock will be felt; and the power of the cover, after the next separation, will be positive, or contrary to that of the inside of the phial. Apply this positive power to the wire of the phial as before; and after 15 applications, the powers of the phial will be destroyed: and by still proceeding in the same manner, the powers of the phial will be changed, and the inside will be fully charged positively and the outside negatively, by 60 applications.

"23. These effects may also be produced by a single application of the coating of the phial to the other side of the glass plate; and by repeated applications of the influential electricity, produced on the same side, to the coating of the phial.

"24. If it were simply the object in this experiment to change the powers of the phial, the operation might then be considerably shortened, by completing the circuit of the phial, and consequently destroying the whole surcharge: but it was intended to show what effects might be produced, by opposing the contrary powers to each other; and by doing this it appears that either side of the glass plate can destroy the powers of the phial, and give it a contrary charge; that either side of the phial can also change the powers of the glass plate; and that the powers of the glass plate, thus inverted, can again destroy the powers of the phial, and give it a full charge of the contrary electricity.

"25. Here it may be observed, that, in some cases, the quality of the power may be determined by observation alone. When the phial employed in the two last experiments has been fully charged, it may be known whether the inside be positive or negative from the light which appears at the wire, or from the hissing noise which attends it: for when the phial has been fully charged positively, if the room be sufficiently darkened, a bright luminous appearance may be seen, diverging in separate rays to the distance of an inch, attended with an interrupted hissing noise; and both the light and the noise continue a very short time. But when the phial is fully charged negatively, a weaker and more uniform light appears, which does not extend itself more than the sixth part of an inch, and is attended with a closer and more uniform hissing; and this noise and light always continue longer than the former. Even positive and negative sparks, passing between the insulated cover and a finger, may be distinguished from each other: for the positive sparks are more divided, give less light, make a weaker snapping noise, and affect the finger less sensibly than the negative.

"26. The strongest sparks which can be produced in these experiments, are those that pass between the coating of the phial and the insulated cover, when they possess contrary powers; but they will be more particularly vigorous, if the coating be positive and the insulated cover negative."

157 Mr Brookes's experiments on the Leyden-phial.

In Sect. vi. of this treatise we have related some experiments, tending to show, that in the act of charging a phial with positive electricity, both became positive; and in the act of charging one negatively, both became negative. These were inserted in the former edition of this work; since which time Mr Brookes, at Norwich, has published a treatise; in which he not only adopts the opinion, but lays claim to it as his discovery, from some letters wrote in the year 1775. His experiments are extremely well adapted to elucidate the point intended; and the most remarkable of them are as follow:

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"1. Let two pound phials be coated with tin-foil on their outsides, and filled to a convenient height with common shot, to serve as a coating within-side, as well as to keep a wire steady in the phials without a stopple in the mouth of them. Let each phial be furnished with a wire about the size of a goose-quill, and about ten inches long, and let each wire be sharpened a little at one end, that it may the more easily be thrust down into the shot, so as not to touch the glass any where at the mouth of the phials, yet so as to stand steadily in them. Let a metallic ball about six or seven eighths of an inch diameter be screwed on at the other end of each wire: also let there be in readiness a third wire, fitted up like those for the phials, except that another ball of nearly the same size as the former may occasionally be screwed on over the sharpened end of it. I say, instead of suspending the phials from the prime conductor as before, let one of those above described be charged at the prime conductor, and then set it aside, but let it be in readiness in its charged state: then let the other be placed upon a good insulating stand, and let the third wire also be laid upon the stand, so that its ball, or some part of the wire, may touch the coating of the phial. Let the sharpened end of this wire project five or six inches over the edge of the stand: all of these being now placed close to the edge of a table, hang a pair of cork balls on the sharpened end of the wire, and make a communication from the prime conductor to the ball on the wire on the bottle: on working the machine, the sharpened end of the wire will permit the bottle to be charged although it be insulated; and if the wire be very finely pointed, the bottle may be charged nearly as well as if it were not insulated: I say, on working the machine, the phial will charge, and the cork balls will immediately repel each other; but whilst this phial is charging, take the first phial, which having been previously charged at the same prime conductor in the hand, and while the second phial is charging, present the ball of the first to the cork balls, and they will all repel each other. This plainly proves that the outside of the second bottle is electrified plus at the time that it is charging, the same as the inside of the first; and the inside of both the bottles will readily be allowed to be charged alike, that is, plus or positive.

"2. Let the second bottle in the last experiment be wholly discharged, and charge it again as before (the first bottle yet remaining charged), and whilst it is charging, let the ball of the first approach the cork balls contiguous with the second, and they will, as before, all repel each other: withdraw the ball of the first, and so long as the machine continues to charge the second bottle higher, the cork balls will continue to repel each other; but cease working the machine, and the cork balls will cease to repel each other till they touch, and will then very soon repel each other again; then let the ball in the first phial approach the cork balls, and they will now be attracted by it, instead of being repelled as above, as in the last experiment. This also plainly shows, that both sides of a Leyden phial are alike at the time it is charging; and at the same time evidently shows, that the difference of the two sides does not take place till after the bottle is charged, or till the machine ceases to charge it higher.

"3. In this experiment, let both the former bottles be discharged, then let one of them be placed upon the insulating stand. Let a ball be put on over the sharpened end of the third wire, and let it be laid on the stand as before, so as to touch the coating of the phial: place the other phial on the table, so that its ball or wire may touch the ball on the third wire, or any part of the wire itself: make a communication from the ball on the wire of the first phial to the prime conductor: then, by working the machine, both bottles will soon become charged. As soon as they are pretty well charged, and before the machine cease working, remove the second phial from the third wire; after the second phial is removed, cease working the machine as soon as possible: take the third wire, with its two balls, off the stand with the hand, and lay it on the table, so that one of its balls may touch the outside coating of the second phial: remove the first phial off the stand, and place it on the table so as to touch the ball at the other end of the third wire; then, with an insulated discharging rod, make a communication from the ball in one bottle to the ball in the other: if the outside of the phial be negative at the time it is charging, the inside of the second will be the same, and making the above communication would produce an explosion, and both bottles would be discharged; but the contrary will happen, for there will be no explosion, nor will either of the bottles be discharged, although there be a complete communication between their outsides, because the inside of them both will be positive. This is a proof, that considering one side of a phial to be positive and the other negative at the time they are charging, is a mistake: as well as that, if any number of bottles be suspended at the tail of each other, all the intermediate surfaces or sides do not continue so.

"4. Here also let the apparatus be disposed as in the last experiment, till the bottles are highly charged: then, with a clean stick of glass, or the like, remove the communication between the ball of the first phial and the prime conductor before the machine ceases working; then, with an insulated discharging rod, make a communication from the outside to the inside of the first phial; a strong explosion will take place on account of the excess within-side, notwithstanding they are both positive.

"5. This experiment being something of a continuation of the preceding one, immediately after the last explosion takes place, discharge the prime conductor of its electricity and atmosphere; then touch the ball in the first phial with the hand, or any conducting substance that is not insulated; then will the inside coating of the first phial, which at first was so strongly positive, be in the same state as the outside coating of the second, having a communication by the hand, the floor, &c. with each other; that is, negative, if any thing can properly be called negative or positive that has a communication with the common stock: but a pair of cork balls that are electrified either plus or minus, will no more be attracted by either the inside coating of the first phial or the outside coating of the second, than they will be by the table on which they stand, or a common chair in the room, while they continue in that situation. Remove the aforesaid communication from the ball of the first phial;

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phial; touch the ball in the second, as before in the first, or discharge the bottle with the discharging rod, and the ball in the first bottle will immediately become negative: with a pair of cork balls, electrified negatively, approach the ball in the first phial, and they will all repel each other, or, if the cork balls be electrified positively, they will be attracted. All these circumstances together seem fully to prove what has already been said, not only that the inside of the first phial, which was so strongly positive, may be altered so as to become in the same state as the outside of the second, without discharging the phial, or any more working the machine; but that it may be fairly changed, from being positively charged to being negatively charged. If a pair of cork balls are now hanged on to the ball of the wire in this phial, by the help of a stick of glass, they will repel each other, being negatively electrified. Make a communication from the outside of the bottle to the table, and replace the communication from the prime conductor to the ball in the bottle; then, upon moderately working the machine to charge the bottle, the cork balls will cease to repel each other till they touch, and will soon repel each other again by being electrified positively. Here the working the machine anew, plainly shows that the inside of the first bottle, which was positive, was likewise changed to negative.

158 His method of preserving jars in a battery from being broke by a discharge.

"In making electrical experiments, and in particular those in which the Leyden phial is concerned (a number of which together compose most electrical batteries), a method to preserve the bottles or jars from being struck through by the electric charge is very desirable; but I do not know that it has hitherto been accomplished. The number of them that have been destroyed in the foregoing, as well as in many experiments made long before, have led me to various conjectures to preserve them: at the same time I have been obliged to make use of bottles instead of open mouthed jars. And as coating the former within-side is very troublesome, it has put me on thinking of some method more easy, quicker, and equally firm and good, as with the tin-foil. With respect to the new method of coating, I failed; though something else presented itself rather in behalf of the former: therefore introducing the process here will not be of very great use; unless in saving another the trouble of making use of the same method, or giving a hint towards the former, so as to succeed with certainty. My aim was, to find something that should be quick and clean, and not easy to come off with the rubbing of wires against it, and yet a good conductor. My first essay was with a cement of pitch, rosin, and wax, melted together; into which, to make it a good conductor, I put a large proportion of finely sifted brass filings. When this mixture was cold, I put broken pieces of it into the bottle, and warmed the bottle till it was hot enough to melt the cement in it so as to run, and cover the bottle within-side; then I coated the out side with tin-foil as is commonly done, and now it was fit for use, or ready to be charged: to which I next proceeded; and I believe I had not made more than four or five turns of the winch before it spontaneously struck through the glass with a very small charge. I then took off the outside coating, and stopped the fracture with some of my common cement, after which I put the coating on again; and, in as little time as before, it was struck through again in a different place: and thus I did with this bottle five or six times; sometimes it struck through the cement, but it struck through the glass in four different places. This made me consider what it might be that facilitated the spontaneous striking through the glass, and likewise what might retard it. I had long before thought that jars or bottles appeared to be struck through with a much less charge, just after their being coated, or before they were dry, than when they had been coated long enough for the moisture to be evaporated from the paste with which I mostly lay on the tin-foil; and could only consider the dry paste as a kind of mediator between the tin-foil and the glass, or, in other words, that the moisture in the paste was a better conductor, and more in actual contact with the glass, that the paste itself when dry. And the coating the bottles with the heated cement, though long afterward, did not alter my former idea; for it appeared as if the hot cement, with the conducting substance in it, might be still more in actual contact with the glass than the moisture in the paste. On these probabilities I had to consider what might act as a kind of mediator more effectually than the dry paste between the glass and the tin-foil. It occured, that common writing-paper, as being neither a good conductor nor insulator, might be serviceable by being first pasted smoothly to the tin-foil and left to dry. The paper then being pasted on one side, having the tin-foil on the other, I put them on the glass together with the tin-foil outward, and rubbed them down smooth. This succeeded so well that I have never since had any struck through that were thus done, either common phials, or large bottles which contain near three gallons each, though some of the latter have stood in the battery in common use with the other a long time. And as I have never had one struck through that has been prepared in this way, I am much less able at present to tell how great a charge they will bear before they are struck through, or whether they will be struck through at all."

159 Glass easily broke by electricity when covered with cement.

160 Nicholson's experiments on excitation, &c.

In the last part of the Philosophical Transactions for 1789, we have the following experiments by Mr Nicholson, on an improved method of excitation, as well as the action of points, and the direction of the fluid in positive and negative electricity.

"1. A glass cylinder was mounted, and a cushion applied with a silk flap, proceeding from the edge of the cushion over its surface, and thence half round the cylinder. The cylinder was then excited by applying an amalgamed leather in the usual manner. The electricity was received by a conductor, and passed off in sparks to Lane's electrometer. By the frequency of these sparks, or by the number of turns required to cause spontaneous explosion of a jar, the strength of the excitation was ascertained.

"2. The cushion was withdrawn about one inch from the cylinder, and the excitation performed by the silk only. A stream of fire was seen between the cushion and the silk; and much fewer sparks passed between the balls of the electrometer.

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" 3. A roll of dry ſilk was interpoſed, to prevent the ſtream from paſſing between the cuſhion and the ſilk. Very few ſparks then appeared at the electrometer.

" 4. A metallic rod, not inſulated, was then interpoſed inſtead of the roll of ſilk, ſo as not to touch any part of the apparatus. A denſe ſtream of electricity appeared between the rod and the ſilk, and the conductor gave very many ſparks.

" 5. The knob of a jar being ſubſtituted in the place of the metallic rod, it became charged negatively.

" 6. The ſilk alone, with a piece of tin-foil applied behind it, afforded much electricity, though leſs than when the cuſhion was applied with a light preſſure. The hand being applied to the ſilk as a cuſhion, produced a degree of excitation ſeldom equalled by any other cuſhion.

" 7. The edge of the hand anſwered as well as the palm.

" 8. When the excitation by a cuſhion was weak, a line of light appeared at the anterior part of the cuſhion, and the ſilk was ſtrongly diſpoſed to receive electricity from any uninſulated conductor. Theſe appearances did not obtain when the excitation was by any means made very ſtrong.

" 9. A thick ſilk, or two or more folds of ſilk, excited worſe than a ſingle very thin flap. I uſe the ſilk which the milliners call Perſian.

" 10. When the ſilk was ſeparated from the cylinder, ſparks paſſed between them; the ſilk was found to be in a weak negative, and the cylinder in a poſitive, ſtate.

161 The ſilk flap the principal cauſe of excitation.

" The foregoing experiments ſhow that the office of the ſilk is not merely to prevent the return of electricity from the cylinder to the cuſhion, but that it is the chief agent in the excitation; while the cuſhon ſerves only to ſupply the electricity, and perhaps increaſe the preſſure at the entering part. There likewiſe ſeems to be little reaſon to doubt but that the diſpoſition of the electricity to eſcape from the ſurface of the cylinder is not prevented by the interpoſition of the ſilk, but by a compenſation after the manner of a charge; the ſilk being then as ſtrongly negative as the cylinder is poſitive: and, laſtly, that the line of light between the ſilk and cuſhion in weak excitations does not conſiſt of returning electricity, but of electricity which paſſes to the cylinder, in conſequence of its not having been ſufficiently ſupplied during its contact with the rubbing ſurface.

" 11. When the excitation was very ſtrong in a cylinder newly mounted, flaſhes of light were ſeen to fly acroſs its inſide, from the receiving ſurface to the ſurface in contact with the cuſhion, as indicated by the bruſh figure. Theſe made the cylinder ring as if ſtruck with a bundle of ſmall twigs. They ſeem to have ariſen from part of the electricity of the cylinder taking the form of a charge. This appearance was obſerved in a 9-inch and a 12-inch cylinder, and the property went off in a few weeks. Whence it appears to have been chiefly occaſioned by the rarity of the internal air produced by handling, and probably reſtored by gradual leaking of the cement.

162 State of the inſide of a cylinder during excitation determined.

" 12. With a view to determine what happens in the inſide of the cylinder, recourſe was had to a plate machine. One cuſhion was applied with its ſilken flap. The plate was 9 inches in diameter and $\frac{3}{10}$ths of an inch thick. During the excitation, the ſurface oppoſite to the cuſhion ſtrongly attracted electricity, which it gave out when it arrived oppoſite to the extremity of the flap: ſo that a continual ſtream of electricity paſſed through an inſulated metallic bow terminating in balls, which were oppoſed, the one to the ſurface oppoſite the extremity of the ſilk, and the other oppoſite to the cuſhion; the former ball ſhowing poſitive and the latter negative ſigns. The knobs of two jars being ſubſtituted in the place of theſe balls, the jar applied to the ſurface oppoſed to the cuſhion was charged negatively, and the other poſitively. This diſpoſition of the back ſurface ſeemed, by a few trials, to be weaker the ſtronger the action of the cuſhon, as judged by the electricity on the cuſhion ſide.

" Hence it follows, ~~that~~ the internal ſurface of a cylinder is ſo far from being diſpoſed to give out electricith during the friction by which the external ſurface acquires it, that it even greedily attracts it.

" 13. A plate of glaſs was applied to the revolving plate, and thruſt under the cuſhion in ſuch a manner as to ſupply the place of the ſilk flap. It rendered the electricity ſtronger, and appears to be an improvement of the late machine; to be admitted if there were not eſſential objections againſt the machine itſelf.

" 14. Two cuſhions were then applied on the oppeſite ſurfaces with their flaps, ſo as to claſp the plate between them. The electricity was received from both by applying the finger and thumb to the oppoſite ſurfaces of the plate. When the finger was advanced a little towards its correſpondent cuſhion, ſo that its diſtance was leſs than between the thumb and its cuſhion, the finger received ſtrong electricity, and the thumb none; and, contrariwiſe, if the thumb were advanced beyond the finger, it received all the electricity, and none paſſed to the finger. This electricity was not ſtronger than was produced by the good action of one cuſhion applied ſtrongly.

" 15. The cuſhion in experiment 12. gave moſt electricity when the back ſurface was ſupplied, provided that ſurface was ſuffered to retain its electricity till the rubbed ſurface had given out its electricity.

163 No advantage gained by rubbing two ſides of the plate machine.

" From the two laſt paragraphs it appears, that no advantage is gained by rubbing both ſurfaces; but that a well managed friction on one ſurface will accumulate as much electricity as the preſent methods of excitation ſeem capable of collecting; but that, when the excitation is weak, on account of the electric matter not paſſing with ſufficient facility to the rubbed ſurface, the friction enables the oppoſite ſurface to attract or receive it, and if it be ſupplied, both ſurfaces will paſs off in the poſitive ſtate; and either ſurface will give out more electricity than is really induced upon it, becauſe the electricity on the oppoſite ſide forms a charge. It may be neceſſary to obſerve, that I am ſpeaking of the facts or effects produced by friction; but how the rubbing ſurfaces act upon each other to produce them, whether by attraction or otherwiſe, we do not here enquire.

" It will hereafter be ſeen, that plate machines do not collect more electricity than cylinders (in the hand of the electrical operators of this metropolis) do with half the rubbed ſurface; which is a corroboration of the inference here made.

" 16. When a cylinder is weakly excited, the appearances mentioned (par. 8.) are more evident the more

rapid

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rapid the turning. In this case, the avidity of the surface of the cylinder beneath the silk is partly supplied from the edge of the silk, which throws back a broad cascade of fire, sometimes to the distance of above 12 inches. From these causes it is that there is a determinate velocity of turning required to produce the maximum of intensity in the conductor. The stronger the excitation, the quicker may be the velocity; but it rarely exceeds five feet of the glass to pass the cushion in a second.

164 Velocity necessary to produce the utmost degree of excitation.

"17. If a piece of silk be applied to a cylinder, by drawing down the ends so that it may touch half the circumference, and the cylinder be then turned and excited by applying the amalgamed leather, it will become very greedy of electricity during the time it passes under the silk. And if the entering surface of the glass be supplied with electricity, it will give it out at the other extremity of contact; that is to say, if insulated conductors be applied at the touching ends of the silk, the one will give, and the other receive, electricity, until the intensities of their opposite states are as high as the power of the apparatus can bring them; and these states will be instantly reversed by turning the cylinder in the opposite direction.

165 How to produce both electricities in the same conductor.

"As this discovery promises to be of the greatest use in electrical experiments, because it affords the means of producing either the plus or minus states in one and the same conductor, and of instantly repeating experiments with either power, and without any change of position or adjustment of the apparatus, it evidently deserved the most minute examination.

"18. There was little hope (par. 6.) that cushions could be dispensed with. They were therefore added; and it was then seen, that the electrified conductors were supplied by the difference between the action of the cushion which had the advantage of the silk, and that which had not; so that the naked face of the cylinder was always in a strong electric state. Methods were used for taking off the pressure of the receiving cushion; but the extremity of the silk, by the construction, not being immediately under that cushion, gave out large flashes of electricity with the power that was used. Neither did it appear practicable to present a row of points or other apparatus to intercept the electricity which flew round the cylinder; because such an addition would have materially diminished the intensity of the conductor, which in the usual way was such as to flash into the air from rounded extremities of four inches diameter, and made an inch and half ball become luminous and blow like a point. But the greatest inconvenience was, that the two states with the backward and forward turn were seldom equal; because the disposition of the amalgam on the silk, produced by applying the leather to the cylinder in one direction of turning, was the reverse of what must take place when the contrary operation was performed.

"Notwithstanding all this, as the intensity with the two cushions was such as most operators would have called strong, the method may be of use, and I still mean to make more experiments when I get possession of a very large machine which is now in hand.

166 Improved method of excitation.

"19. The more immediate advantage of this discovery is, that it suggested the idea of two fixed cushions with a moveable silk flap and rubber. Upon this principle, which is so simple and obvious that it is wonderful it should have been so long overlooked, I have constructed a machine with one conductor, in which the two opposite and equal states are produced by the simple process of loosening the leather-rubber, and letting it pass round with the cylinder (to which it adheres) until it arrives at the opposite side, where it is again fastened. A wish to avoid prolixity prevents my describing the mechanism by which it is let go and fastened in an instant, at the same time that the cushion is made either to press or is withdrawn, as occasion requires.

"20. Although the foregoing series of experiments naturally lead us to consider the silk as the chief agent in excitation; yet as this business was originally performed by a cushion only, it becomes an object of enquiry to determine what happens in this case.

167 In what manner excitation is performed by a simple rubber without a silk flap.

"21. The great Beccaria inferred, that in a simple cushion, the line of fire, which is seen at the extremity of contact from which the surface of the glass recedes, consists of returning electricity; and Dr Nooth grounded his happy invention of the silk flap upon the same supposition. The former asserts, that the lines of light both at the entering and departing parts of the surface are absolutely similar; and thence infers, that the cushion receives on the one side, as it certainly does on the other. I find, however, that the fact is directly contrary to this assertion; and that the opposite inference ought to be made, as far as this indication can be reckoned conclusive: for the entering surface exhibits many luminous perpendiculars to the cushion, and the departing surface exhibits a neat uniform line of light. This circumstance, together with the consideration that the line of light behind the silk in par. 8. could not consist of returning electricity, showed the necessity of farther examination. I therefore applied the edge of the hand as a rubber, and by occasionally bringing forward the palm, I varied the quantity of electricity which passed near the departing surface. When this was the greatest, the sparks at the electrometer were the most numerous. But as the experiment was liable to the objection that the rubbing surface was variable, I pasted a piece of leather upon a thin flat piece of wood, then amalgamed its whole surface, and cut its extremity off in a neat right line close to the wood. This being applied by the constant action of a spring against the cylinder, produces a weak excitation; and the line where the contact of the cylinder and leather ceased (as abruptly as possible) exhibited a very narrow fringe of light. Another piece of wood was prepared of the same width as the rubber, but one quarter of an inch thick, with its edges rounded, and its whole surface covered with tin-foil. This was laid on the back of the rubber, and was there held by a small spring, in such a manner as that it could be slided outward, so as occasionally to project beyond the rubber, and cover the departing and excited surface of the cylinder without touching it. The sparks at the electrometer were four times as numerous when this metallic piece was thus projected; but no electricity was observed to pass between it and the cylinder. The metallic piece was then held in the hand to regulate its distance from the glass; and it was found, that the sparks at the electrometer increased in number as it was brought nearer, until light appeared between the metal and cylinder; at which time they became fewer the nearer it was brought, and at last ceased when it was in contact.

"The

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the following concluſions appear to be deducible from theſe experiments. 1. The line of light on a cylinder departing from a ſimple cuſhion conſiſts of returning electricity: 2. The projecting part of the cuſhion compenſates the electricity upon the cylinder, and by diminiſhing its intenſity prevents its ſtriking back in ſuch large quantities as it would otherwiſe do: 3. That if there was no ſuch compenſation, very little of the excited electricity would be carried off: and, 4. That the compenſation is diminiſhed, or the intenſity increaſed, in an higher ratio than that of the diſtance of the compenſating ſubſtance; becauſe if it were not, the electricity which has been carried off from an indefinitely ſmall diſtance, would never fly back from a greater diſtance and form the edge of light.

168 Concluſions from theſe experiments.

169 How to increaſe the intenſity of electricity to a great degree.

"22. I hope the conſiderable intenſity I ſhall ſpeak of will be an apology for deſcribing the manner in which I produce it. I wiſh the theory of this very obſcure proceſs were better known; but no conjecture of mine is worth mentioning. The method is as follows:

"Clean the cylinder, and wipe the ſilk.

"Greaſe the cylinder by turning it againſt a greaſed leather till it is uniformly obſcured. I uſe the tallow of a candle.

"Turn the cylinder till the ſilk flap has wiped off ſo much of the greaſe as to render it ſemitranſparent.

"Put ſome amalgam on a piece of leather, and ſpread it well, ſo that it may be uniformly bright. Apply this againſt the turning cylinder. The friction will immediately increaſe, and the leather muſt not be removed until it ceaſes to become greater.

"Remove the leather and the action of the machine will be very ſtrong.

"My rubber, as before obſerved, conſiſts of the ſilk flap paſted to a leather, and the cuſhion is preſſed againſt the ſilk by a ſlender ſpiral ſpring in the middle of its back. The cuſhion is looſely retained in a groove, and reſts againſt the ſpring only, in ſuch a manner that by a ſort of libration upon it as a fulcrum, it adapts itſelf to all the irregularities of the cylinder, and never fails to touch it in its whole length. There is no adjuſtment to vary the preſſure, becauſe the preſſure cannot be too ſmall when the excitation is properly made. Indeed, the actual withdrawing of the cuſhion to the diſtance of $\frac{1}{10}$th of an inch from the ſilk, as in par. 2. will not materially affect a good excitation.

"The amalgam is that of Dr Higgins, compoſed of zinc and mercury. If a little mercury be added to melted zinch, it renders it eaſily pulverable, and more mercury may be added to the powder to make a very ſoft amalgam. It is apt to cryſtallize by repoſe, which ſeems in ſome meaſure to be prevented by triturating it with a ſmall proportion of greaſe; and it is always of advantage to triturate it before uſing.

"A very ſtrong excitation may be produced by applying the amalgamed leather to a clean cylinder with a clean ſilk: but it ſoon goes off, and is not ſo ſtrong as the foregoing, which laſts ſeveral days.

170 Effects of different cylinders excited in this manner.

"23. To give ſome diſtinctive criterions by which other electricians may determine whether the intenſity they produce exceeds or falls ſhort of that which this method affords, I ſhall mention a few facts.

"With a cylinder 7 inches diameter and cuſhion 8 inches long, three bruſhes at a time conſtantly flew out of a 3-inch ball in a ſucceſſion too quick to be counted, and a ball of $1\frac{1}{2}$ inch diameter was rendered luminous, and produced a ſtrong wind like a point. A 9-inch cylinder with an 8-inch cuſhion occaſioned frequent flaſhes from the round end of a conductor 4 inches diameter: with a ball of $2\frac{1}{2}$ inches diameter the flaſhes ceaſed now and then, and it began to appear luminous: a ball of $1\frac{1}{2}$ inch diameter firſt gave the uſual flaſhes: then, by quicker turning, it became luminous with a bright ſpeck moving about on its ſurface, while a conſtant ſtream of air ruſhed from it; and, laſtly, when the intenſity was greateſt, bruſhes of a different kind from the former appeared. Theſe were leſs luminous but better defined in the branches, many ſtarted out at once with a hoarſe ſound. They were reddiſh at the ſtem, ſooner divided, and were greeniſh at the point next the ball, which was braſs. A ball of $\frac{4}{10}$ths of an inch diameter was ſurrounded by a ſteady faint light, enveloping its exterior hemiſphere, and ſometimes a flaſh ſtruck out at top. When the excitation was ſtrongeſt, a few flaſhes ſtruck out ſideways. The horizontal diameter of the light was longeſt, and might meaſure one inch, the ſtem of the ball being vertical.

171 Surpriſing appearance on raiſing an electrical kite.

"This laſt phenomenon is ſimilar to a natural event related by M. Loammi Baldwin *, who raiſed an electrical kite in July 1771 during the approach of a ſevere thunder-ſtorm, and obſerved himſelf to be ſurrounded by a rare medium of fire, which as the cloud roſe nearer the zenith, and the kite roſe higher, continued to extend itſelf with ſome gentle faint flaſhes. Mr Baldwin felt no other effect than a general weakneſs in his joints and limbs, and a kind of liſtleſs feeling; all which he obſerves might poſſibly be the effect of ſurpriſe, though it was ſufficient to diſcourage him from perſiſting in any farther attempt at that time. He therefore drew in his kite, and retired to a ſhop till the ſtorm was over, and then went to his houſe, where he found his parents and friends much more ſurpriſed than he had been himſelf; who, after expreſſing their aſtoniſhment, informed him, that he appeared to them (during the time he was raiſing the kite) to be in the midſt of a large bright flame of fire, attended with flaſhings: and that they expected every moment to ſee him fall a ſacrifice to the flame. The ſame was obſerved by ſome of his neighbours, who lived near the place where he ſtood.

* *Memoirs of the American Academy*, Vol. I. p. 257.

"This fact is ſimilar to another obſerved by M. de Sauſſure on the Alps, and both are referable to my luminous ball with the ſecond kind of bruſh. The cloud muſt have been negative..

"With a 12-inch cylinder and rubber of $7\frac{1}{2}$ inches, a five-inch ball gave frequent flaſhes, upwards of 14 inches long, and ſometimes a 6-inch ball would flaſh. I do not mention the long ſpark, becauſe I was not provided with a favourable apparatus for the two larger cylinders. The 7-inch cylinder affords a ſpark of $10\frac{3}{4}$ inches at beſt. The 9-inch cylinder, not having its conductor inſulated on a ſupport ſufficiently high, afforded flaſhes to the table which was 14 inches diſtant. And the 12-inch cylinder, being mounted only as a model or trial for conſtructing a larger apparatus, is defective in ſeveral reſpects which I have not thought fit to alter. When the five-inch ball gives flaſhes, the cylinder is enveloped on all ſides with fire which ruſhes from the receiving part of the conductor.

I

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I never uſe points, but in a ſimple machine bring the conductor almoſt in contact with the cylinder. In this apparatus that cuſhion to which the rubber is not applied ſerves that purpoſe.

172 Jars charged by them.

"24. Theſe marks exhibit the intenſity as deduced from ſimple electrifying. I will now mention the rate of charging, which was nearly the ſame in all the three cylinders.

"A large jar of 350 ſquare inches, or near $2\frac{1}{2}$ ſquare feet, with an uncoated varniſhed rim of more than four inches in height, was made to explode ſpontaneouſly over the rim. The jar, when broken, proved to be 0.082 inches thick on an average; and the number of ſquare feet of the ſurface of the cylinder which was rubbed to produce the charge of one foot, was, when leaſt, 18.03, and when moſt, with good excitation,

173 Mr Nicholſon's machines ſuperior to Van Marum's.

19.34. The great machine at Haarlem charges a ſingle jar of one foot ſquare by the friction of 66.6 ſquare feet, and charges its battery of 225 ſquare feet at the rate of 94.8 ſquare feet rubbed for each foot. The intenſity of electricity on the ſurface of the glaſs is therefore conſiderably leſs than $\frac{1}{4}$th of that here ſpoken of; but if we take the moſt favourable number 66.6 at the commencement of turning, and halve it on account of the unavoidable imperfection of a plate machine (as ſhown in par. 14.), it will be found, that the management applied to that machine would cauſe a cylinder to charge one ſquare foot by the friction of $33\frac{1}{3}$ ſquare feet. It muſt be obſerved, however, that M. Van Marum's own machine, conſiſting of two plates 33 inches diameter, has only half the intenſity, though he reckons it a very good one. This machine is about equal in abſolute power to my 9-inch cylinder, with its ſhort rubber; but it is near 30 times as dear in price. In all theſe deductions I omit the computations, for the ſake of brevity, and becauſe they are eaſily made. The data are found in the deſcription of the Teylerian machine, and its continuation publiſhed at Haarlem in the years 1785 and 1787.

174 Gradual improvements in excitation.

"I ſhall here take the liberty of obſerving, that the action of the cylinder, by a ſimple cuſhion or the hand, which excited the aſtoniſhment of all Europe, in the memory of our cotemporaries, was firſt improved by the addition of a leathern flap; then by moiſtening the rubber; afterwards by applying the amalgam; and, laſtly, by the addition of a ſilk flap. Now I find by experiment, that we at preſent obtain upwards of 40 times the intenſity which the bare hand produces; and conſequently, that, ſince 18 times our preſent intenſity will equal the utmoſt we can now condenſe on ſtrong glaſs even in the form of a charge, we have a leſs ſtep to take before we arrive at that amazing power than our immediate predeceſſors have already made. My 9-inch cylinder, when broken, proved to be $\frac{1}{21}$ of an inch thick.

175 Difference in the appearance of poſitive and negative ſparks.

"25. Some of the luminous appearances with balls in the poſitive ſtate, have been ſlightly noticed as criterions of intenſity. I ſhall here add, that the eſcape of negative electricity from a ball is attended with the appearance of ſtraight ſharp ſparks with a hoarſe or chirping noiſe. When the ball was leſs than two inches in diameter, it was uſually covered with ſhort flames of this kind, which were very numerous.

"26. When two equal balls were preſented to each other, and one of them was rendered ſtrongly poſitive, while the other remained in connection with the earth, the poſitive bruſh or ramified ſpark was ſeen to paſs from the electrified ball: when the other ball was electrified negatively, and the ball, which before had been poſitive, was connected with the ground, the electricity (paſſing the ſame way according to Franklin) exhibited the negative flame, or denſe, ſtraight, and more luminous ſpark, from the negative ball; and when the one ball was electrified plus and the other minus, the ſigns of both electricities appeared. If the interval was not too great, the long zig-zag ſpark of the plus ball ſtruck the ſtraight flame of the minus ball, uſually at the diſtance of about $\frac{1}{3}$d of the length of the latter from its point, rendering the other $\frac{2}{3}$ds very bright. Sometimes, however, the poſitive ſpark ſtruck the ball at a diſtance from the negative flame. Theſe effects are repreſented in Plate CLXXVIII. fig. 86, 87, 88.

"27. Two conductors of three-quarters of an inch diameter, with ſpherical ends of the ſame diameter, were laid parallel to each other, at the diſtance of about two inches, in ſuch a manner as that the ends pointed in oppoſite directions and were ſix or eight inches aſunder. Theſe, which may be diſtinguiſhed by the letters *P* and *M*, were ſucceſſively electrified as the balls were in the laſt paragraph. When one conductor *P* was poſitive, fig. 90. it exhibited the ſpark of that electricity at its extremity, and ſtruck the ſide of the other conductor *M*. When the laſt mentioned conductor *M* was electrified negatively, fig. 89. the former being in its turn connected with the earth, the ſparks ceaſed to ſtrike as before, and the extremity of the electrified conductor *M* exhibited negative ſigns, and ſtruck the ſide of the other conductor. And when one conductor was electrified *plus* and the other *minus*, fig. 91. both ſigns appeared at the ſame time, and continued ſtreams of electricity paſſed between the extremities of each conductor to the ſide of the other conductor oppoſed to it. In each of theſe three caſes, the current of electricity, on the hypotheſis of a ſingle fluid, paſſed the ſame way.

176 Of the diſpoſition of balls to receive electricity as their ſtems are long or ſhort.

"28. In drawing the long ſpark from a ball of four inches diameter, I found it of ſome conſequence that the ſtem ſhould not be too ſhort, becauſe the vicinity of the large prime conductor altered the diſpoſition of the electricity to eſcape: I therefore made a ſet of experiments, the reſult of which ſhowed, that the diſpoſition of balls to receive or emit electricity is greateſt when they ſtand remote from other ſurfaces in the ſame ſtate; and that between this greateſt diſpoſition in any ball, whatever may be its diameter, every poſſible leſs degree may be obtained by withdrawing the ball towards the broader or leſs convex ſurface out of which its ſtem projects, until at length the ball, being wholly depreſſed beneath that ſurface, loſes the diſpoſition entirely. From theſe experiments it follows, that a variety of balls is unneceſſary in electricity; becauſe any ſmall ball, if near the prime conductor, will be equivalent to a larger ball whoſe ſtem is longer.

177 Of the action of points.

"29. From comparing ſome experiments made by myſelf many years ago with the preſent ſet, I conſidered a point as a ball of an indefinitely ſmall diameter, and conſtructed an inſtrument conſiſting of a braſs ball of ſix inches diameter, through the axis of which a ſtem, carrying a fine point, was ſcrewed. When this ſtem

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stem is fixed in the prime conductor, if the ball be moved on its axis in either direction, it causes the fine point either to protrude through a small hole in its external surface, or to withdraw itself; because by this means the ball runs along the stem. The disposition of the point to transmit electricity may thus be made equal to that of any ball whatever, from the minutest size to the diameter of six inches. See fig. 92. *A*.

"30. The action of pointed bodies has been a subject of discussion ever since it was first discovered, and is not yet well explained. To those who ascribe this effect to the figure of electric atmospheres, and their disposition to fly off, it may be answered, that they ought first to prove their existence, and then show why the cause which accumulated them does not prevent their escape; not to mention the difficulty of explaining the nature of negative atmospheres. If these be supposed to consist of electrified air, it will not be easy to show why a current of air passing near a prime conductor does not destroy its effects. The opinion supported by the celebrated Volta and others, that a point is the coating to an infinitely small plate of air, does not appear better founded: for such a plate must be broken through at a greater distance only because higher charged; whence it would follow, that points should not act but at high intensities. I must likewise take notice, as a proof that the charge has little to do here, that if a ball be presented to the prime conductor, at the same time that a point proceeds from the opposite side of the ball, the electricity will pass by the point, though it is obliged to go round the ball for that purpose; but it can hardly be doubted, that whatever charge obtains in this case is on the surface of the ball next the conductor, and not on the remote side to which the electricity directs its course.

"31. The pointed apparatus described (par. 29.) shows that the effect of points depends on the remoteness of their extremities from the other parts of the conductor. This leads to the following general law: *In any electrified conductor, the transition or escape of electricity will be made chiefly from that part of the surface which is the most remote from the natural state.* Thus in the apparatus of the ball and stem, the point having a communication with the rest of the whole conductor, constantly possesses the same intensity; but the influence of the surrounding surface of the ball diminishes its capacity. This diminution is less the farther the ball is withdrawn, and consequently the point will really possess more electricity, and be more disposed to give it out when it is prominent than when depressed. The same explanation serves for negative electricity.

"32. The effect of a positive surface appears to extend farther than that of a negative: for the point acts like a ball when considerably more prominent if it be positive than it will if negative.

"For the sake of conciseness, I pass over many facts which have presented themselves in the course of my experiments on the two electricities, and content myself with observing, that there is scarcely any experiment made with the positive power, which will not afford a result worthy of notice, if repeated with the negative."

With regard to the direction of the electric fluid, we shall only farther take notice of two experiments, which have been thought to prove directly the passage of the fluid outward from the positive and inward to the negative side of the phial. Fig. 18. represents an electric jar, whose exterior coating is made up of small pieces of tin-foil placed at a small distance from each other. This jar is to be charged in the usual manner, when small sparks of the electric fluid will pass from one piece of tin-foil to the other, in various directions, forming a very pleasing spectacle. The separation of the tin-foil is the cause of this visible passage of the fluid from the outside to the table; and the experiment is similar in appearance to that of the spiral tube mentioned in the foregoing section. If the jar be discharged by bringing a pointed wire gradually to the knob *T*, the unsealed part of the glass between the wire and knob will be agreeably illuminated with a crackling noise of the sparks. If the jar be suddenly discharged, the whole outside will be illuminated. The jar, in this experiment, must be very dry when used.

Miscellaneous Experiments. Plate CLXXIV.

178 Construction of jars to show the course of the electric fluid.

Fig. 19. represents two jars, or Leyden phials, placed one over the other, by which various experiments may be made in order to elucidate the common theory. Bring the outside coating of the bottle *A* in contact with the prime conductor, and turn the machine till the bottle is charged; then place one ball of the discharging rod upon the coating of *B*, and with the other touch the knob of the jar *A*, which will cause an explosion; now place one ball of the discharger on the knob *A*, and bring the other ball to its coating, and you have a second discharge. Again, apply one ball of the discharger to the coating of *B*, and carry the other to the coating of *A*, and it will produce a third discharge. A fourth is obtained by applying the discharger from the coating of *A* to its knob. The outer coating of the under jar communicating with the inside of the under one, conveys the fluid from the conductor to the large jar, which is therefore charged positively: the upper jar does not charge, because the inside cannot part with any of its electric fluid: but when a communication is formed from the outside of *A* to the inside of *B*, part of the fire on the inside of *A* will be conveyed to the negative coating of *B*, and the jar will be discharged. The second explosion is occasioned by the discharge of the jar *A*; but as the outside of this communicates, by conducting substances, with the positive inside of the jar *B*, if the ball of the discharging rod remains for a little time after the discharge on the knob of *A*, part of the fire of the inside of *A* will escape, and be replaced by an equal quantity on the outside from the jar *B*, by which means *A* is charged a second time; the discharge of this produces the third, and of *B* the fourth explosion.

Fig. 20. is an electric jar, which serves to illustrate the contrary states of the side of a Leyden phial while charging. *B B* is the tin-foil coating; *C* a stand which supports the jar; *D* a socket of metal, carrying the glass rod *E*, a bent brass wire pointed at each end, and fixed at the end of the rod *G*; which rod is moveable in the spring tube *N* at pleasure: that tube being fixed by a socket on the top of the glass rod *F*, the jar is charged by the inside wire, which communicates with the different divisions of the inside coating by horizontal wires.

Place

ELECTRICITY Plate CLXXVIII

Fig 90 Fig 88. Fig 86

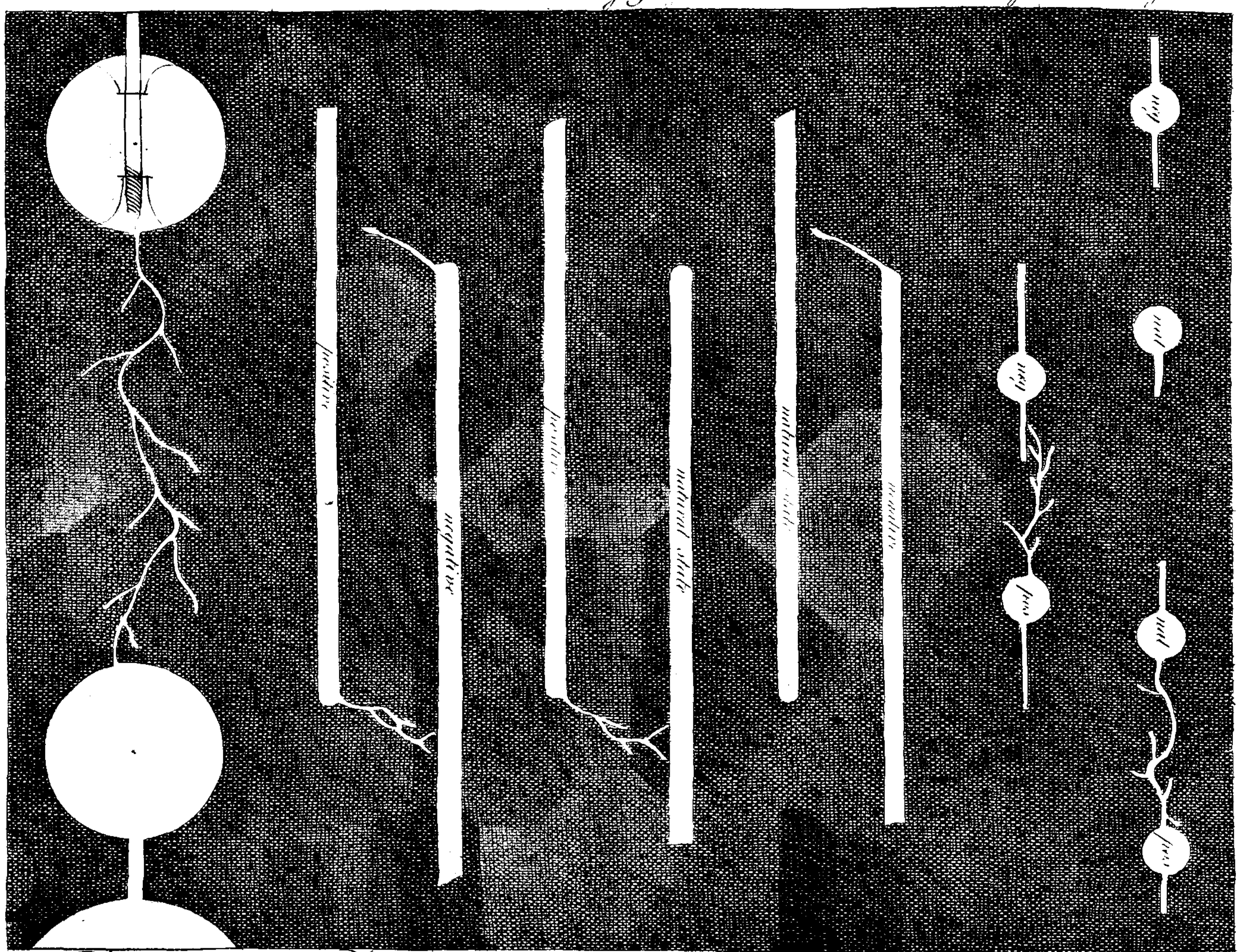


Fig 92 Fig 91 Fig 89 Fig 87

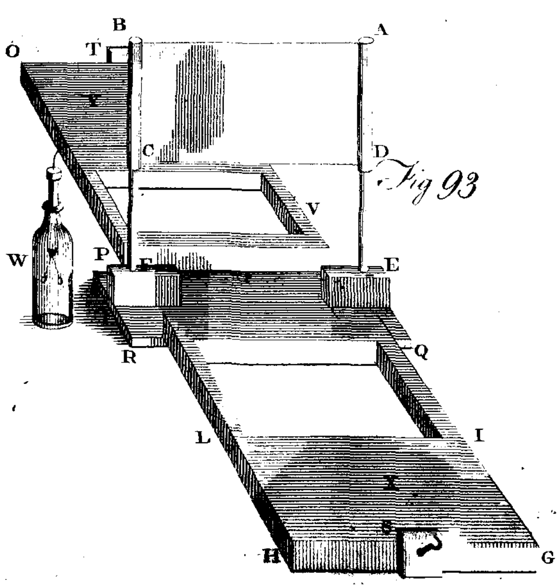
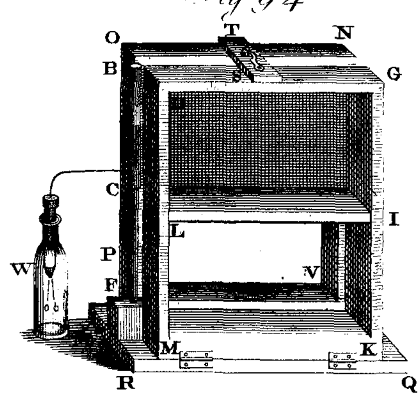


Fig 93

Fig 94



Scot Philad.

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Place the jar to the conductor as uſual; and, when charging, a luminous ſpeck will appear upon the upper point of the wire at *F*, clearly ſhowing, according to the commonly received opinion, that the point is then receiving the electrical fluid. From the upper ring of coating *B*, on the outſide of the jar, a fine ſtream or pencil of rays will at the ſame time fly off, beautifully diverging from the lower point of the wire *F* upon the bottom ring of the coating of the jar. When the appearances ceaſe, which they do when the jar is charged, let a pointed wire be preſented towards the conductor: this will ſoon diſcharge the jar ſilently; during which the point will be illuminated with a ſmall ſpark, while the upper point of the wire will throw off a pencil of rays diverging towards the upper ring of the coating.

179
Experiments on the various kinds of airs with Dr Van Marum's great electrical machine.

We ſhall conclude this ſection with an account of ſome effects of the electrical fluid upon various elaſtic vapours. Theſe were tried to the greateſt advantage by Dr Van Marum with the great machine already mentioned: and for this purpoſe he uſed a cylindrical glaſs receiver five inches long and an inch and a quarter in diameter, into which different ſorts of elaſtic fluids were ſucceſſively inſerted, and were confined by quickſilver or water. To a hole made in the bottom of the inverted glaſs receiver an iron wire was faſtened, the external part of which commmunicated with a conductor, which being preſented to the prime conductor of the machine, received the ſparks from it. In this diſpoſition of the apparatus it evidently appears, that the ſparks paſſed through the elaſtic fluid contained in the receiver, by going from the inner extremity of the wire to the quickſilver or water in which the receiver was inverted. With this apparatus it was found, that dephlogiſticated air, obtained from mercurial red precipitate, loſt $\frac{1}{20}$th of its bulk; but its quality was not ſenſibly altered, as it appeared from examining it with the eudiometer. This experiment being repeated when the receiver was inverted in lime-water, and likewiſe in the infuſion of turnſole, there enſued no precipitation, no change of colour, nor any phlogiſtication of the air. On pouring out this air, the uſual ſmell of the electric fluid was perceived very ſenſibly.

Nitrous air was diminiſhed of more than the half of its original bulk; and in that diminiſhed ſtate, being mixed with common air, it occaſioned no red colour, nor any ſenſible diminution. It had loſt its uſual ſmell, and it extinguiſhed a candle. In paſſing the ſparks through the nitrous air, a powder is formed on the ſurface of the quickſilver, which is a part of that metallic ſubſtance diſſolved by the nitrous acid.

Inflammable air, obtained from iron and diluted vitriolic acid, communicated a little redneſs to the tincture of turnſole. The ſtream of electric fluid thro' this air appeared more red, and much larger, than in common air, being every where ſurrounded by a faint blue light.

The inflammable air, obtained from ſpirit of wine and vitriolic acid, was increaſed to about three times its original bulk, and loſt a little of its inflammability.

Fixed air, from chalk and vitriolic acid, was a little increaſed in bulk by the action of electricity; but it was rendered leſs abſorbable by water.

Vitriolic acid air, obtained from vitriolic acid and charcoal, was diminiſhed a little, and black ſpots were formed on the inſide of the glaſs receiver. Afterwards it was obſerved, that only one-eighth part of the electrified elaſtic fluid was abſorbed by water. It extinguiſhed a candle, and had very little ſmell.

Marine acid air ſeemed to oppoſe in great meaſure the paſſage of the electrical fluid; ſince the ſparks would not paſs through a greater length than $2\frac{1}{4}$th inches of this air. It was conſiderably diminiſhed, but the reſt was readily abſorbed by water.

Spathous air was neither diminiſhed, nor any other way ſenſibly altered, by the electric ſparks.

Alkaline air, extracted from ſpirit of ſal ammoniac, was at firſt almoſt doubled in bulk; then it was diminiſhed a little; after which it remained without any augmentation or diminution. It became unabſorbable by water, and by the contact of flame it exploded, like a mixture of inflammable air and a good deal of common air.

Common air was laſtly tried, and it was found to give a little faint redneſs to the tincture of turnſole; becoming at the ſame time ſenſibly phlogiſticated. The experiment was repeated thrice at different times, and in each time after the electrization it was examined by the admixture of nitrous air in Mr. Fontana's eudiometer, and it was compared with the ſame air not electrified; the latter always ſuffering the greateſt diminution. In the firſt experiment the diminutions were $\frac{146}{500}$ and $\frac{175}{500}$; in the ſecond, $\frac{159}{500}$ and $\frac{194}{500}$; and in the laſt, $\frac{149}{500}$ and $\frac{178}{500}$.

On attempting to repeat Mr. Cavendiſh's experiment,* in which he produced the nitrous acid by a mixture of pure with phlogiſticated air: inſtead of a ſyphon. The Doctor made uſe of a glaſs tube $\frac{1}{6}$th part of an inch in diameter, cloſed at one end, into which and iron wire, $\frac{1}{120}$th of an inch in diameter, had been inſerted: into this tube, filled with mercury, and fixed in a vertical poſition, was introduced the air with which the experiment was to be tried. The dephlogiſticated air was obtained from red precipitate, and had been thoroughly purified by alkaline ſalts, from any acid it might have contained. With a mixture of 5 parts of this and 3 of the common air, the tube was filled to the heigth of 3 inches to which was added $\frac{5}{12}$ths of an inch of lixivium, of the ſame kind with that uſed by Mr. Cavendiſh. The reſult was, that, after tranſmitting through the tube a continued ſtream of the electrical fluid during 15 minutes, 2 inches of the air were abſorbed by the lixivium: more air being introduced into the tube till it was filled to the height of 3 inches, when it was again electrified. This proceſs was repeated till $8\frac{3}{4}$ths inches of air had been abſorbed by the lixivium: this was now examined, and found to be, in ſome degree, impregnated with the nitrious acid; but it was very far from being ſaturated. With the ſame lixivium, of which a quarter of an inch remained in the tube, the experiment was continued till 14 inches more of air had been abſorbed; but its diminution was not perceived to decreaſe, though the lixivium had now abſorbed 77 meaſures of air, each equal to its own; whereas, in the experiment related by Mr. Cavendiſh, only 31 meaſures of air were abſorbed by the alkali. But notwithſtanding this greater

*See *Aerology*, n° 77.

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greater absorption, the lixivium was yet far from being saturated.

The experiment was repeated with pure air, produced by minium, moistened with the vitriolic acid. and deprived of its fixed air; seven parts of this were mixed with three of phlogistic air, and lixivium added to the height of $\frac{1}{8}$th of an inch. Here, as in the former experiment, the diminution continued without any decrease; and the lixivium, after it had absorbed $22\frac{1}{4}$th inches, and consequently 178 times its own measure of air, was very far from being saturated with the nitrous acid.

On this Dr. Van Marum wrote to Mr. Cavendish: and finding, by his answer that this gentleman had used pure air, obtained from a black powder produced by shaking mercury with lead, he requested to be informed of the process by which it is generated: but Mr. Cavendish, not choosing to communicate this at present, he determined to defer the repetition of the experiment till this ingenious philosopher shall have published his mode of obtaining the pure air used in it.

Our author then goes on to some experiments made by suffering the electric fluid to pass in a continued stream through various kinds of air, inclosed for this purpose in the little glass tube used in the last experiments.

Pure air obtained the week before from red precipitate, being placed over mercury, and electrified for 30 minutes, was diminished by $\frac{1}{5}$th, the surface of the quicksilver soon began to be calcined, and towards the end of the experiment the glass tube was so lined with the calx as to cease to be transparent. By introducing a piece of iron, the electric stream was made to pass through the air without immediately touching the mercury; yet this was equally calcined. The phenomenon the Doctor ascribes solely to the dissolution of the pure air, the principle of which unites itself with the metal; as in these experiments the mercury had not acquired any sensible heat. Two inches and three quarters of the same kind of air being placed over water, and electrified in the same manner during half an hour, lost a quarter of an inch; and being suffered to stand 12 hours in the tube, was found to have lost $\frac{1}{8}$th of an inch more. This was very nearly the same diminution of the air that had taken place when it was electrified over mercury; but, in this case, the process appears to be more slow, and the detached principle not so easily absorbed. The air remaining after these experiments, being tried by the eudiometer, did not differ from unelectrified pure air taken from the same receiver.

To determine whether the pure air retained any of the acid employed in its production, the Doctor repeated the experiment with air obtained from red precipitate, confined by an infusion of turnsole, but could not perceive in it the least change of colour. He also electrified air obtained from minium and the vitriolic acid, placed over some diluted vinegar of lead; but this was not rendered at all turbid.

Three inches of phlogisticated air being electrified, during the first 5 minutes were augmented to $3\frac{1}{8}$th inches, and in the next 10 minutes to $3\frac{1}{4}$th inches: some lixivium was then introduced to try whether this would absorb it; but upon being electrified 15 minutes, the column rose to the height of $3\frac{3}{8}$th inches. It was suffered to stand in the tube till the next day, when it was found to have sunk to its original dimensions.

Nitrous air, confined by lixivium, being electrified during half an hour, lost 3 quarters of its bulk; the lixivium appeared to have absorbed a great deal of nitrous acid; and the air remaining in the tube did not seem to differ from common phlogisticated air. Some of the same nitrous air, confined by lixivium, was, by standing 3 weeks, diminished to half its bulk, and this residuum also proved to be phlogisticated air. Thus electricity very speedily effects that separation of the nitrous acid from nitrous air, which is slowly produced by the lixivium alone.

Inflammable air obtained from steel-filings and the diluted vitriolic acid, being confined by an infusion of turnsole, was electrified for 10 minutes without any change of colour in the infusion, or any alteration in the bulk of the air. The tube being filled with the same air to the height of $2\frac{1}{2}$ inches, and placed in diluted vinegar of lead, was exposed to the electric stream during 12 minutes, in which time the inclosed air rose 5 inches: but the vinegar remained perfectly clear. Three inches of inflammable air obtained from a mixture of spirits of wine with oil of vitriol, on being electrified for 15 minutes, rose to 10 inches; thus dilated, it lost all its inflammability, and when nitrous air was added, no diminution ensued.

A column of alkaline air obtained by heat from spirit of sal ammoniac, 13 inches high, was electrified 4 minutes, and rose to 6 inches, but did not rise higher when electrified 10 minutes longer. It appears that this air is not expanded more by the powerful electric stream from this machine than by the common spark. Water would not absorb this electrified air, which was in part inflammable.

The tube, being filled to the height of an inch with spirit of sal ammoniac, and inverted in mercury, was electrified 4 minutes; in which time the tube was filled with 8 inches of air, which proved to be equally inflammable, and as little absorbed by water as the alkaline air. Hence Dr. Van Marum conjectures that this air is only the volatile alkali rendered elastic.

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Curious experiment with balloons filled with inflammable air.

The following experiment is very curious, and may serve to illustrate some phenomena observed in thunder storms. Two balloons made of the allantoides of a calf, were filled with inflammable air, of which each contained about 2 cubit feet. To each of these was suspended, by a silken thread about 8 feet long, such a weight as was just sufficient to prevent it from rising higher in the air; they were connected, the one with the positive, the other with the negative conductor, by small wires about 30 feet in length, and being kept near 20 feet asunder, were placed as far from the machine as the length of the wires would admit. On being electrified, these balloons rose up in the air as high as the wire allowed, attracted each other, and uniting as it were into one cloud, gently descended. The rising of these artificial clouds is ascribed to the expansion of the air they contained, in consequence of the repulsive force communicated to its particles by elec-

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electricity: when in contact, their opposite electrical powers destroyed each other, and they recovered their specific gravity by losing the cause of its diminution. In order to render this experiment more perfectly imitative, the Doctor suspended to the balloon which was connected with the negative conductor, a bladder filled with a mixture of inflammable and atmospherical air, which, being kindled by the spark that took place on the union of these clouds, gave a considerable explosion. From these experiments, the Doctor explains the sudden elevation of the clouds, and the violent showers of rain and hail, which often accompany thunder-storms.

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Dr Priestley's experiments on the effects of the electric fluid on air.

In the course of his experiments upon air and electric fluid, Dr Priestley found, that, by means of the spark, he was able to turn vegetable blues to a red colour; though we are not to imagine that this was any indication of the acidity of the electric fluid, but merely of the decomposition of the air, and its conversion into fixed air or aerial acid. The instrument used in this experiment is a glass tube about 4 or 5 inches long and 1 or $\frac{2}{10}$ths of an inch diameter in the inside; a piece of wire is put into one end of the tube, and fixed there with cement; a brass ball is placed on the top of this wire; the lower part of the tube is to be filled with water, tinged blue with a piece of turnsole or archil. This is easily effected, by setting the tube in a vessel of the tinged water, then placing it under a receiver on the plate of the air-pump; exhaust the receiver in part, and then, on letting in the air, the tinged liquor will rise in the tube, and the elevation will be in proportion to the accuracy of the vacuum; now take the tube and vessel from under the receiver, and throw strong sparks on the brass ball from the prime conductor.

When Dr Priestley made this experiment, he perceived, that after the electric spark had been taken between the wire and the liquor about a minute, the upper part of it began to look red; in 2 minutes it was manifestly so, and the red part did not readily mix with the liquor. If the tube was inclined when the sparks were taken, the redness extended twice as far on the lower side as on the upper. In proportion as the liquor became red, it advanced nearer to the wire, so that the air in which the sparks were taken was diminished; the diameter amounted to about $\frac{1}{5}$th of the whole space; after which, a continuance of the electrification produced no sensible effect.

To determine whether the cause of the change of colour was in the air or in the electric matter, Dr Priestley expanded the air in the tube by means of an air-pump, till it expelled all the liquor, and admitted fresh blue liquor in its place: but after this, electricity produced no sensible effect on the air or on the liquor; so that it was clear, that the electric matter had decomposed the air, and made it deposit something of an acid nature. The result was the same with wires of different metals. It was also the same when, by means of a bent tube, the spark was made to pass from the liquor in one leg to the liquor in the other. The air thus diminished was in the highest degree noxious.

In passing the electric spark through different elastic fluids, it appears of different colours. In fixed air, the spark is very white; in inflammable and alkaline air, it appears of a purple or red colour. From hence we may infer, that the conducting powers of these airs is different, and that fixed air is a more perfect non-conductor than inflammable air.

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The spark was not visible in air from a caustic alkali made by M. Lane, nor in air from spirit of salt: so that they seem to be more perfect conductors of electricity than water or other fluid substances.

The electric spark, taken in any kind of oil, produces inflammable air. Dr Priestley tried it with ether, oil of olives, oil of turpentine, and essential oil of mint, taking the electric spark in them without any air to begin with; inflammable air was produced in them all.

Dr Priestley found, that on taking a small electric explosion for an hour, in the space of an inch of fixed air, confined in a glass tube $\frac{1}{10}$th of an inch diameter, when water was admitted to it, only $\frac{1}{4}$th of the air was imbibed. Probably the whole would have been rendered immiscible in water, if the electrical operation had been continued a sufficient time.

The electric spark, when taken in alkaline air, appears of a red colour; the electric explosions, which pass through this air, increase its bulk; so that, by making about 200 explosions in a quantity of it, the original quantity will be sometimes increased $\frac{1}{4}$th. If water is admitted to this air, it will absorb the original quantity, and leave about as much elastic fluid as was generated by the electricity, and this elastic fluid is a strong inflammable air.

Dr Priestley found, when the electric spark was taken in vitriolic acid air, that the inside of the tube in which it was confined was covered with a blackish substance. He seems to think, that the whole of the vitriolic acid air is convertible into this black matter, not by means of any union which it forms with the electric fluid, but in consequence of the concussion given to it by the explosion; and that, if it be the calx of the metal which supplied the phlogiston, it is not to be distinguished from what metal, or indeed from what substance of any kind, the air had been extracted.

Dr Priestley made 150 explosions of a common jar in about a quarter of an ounce measure of vitriolic acid air from copper, by which the bulk was diminished about $\frac{1}{5}$, and the remainder seemingly not changed, being all absorbed by water. In the course of this process, the air was carefully transferred three times from one vessel to another; and the last vessel, in which the explosions were made, was, to all appearance, as black as the first; so that the air seems to be all convertible into this black substance.

Thinking this diminution of the vitriolic acid air might arise from its absorption by the cement with which the glass tubes employed in the last experiment were closed, he repeated it with the air from quicksilver, in a glass syphon confined by quicksilver, and the result was the same.

That this matter comes from the vitriolic acid air only, and not from any combination of the electric matter with it, will appear from the following experiment.

He took the simple electric spark from a conductor of a moderate size, for the space of 5 minutes without interruption, in a quantity of vitriolic acid air,

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air, without producing any change in the inside of the glass; when immediately after, making in it only two explosions of a common jar, each of which might be produced in less than a quarter of a minute with the same machine in the same state, the whole of the inside of the tube was completely covered with the black matter. Now, had the electric matter formed any union with the air, and this black matter had been the result of that combination, all the difference that would have arisen from the simple spark or the explosion, could only have been a more gradual or a more sudden formation of that matter.

A large phial, about an inch and a half wide, being filled with this air, the explosion of a very large jar, containing more than 2 feet of coated surface, had no effect upon it; from which it should seem, that in these cases the force of the shock was not able to give the quantity of air such a concussion as was necessary to decompose any part of it.

He had generally made use of copper, but afterwards he procured this air from almost every substance from which it could be obtained; the electric explosion taken in it produced the same effect. But as some of the experiments were attended with peculiar circumstances, he briefly mentions them as follows.

When he endeavoured to get vitriolic acid air from lead, putting a quantity of leaden shot into a phial containing oil of vitriol, and applying only the usual degree of heat, a considerable quantity of heat was produced; but afterwards, though the heat was increased till the acid boiled, no more air could be got. He imagined, therefore, that in this case the phlogiston had in fact been supplied by something that had adhered to the shot. However, in the air so produced, he took the electric explosion; and in the first quantity he tried, a whitish matter was produced, almost covering the inside of the tube; but in the succeeding experiments, with air produced from the same shot or from something adhering to it, there was less of the whitish matter; and at last nothing but black matter was produced, as in all the other experiments. Water being admitted to this air, there remained a considerable residuum, which was very slightly inflammable.

Vitriolic acid air is easily procured from spirit of wine, the mixture becoming black before any air is yielded. The electric explosion taken in this air also produced the black matter.

The experiments made with ether seem to throw most light upon this subject, as this air is as easily procured from ether as any other substance containing phlogiston. In the air produced by ether the electric explosion tinged the glass very black, more so than in any other experiment of the kind; and when water had absorbed what it could of this air, there was a residuum in which a candle burned with a lambent blue flame. But what was most remarkable in this experiment was, that besides the oil of vitriol becoming very black during the process, a black substance, and of a thick consistence, was formed, which swam on the surface of the acid.

It is very possible, that the analysis of this substance may be a means of throwing light upon the nature of the black matter formed by electric explosions in vitriolic acid air, as they seem to resemble one another very much.

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The electric spark or explosion taken in common air, confined by quicksilver in a glass tube, covers the inside of the tube with a black matter, which, when heated, appears to be pure quicksilver. This, therefore, may be the case with the black matter into which he supposed the vitriolic acid air to be converted by the same process, though the effect was much more remarkable than in the common air. The explosion will often produce the diminution of common air in half the time that simple sparks will do it, the machine giving the same quantity of fire in the same time: also, the blackness of the tube is much sooner produced by the shocks than by the sparks. When the tube considerably exceeds $\frac{3}{10}$ths of an inch in diameter, it will sometimes become very black, without any sensible diminution of the quantity of air.

SECT. X. *Of the Methods of measuring Electricity both artificial and natural; of condensing and doubling it, so that the smallest Quantity may be made perceptible; of distinguishing the two Kinds of Electricity from one another, &c.*

We have already had occasion to mention, and in part to explain, the instruments for this purpose named *electrometers*. When the electricity is very evident, many obvious contrivances may be fallen upon to determine its quality and strength, when compared with that of any other body electrified also to a considerable degree. But in many cases the quantity of electricity is so small that it does not discover itself by any of the ordinary electrometers; and in others, though the quantity be very great, yet we are destitute of any proper standard which might enable us to compare it with another of apparently the same height, or which might determine the degrees of charge which the electrified substance progressively receives.

182 Description of various electrometers.

In the former case, Dr Priestley recommends a single thread of silk as it comes from the worm; which being extremely light and flexible, very readily discovers the electric properties of any body, by being first attracted and then repelled by it: and, as this substance at the same time has a power of retaining its electricity very strongly, we have thus an opportunity of determining whether the body from which it received the electricity was positive or negative. Even this electrometer has not been found to be endowed with all the sensibility to be wished for; so that others have been contrived which answer to a still greater degree of exactness. For ordinary purposes the following instruments are most commonly made use of.

Plate CLXXIV.

Fig. 13. represents a stand supporting the electrometers *D D*, *C C*. *B* is the basis of it, made of common wood. *A* is a pillar of wax, glass, or baked wood. To the top of the pillar, if it be of wax or glass, a circular piece of wood is fixed; but if the pillar be of baked wood, that may constitute the whole. From this circular piece of wood proceed four arms of glass, or baked wood, suspending at their ends four electrometers, two of which *D D* are silk threads about eight inches long, suspending each a small downy feather

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feather at its end. The other two electrometers *CC* are those with very small balls of cork, or of the pith of elder; and they are constructed in the following manner. *a b* is a stick of glass about six inches long, covered with sealing-wax, and shaped at top in a ring: from the lower extremity of this stick proceed two fine linen threads (K) *c c* about five inches long, each suspending a cork or pith-ball *d* about $\frac{1}{8}$th of an inch in diameter. When this electrometer is not electrified, the threads *c c* hang parallel to each other, and the cork-balls are in contact; but when electrified, they repel one another, as represented in the figure. When it happens to be inconvenient to use the insulating stand *AB*, the electrometers may be easily supported by a glass rod or tube.

Plate CLXXIV. Another species of the above electrometer is represented in fig. 14. which consists of a linen thread, having at each end a small cork-ball. This electrometer is suspended by the middle of the thread on any conductor proper for the purpose, and serves to show the kind and quantity of its electricity.

Fig. 15. represents Mr Henley's quadrant electrometer fixed upon a small stand, from which it may be occasionally separated and fixed upon the prime conductor, or in any other place, at pleasure. The electrometer consists of a perpendicular stem formed at the top like a ball, and furnished at its lower end with a brass ferule, by which it may be fixed in one of the holes of the prime conductor, or in its proper stand, as occasion requires. To the upper part of the stem or pillar, a graduated ivory semicircle is fixed; about the middle of which is a brass arm, which contains a pin, or the small axis of the index. The index consists of a very slender stick, which reaches from the centre of the graduated semicircle to the brass ferule, and at its lower extremity is fastened a small cork-ball, nicely turned in a lathe.

When this electrometer is not electrified, the index hangs parallel to the pillar; but when it is electrified, the index recedes more or less, according to the quantity of the electricity from the stem. See *FCDI*, in fig. 14. and *a b* in fig. 6. both of which are new and improved ways of applying it; by which the quantity of the shocks are regulated in the most convenient manner, as will be more particularly explained under *Medical Electricity*, Sect XII.

283 Brookes's electrometer.

Fig. 16. and 17. represent an electrometer nearly similar to that contrived by Mr Brookes. The two instruments are sometimes combined in one, or used separately, as in these figures. The arms *F H f k*, fig. 17. when in use, are to be placed as much as possible out of the atmosphere of a jar, battery, prime conductor, &c. The arm *F H* and the ball *K* are made of copper and as light as possible. The divisions on the arm *FH* are each of them exactly a grain. They are ascertained at first by placing grain weights on a brass ball which is within the ball *L* (this ball is an exact counterbalance to the arm *F H* and the ball *K* when the small slide on this arm is at the first division); and then removing the slide till it, together with the ball *K*, counterbalance the ball *L* and the weight laid on it.

A, fig. 16. is a dial-plate, divided into 90 equal parts. The index of this plate is carried once round, when the arm *B C* has moved through 90 degrees, or a quarter of a circle. That motion is given to the index by the repulsive power of the charge acting between the ball *D* and the ball *B* *.

The arm *B C* being repelled, shows when the charge is increasing, and the arm *F H* shows what this repulsive power is between two balls of this size in grains, according to the number the weight rests at when lifted up by the repulsive power of the charge: at the same time the arm *B C* points out the number of degrees to which the ball *B* is repelled; so that, by repeated trials, the number of degrees, answering to a given number of grains, may be ascertained, and a table formed from these experiments, by which means the electrometer, fig. 16. may be used without that of fig. 17.

* Phil. Tran. vol. lxxxii. p. 384.

Mr Brookes thinks, that no glass charged (as we call it) with electricity, will bear a greater force than that whose repulsive power, between two balls of the size he used, is equal to 60 grains; that in very few instances it will stand 60 grains weight; and he thinks it hazardous to go more than 45 grains.

Hence, by knowing the quantity of coated surface, and the diameter of the balls, we may be enabled to say, so much coated surface, with a repulsion between balls of so many grains, will melt a wire of such a size, or kill such an animal, &c.

Mr Brookes thinks, that he is not acquainted with all the advantages of this electrometer; but that it is clear, it speaks a language which may be universally understood, which no other will do; for though other electrometers will show whether a charge is greater or less, by an index being repelled to greater or smaller distances, or by the charge exploding at different distances, yet the power of the charge is by no means ascertained: but this electrometer shows the force of the repulsive power in grains; and the accuracy of the instrument is easily proved, by placing the weights on the internal ball, and seeing that they coincide with the divisions on the arm *FH*, when the slide is removed to them.

Mr Achard has shown clearly, that if the scale of an electrometer is divided into equal parts (degrees for example), the angle at which the index is held suspended by the electric repulsion will not be a true measure of the repulsive force; to estimate which truly, he demonstrates that the arc of the electrometer should be divided according to a scale of arcs, the tangents of which are in arithmetical progression.

The electrometer of which this is an imitation was invented by Mr Brookes, and described in his treatise already quoted. An account of it is given in that treatise, along with a very full representation of it by plates; but as these are somewhat difficult to be understood, we must for further particulars refer to the treatise itself. On this electrometer, however, we must observe, that it is constructed on the only true principle on which machines for measuring the quantity of electricity can be made. The mere attraction of any light body shows indeed that the substance which attracts it is electrified; but this property is by no means calculated to discover the comparative strength of it, on account

(K) These threads should be wetted in a weak solution of salt.

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count of its continual variation. Thus, if we hold any body within the electrified atmoſphere of another, though it be firſt attracted pretty ſtrongly, yet that attraction will be conſtantly diminiſhing, and at laſt changed into a repulſive power; but the latter, after it has once taken place, continues invariable as long as any degree of electric charge remains.

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Mr Cavallo's atmoſpherical electrometer.

The electricity of the atmoſphere particularly, has engaged the attention of philoſophers; and by reaſon of its infinite variety, requires the moſt delicate inſtruments to obſerve its minutiæ. Beſides the kite formerly deſcribed, which was an invention of Dr Franklin's, Mr Cavallo has invented ſeveral others. Fig. 61. repreſents a portable atmoſpherical electrometer, the principal part of which is a glaſs tube *CDMN*, cemented at the bottom into the braſs piece *AB*, by which part the inſtrument is to be held when uſed for the atmoſphere; and it alſo ſerves to ſcrew the inſtrument into its braſs caſe *ABC*. The upper part of the tube *CDMN* is ſhaped tapering to a ſmall extremity, which is entirely covered with ſealing-wax; to this tapering part a ſmall tube is cemented; the lower extremity, being alſo covered with ſealing-wax, projects a ſmall way within the tube *CDMN*; into this ſmaller tube a wire is cemented, which with its under extremity touches the flat piece of ivory *H*, faſtened to the tube by means of a cork; the upper extremity of the wire projects about a quarter of an inch above the tube, and ſcrews into the braſs cap *EF*, which cap is open at the bottom, and ſerves to defend the waxed part of the inſtrument from the rain, &c.

IM and *KN* are two narrow ſlips of tin-foil, ſtuck to the inſide of the glaſs *CDMN*, and communicating with the braſs bottom *AB*. They ſerve to convey that electricity which, when the balls touch the glaſs, is communicated to it, and being accumulated, might diſturb the free motion of the balls.

To uſe this inſtrument for artificial electricity, electrify the braſs cap by an electrified ſubſtance, and the divergence or convergence of the balls of the electrometer, at the approach of an excited electric, will ſhow the quality of the electricity. The beſt manner to electrify this inſtrument is, to bring excited wax ſo near the cap that one or both of the corks may touch the ſide of the bottle *CDMN*, after which they will ſoon collapſe and appear unelectrified. If now the wax is removed, they will again diverge, and remain electrified poſitively.

When this electrometer is to be uſed to try the electricity of the fogs, air, clouds, &c. the obſerver is to do nothing more than to unſcrew it from its caſe, and hold it by the bottom *AB* to preſent it to the air a little above his head, ſo that he may conveniently ſee the balls *P*, which will immediately diverge if there is any electricity; i. e. whether poſitive or negative may be aſcertained, by bringing an excited piece of ſealing-wax or other electric towards the braſs cap *EF*.

185
M. Sauſſure's improvement on this electrometer.

An improvement of Mr Cavallo's electrometer has been made by M. Sauſſure. The principal circumſtances in which they differ are, 1. The fine wires by which the balls are ſuſpended, ſhould not be long enough to reach the tin-foil which is paſted on the inſide of the glaſs; becauſe the electricity, when ſtrong, will cauſe them to touch this tin-foil twice conſecutively, and thus deprive them in a moment of their electricity. To prevent this defect, and yet give them a ſufficient degree of motion, it is neceſſary to uſe larger glaſſes than thoſe that are generally applied to Mr Cavallo's electrometer; two or three inches diameter will be found to anſwer the purpoſe very well. But as it is neceſſary to carry off the electricity which may be communicated to the inſide of the glaſs, and thus be confounded with that which belongs to thoſe ſubſtances that are under examination; four pieces of tin-foil ſhould be paſted on the inſide of the glaſs; the balls ſhould not be more than $\frac{1}{10}$th of an inch diameter, ſuſpended by ſilver wire, moving freely in holes nicely rounded. The bottom of the electrometer ſhould be of metal; for this renders it more eaſy to deprive them of any acquired electricity, by touching the bottom and top at the ſame time.

186
Serves inſtead of M. Volta's condenſer.

This electrometer may be uſed inſtead of the condenſer of M. Volta, by only placing it on a piece of oiled ſilk, ſomewhat larger than the baſe of the inſtrument: but in this caſe it is the baſe and not the top of the inſtrument, which muſt be brought into contact with the ſubſtance whoſe electricity is to be explored.

187
Aſcertains the conducting power of different ſubſtances.

By this inſtrument, it is eaſy to aſcertain the degree of conducting power in any ſubſtance. For example, if it is placed on an imperfect conductor, as dry wood or marble, and if the inſtrument is electrified ſtrongly, and afterwards the top is touched, the electricity will appear to be deſtroyed; but on lifting up the inſtrument by the top, the balls will again open, becauſe the imperfect conductor formed with the baſe a kind of electrophorus, by which the electric fluid was condenſed, and loſt its tenſion, till the perfect conductor was ſeparated from the imperfect one; whereas, if the conductor had been more perfect, it would have been deprived of its electricity immediately on the application of the hand.

188
Or their electricity.

It is eaſy to diſcover alſo, by this inſtrument, the electricity of any ſubſtance, as of cloaths, hair of different animals, &c. For this purpoſe, it muſt be held by the baſe, and the ſubſtance rubbed briſkly (only once) by the ball of the electrometer; the kind of electricity may be aſcertained in the uſual manner. It is proper, however, to obſerve here, that as the top of the electrometer acts in this caſe as an inſulated rubber, the electricity it acquires is always contrary to that of the rubbed body.

189
How to collect a great quantity of atmoſpherical electricity.

In order to collect a great quantity of electricity from the air, the electrometer is furniſhed with a pointed wire 15 inches or two feet long, which unſcrews in three or four pieces, to render the inſtrument more portable; ſee fig. 62. When it rains or ſnows, the ſmall cover, fig. 63. is to be ſcrewed on the top of the inſtrument, as by this its inſulation is preſerved, notwithſtanding the rain.

190
Or to aſcertain the kind of it.

This inſtrument indicates not only the electricity of fogs, but that alſo of ſerene weather, and enables us to diſcover the kind of electricity which reigns in the atmoſphere; and to a certain degree to form an eſtimate of its quantity, and that under two different points of view, the degree of intenſity, and the diſtance from the earth at which it firſt begins to be ſenſible.

A conductor exhibits ſigns of electricity only when the

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the electric fluid is more or less condensed in the air than in the earth. Though the air resists the passage of the electric fluid, it is not absolutely impermeable to it; it suffers it to pass gradually, and generally with more ease in proportion as its mass or thickness is less.

191 How high it is necessary to raise conductors in order to produce signs of electricity.

It is therefore interesting to discover at what height it is necessary to be elevated, in order to find a sensible difference between the electricity of the earth and that of the air. A very sensible difference may be generally discovered by this instrument at the distance of four or five feet from the ground; sometimes it may be seen if the instrument is placed even on the ground, while at others it must be raised seven or more feet before the balls will open; sometimes, though seldom, this height is not sufficient. This distance is generally greatest when the electricity is strongest, though necessarily modified by a variety of circumstances, some of which are known, as the degree of dryness or humidity of the air, and others are unknown.

The degree of intensity, at a given height, may be discovered thus: raise the electrometer, and judge by the divisions which are placed on the edge thereof the degree of their divergence. To find the relation between this degree of divergence and the force of the electricity, M. Saussure took the following method: As he could not with certainty double or triple a given quantity of electricity; yet as a given force may be reduced one half, a fourth, or eighth, &c. by dividing it between two equal and similar bodies, the electricity contained in one; he took two of his unarmed electrometers, which were as similar as possible, and electrified one of them, so that the balls separated precisely 6 lines: he then touched the top thereof by the top of that which was not electrified; in an instant the electricity was equally divided between them, as was evident by the divergence of the balls, which was 4 lines in each; consequently, a diminution of half the density had only lessened the divergence one third. One of these electrometers was then deprived of its electricity, and was afterwards brought in contact with the other, as before; the remaining electricity divided itself again between them, and the balls fell from 4 to 28 lines, nearly in the same proportion as before; in the third operation they fell to 19; in the fourth to one, where he was obliged to stop, as there was not now sufficient force in the fluid to pass from one electrometer to the other, and distribute itself uniformly between them. The same experiment repeated several times gave very nearly the same results. Negative electricity decreased also in the same proportion as the positive. The following table may therefore be considered as giving a general, though not exact, idea of the increase in force, which corresponds to different degrees of divergence in the balls; it is only calculated to every fourth of a line; the force of electricity is always expressed by whole numbers, as it would be ridiculous to put a greater degree of exactness in the numbers than is to be found in the experiments which form the basis of the calculation (L).

Distance of the balls in fourths of a line.	Corresponding forces of electricity.
1	1
2	2
3	3
4	4
5	5
6	6
7	8
8	10
9	12
10	14
11	17
12	20
13	23
14	26
15	29
16	32
17	36
18	40
19	44
20	48
21	52
22	56
23	60
24	64

Those who are desirous to carry this measure of the electric force further, may do it by having similar electrometers constructed, but made upon a larger scale, and with heavier balls, which would only separate one line, with the degree of electricity that makes the smaller ones diverge 6 lines; these would consequently measure a force 1024 times greater than that which forms the unity of the preceding table; and thus by degrees we may be enabled to discover the ratio of the strongest discharge of a great battery, or perhaps even of thunder itself, to that of a piece of amber, which only attracts a bit of straw or any other light substance. (M). In

(L) M. Saussure, in a long note, anticipates the objections that may be made to the foregoing method of estimating the force of electricity; but as at the most they only show that this science is at present in state of considerable imperfection, it will be unnecessary to take notice of them here.

(M) The consideration of the repulsive force is not sufficient to discover the absolute force of an explosion or electrical discharge: for M. Volta has shown, that the force of a discharge depends principally on the quantity of the electric fluid which passes from one body to another. Now the repulsive force of the electrometer only indicates the ratio of this quantity in equal and similar bodies, and which are also similarly situated. If equal quantities of the electric fluid were imparted to two unequal and separate conductors, the electric fluid being less condensed on the largest, would act with the least force on the electrometer; though it is probable, the force of the discharge in the two conductors would be equal. The repulsive force serves, however, to show what M. Volta calls the *electrical capacity* of a body, the quantity of the electric fluid it actually contains, or is capable of containing. To effect this, and have points of comparison, we should use light metallic balls, of different sizes, suspended by silk thread. One of these balls, unelectrified, being brought into contact with the substance

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In order to observe the electricity of the atmosphere with this instrument, we must first bring the electric fluid contained in the electrometer to the same degree of density with that at the surface of the earth; this is easily done by letting the bottom and top touch the ground at the same time; then raise the point, keeping the bottom still in contact with the ground, from whence it may be lifted up in a vertical position till the balls are level with the eye.

192 How to observe the electricity of the atmosphere.

193 How to render the signs of electricity in the electrometer permanent.

The second circumstance is to render the divergence of the balls, which is occasioned by the electricity of the air, permanent. This is effected by touching the top of the electrometer with the finger: but here the acquired electricity becomes contrary to that of the body by which they are electrified. Let us suppose, for example, that the electrometer is at five feet from the ground, and the balls diverging; touch the top of the electrometer with the finger, and the balls will close; but they will again open if the electrometer is withdrawn from the influence of the electricity of the air, by being brought nearer the ground, or into the house. M. Saussure only employed this method when the electricity was so weak that he could not perceive any until the electrometer was raised considerably above his eye: as in this case he could not perceive the divergence of the balls, he always endeavoured to obtain a permanent electricity in the foregoing manner.

194 How to distinguish the two electricities.

To know whether the balls separate with positive or negative electricity, bring a piece of excited wax gradually near the top of the electrometer; if the balls separate further on the approach of the wax, they are negatively electrified, or of the same nature with the electricity of the wax; if on the other hand they come nearer together on the approach of the wax, then the electricity is positive, or in a contrary state to that of the wax. If glass be used, the results will be exactly the reverse of the preceding.

The following example will render the use of the foregoing observations more familiar. Choose an open situation free from trees and houses, screw the conductor on the top of the electrometer, lay hold of it by its base, and place it so that the base and conductor may touch the ground at the same time; then elevate it to the height of the eye, and observe the quantity of lines, or fourths of a line, that the balls have diverged; now lower it till the balls almost touch each other, and observe at what distance the top of the conductor is from the ground; and this is the height from the ground at which the electricity of the air begins to be sensible. If the electricity of the air is sufficiently strong to make the balls diverge when it stands upon the ground, one of the lengths of the electrometer must be unscrewed from it. If the balls however still diverge, the other parts of the conductor should also be unscrewed, and you may mark down, that the electricity is sensible at zero, or on the surface of the earth. If, on the contrary, the electricity is so weak, as not to cause the balls to diverge when they are even with the eye, and consequently when the conductor is two feet higher, or seven feet from the ground, you should then raise it a foot higher; while it is thus elevated, touch the top with the other hand; when this hand is taken away, lower the electrometer, and if it is electrified you may say the electricity is sensible at eight feet; if it is not, raise it as high as the arm can reach, and repeat the same operation, if any electricity is found, write down electricity sensible at nine feet; if not, mark o, or no electricity relative to this instrument, and this mode of employing it; for signs of electricity may still be obtained, by throwing a metallic ball 50 or 60 feet into the air, which is at the same time connected with the electrometer by a metallic thread.

One advantage of this instrument is, that it will often exhibit signs of electricity when none can be obtained from a conductor of 100 feet in height, because it can more easily be preserved from humidity, &c. which destroy the insulation of the large conductors.

195 Observations on atmospherical electricity.

Aerial electricity varies according to the situation; it is generally strongest in elevated and insulated situations, not to be observed under trees, in streets, in houses, or any inclosed places; though it is sometimes to be found pretty strong on quays and bridges. It is also not so much the absolute height of the places as their situation; thus a projecting angle of a high hill will often exhibit a stronger electricity than the plain at the top of the hill, as there are fewer points in the former to deprive the air of its electricity.

The intensity of the atmospheric electricity is varied by a great many circumstances, some of which may be easily accounted for, others with more difficulty. When the weather is not serene, it is impossible to assign any rule for their variation, as no regular correspondence can then be perceived with the different hours of the day, nor with the various modifications of the air. The reason is evident; when contrary and variable winds reign at different heights, when clouds are rolling over clouds, these winds and clouds, which we cannot perceive by any exterior sign, influence however the strata of air in which we make our experiments, produce these changes of which we only see the result, without being able to assign either the cause or its rela-

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substance whose electricity is to be explored, will diminish the tension or repulsive force of this substance; and the quantity diminished by the contact of the ball will give the ratio of the capacity of this substance with that of the ball. Let us suppose a Leyden phial uninsulated, but so concealed, that only the knob is visible, and we are therefore ignorant of its size, and the strength of the shock it will give. Let the top of M. Saussure's electrometer be in contact with the knob of the bottle, and the balls of the electrometer separate 6 lines, —from this solitary fact, we shall gain no information relative to the force of the shock; because, if the jar is very large, this degree of tension will give a very painful sensation; when, if it is very small, with the same indicated tension, the sensation may be almost imperceptible. But if we bring a ball of a foot diameter, in contact with the knob of the bottle, and after having thus taken a part of the fluid therefrom, the electrometer is again put in contact with the knob thereof, the remaining quantity of repulsive force will show the relation between its contents and that of the globe of metal, and by this means the intensity of its charge.

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relation. Thus, in stormy weather, we see the electricity strong, then null, and in a moment after arise to its former force; one instant positive, the next negative, without being able to assign any reason for these changes. M. Saussure says, that he has seen these changes succeed with such rapidity, that he had not time to note them down.

When rain falls without a storm, these changes are not so sudden; they are, however, very irregular, particularly with respect to the intensity of force; the quality thereof is more constant. Rain or snow almost uniformly gives positive electricity.

In cloudy weather, without rain or storms, the electricity follows generally the same laws as in serene weather.

Strong winds generally diminish its intensity; they mix together the different strata of the atmosphere, and make them pass successively towards the ground, and thus distribute the electricity uniformly between the earth and the air. M. Saussure has observed a strong electricity with a strong north wind.

The state of the air in which the electricity is strong, is foggy weather: this is always accompanied with electricity, except when the fog is going to resolve into rain.

196 A periodical flux and reflux observable in the electricity of the atmosphere.

The most interesting observations, and those which throw the greatest light upon the various modifications of electricity in our atmosphere, are those that are made in serene weather. In winter (during which most of M. Saussure's observations were made) and in serene weather, the electricity was generally weakest in an evening, when the dew had fallen, until the moment of the sun's rising: its intensity afterwards augmented by degrees, sometimes sooner and sometimes later; but generally before noon, it attained a certain maximum, from whence it again declined, till the fall of the dew, when it would be sometimes stronger than it had been during the whole day; after which, it would again gradually diminish during the whole night; but it is never quite destroyed, if the weather is perfectly serene.

Atmospherical electricity seems, therefore, like the sea, to be subject to a flux and reflux, which causes it to increase and diminish twice in 24 hours. The moments of its greatest force are some hours after the rising and setting of the sun; those when it is weakest, precede the rising and setting thereof.

197 M. Saussure's observations on this subject in an extraordinary degree of cold.

M. Saussure has given an instance of this periodic flux in electricity: On the 22d of February, 1785, (one of the coldest days ever remembered at Geneva), the hygrometer and thermometer were suspended in the open air on a terrace exposed to the south-west; the electrometer, from its situation, indicated an electricity equal to what it would have shown if it had been pitched on an open plain. The height of the barometer was reduced to what it would have been if the mercury had been constantly at the temperature of 10 degrees of Reamur's thermometer. The place of observation was elevated 60 feet above the level of the lake. The observations of the day preceding and following this great cold were marked down by him; because it is pleasing to have these which precede and follow any singular phenomena. There was a weak S. W. wind during the whole three days; and it is rather remarkable, that most of the great colds, which have been observed at Geneva, were preceded by, or at least accompanied with, a little S. W. breeze.

198 Of the maximum and minimum of the electricity of the atmosphere on this occasion.

From the first 18 observations made during these three days, when the sky was quite serene, we learn that the electricity was pretty strong at nine in the morning; that from thence it gradually diminished till towards six in the evening, which was its first minimum; after which it increased again till eight, its second maximum; from whence it again gradually declined till six the next morning, which was the time of its second minimum; after which it again increased till ten in the morning, which was the first maximum of the following day; as this was cloudy, the electric periods were not so regular.

199 Electricity weaker in summer than in winter.

The electricity of serene weather is much weaker in summer than in winter, which renders it more difficult to observe these gradations in summer than in winter; besides a variety of accidental causes, which at the same time renders them more uncertain. In general, in summer, if the ground has been dry for some days, and the air is dry also, the electricity increases from the rising of the sun till three or four in the afternoon, when it is strongest; it then diminishes till the dew begins to fall, which again reanimates it; tho' after this it declines, and is almost extinguished during the night.

But the serene days that succeed rainy weather in summer, generally exhibit the same diurnal periods or states of electricity, as are to be observed in winter.

200 Air always positively electrified.

The air is invariably positive in serene weather, both in winter and summer, day and night, in the sun or in the dew. It would seem therefore, that the electricity of the air is essentially positive; and that whenever it appears to be negative, in certain rains or in storms, it probably arises from some clouds, which have been exposed to the pressure of the electric fluid contained in the upper part of the atmosphere, or to more elevated clouds that have discharged a part of their fluid upon the earth, or upon other clouds.

In order to find out the cause of these phenomena, M. Saussure instituted a set of experiments on evaporation, avoiding the use of M. Volta's condenser.

201 Saussure's experiments to determine the cause of the phenomena of atmospherical electricity.

To produce a strong evaporation, he threw a mass of red-hot iron into a small quantity of water, which was contained in a coffee-pot with a large mouth, and suspended by silk strings; by this he obtained a strong positive electricity; though, according to M. Volta's system, it ought to have been negative: the experiment was repeated several times, varying some of the circumstances, but the result was always the same.

As it was not easy to think so able a philosopher as M. Volta was deceived, it was necessary to try the experiment in a manner more analogous to that of M. Volta. A small chafing-dish was therefore insulated by silk cords, and the coffee-pot, with a small quantity of water, placed on it; one electrometer was connected with the coffee-pot and another with the chafing-dish; the fire was raised by a pair of bellows; when the water had boiled strongly for a few minutes, both electrometers exhibited signs of electricity, which, on examination, was found to be negative; proving the truth of M. Volta's experiment.

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The evaporation produced by the effervescence of iron in the vitriolic acid, and by that of chalk in the same acid, gave also negative electricity.

It was now necessary to inquire, why the vapour, excited by the heated iron, produced positive electricity; while that from boiling water in any other way produced a negative electricity.

202 Immense quantity of electricity extricated from volcanoes, &c.

M. Saussure suspected, that the intensity of heat to which the water is exposed, by the contact of a body in a state of incandescence, was the cause of the electricity produced by its evaporation; and that a combination was then formed, by which a new quantity of the electric fluid was produced. This conjecture may at first sight seem impossible; but the quantity of electricity produced by this experiment will astonish those that repeat it: and this quantity is the more surprising, because, if it is true, according to the system of M. Volta, that the waters absorb, while they are forming a quantity of the electric fluid, there must, therefore, be enough developed in this experiment for the formation of the great quantity of vapours produced by the heated iron, and afterwards a sufficient quantity to electrify strongly the apparatus, and all these vapours.

This experiment shows clearly the cause of that prodigious quantity of electricity which is unfolded in the eruption of volcanos; as it is probable that the water in these, from many circumstances, acquires a much greater degree of heat than is given to it in our experiments.

203 Positive electricity always produced by the combustion of iron.

To verify this conjecture, that it was in some measure the combustion of the water or the iron that produced the positive electricity, it was proper to try whether, by a regular moderation of the heat of the iron, positive electricity would always be obtained. This was essayed in the following manner: A large iron crucible, five inches high, four in diameter, and six lines thick, was heated red hot, then insulated; after which, small quantities of water were thrown into it, each projection of the water cooling more and more the crucible; thus descending by degrees till there was only sufficient heat to boil the water; carefully observing, and then destroying, the electricity produced at each projection. The electricity was always positive or null; at the first projections it was very strong; it gradually diminished to the twelfth, when it was scarcely sensible, though always with a tendency to be positive.

On repeating this experiment, and varying it in different ways, a remarkable circumstance was observed: When a small quantity of water was thrown into the crucible, the moment it was taken from the fire, while it was of a pale red, approaching what is called the *white heat*, no electricity was obtained.

204 Water evaporates more slowly on a red-hot metal than on one heated to a lesser degree.

This fact seemed to have some connection with another mentioned by Musschenbroek, that water evaporates more slowly on a metal, or any other incandescent body, than on the same body, heated only a small degree above boiling water. To examine this relation, and to find whether there was any between the periods of evaporation and the production of electricity, M. Saussure made a great number of experiments, which are most accurately described in his work; but as the detail would be much too long, we shall only present the reader with the heads thereof, and a description of the apparatus.

205 Apparatus for making the experiments.

The apparatus consisted of a pot of clay, well baked or annealed, 15 lines thick and 4 inches diameter; this was insulated by a dry glass goblet; upon this pot was placed the crucible, or any other heated substance on which the water was to be thrown, in order to be reduced into vapour; the crucible was contiguous to a wire connected with an electrometer; a measure, containing 54 grains weight of distilled water, was thrown upon the heated crucible: the time employed in the evaporation thereof was observed by a second watch; the electricity produced by this evapopation was noted. When this measure of water was reduced into vapour, the electricity of the apparatus is destroyed, and a fresh measure of water is thrown into the crucible, proceeding in the same manner till the crucible is almost cold.

206 Experiments with this apparatus.

The first experiment was with an iron crucible, from which it was found that Musschenbroek was not right in saying that the evaporation was slowest when the iron was hottest; for at the instant it was taken from the fire, it required 19 seconds to evaporate the water, and took no more time till the third projection, when it took 35 seconds, though from that period it employed less time, or in other words, the evaporation accelerated in proportion as the iron cooled.

With respect to the electricity, it was at first o, then positive, afterwards negative, then o, and afterwards positive to the end of the experiment. The vapour was not visible till the 7th projection.

In the second experiment with the same crucible, though every endeavour was made use of to render them as similar as possible, the electricity was constantly positive.

The third experiment was with a copper crucible: here also the electricity was positive; and the longest time employed in evaporation was not the instant of the greatest heat. It was very curious to see the water endeavouring to gather itself into a globule, like mercury on glass, to be sometimes immoveable, and then to turn on itself horizontally, with great rapidity; sometimes throwing from some of its points a little jet, accompanied with a hissing noise.

The fourth experiment was with the same crucible: the electricity was at first negative, then constantly positive.

The fifth was with a crucible of pure silver: a considerable time was employed here in evaporating the same quantity of water; even in the instant of the greatest heat it took 5 minutes 6 seconds; the electricity was weak; three times no electricity was perceived; five times negative electricity was discovered.

In a sixth experiment with the same crucible, a positive electricity was obtained at the second projection, after which none of any kind was perceived.

The seventh with the same, gave at first a strong negative electricity; the second and third projection gave a weak positive electricity.

The eighth was made with a porcelain cup: here the evaporation was slower at the second than at the first projection; but from this it took longer time till it was cold,

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cold, contrary to what happened with the metals; the electricity was always negative.

The ninth and tenth experiments with the same cup produced similar effects.

The eleventh experiment was with spirits of wine in a silver crucible: there was no electricity produced at the two first projections, and what was afterwards obtained was negative.

Twelfth experiment with ether: here the electricity was also negative. These two inflammable fluids in evaporating, followed the same laws as water, being dissipated at first most rapidly in the greatest heat, afterwards taking a longer and longer time before they were evaporated to a certain period, then employing less time, or evaporating quicker, till the crucible was nearly cold.

Now as china and silver always produced negative electricity, while iron and copper have generally given positive electricity, we may conclude, that electricity is positive with those bodies that are capable of decomposing water, or of being decomposed themselves by their contact with the water; and negative with those which are not at all decomposed or altered.

207 Saussure's conjecture concerning the nature of the electric fluid.

From hence M. Saussure conjectures, that the electric fluid may be looked upon as formed by the union of fire with some unknown principle, perhaps a fluid analogous to inflammable air, but exceedingly more subtle. This analogy seems to him sufficiently proved by the inflammation of the electric fluid, and by the diminution of the air in which this inflammation is made. Though many doubts have been attempted to be thrown on this inflammation, there seems to be one reason which forces us to admit it, which is the loss of a quantity of this fluid at every spark; we may diminish at pleasure any quantity of this fluid by taking a number of sparks from it. From whence also it may be inferred, that a considerable quantity is destroyed every day by thunder.

208 Consequences of M. Saussure's system.

According to this system, when the operation, which converts water into vapour, produces at the same time a decomposition, it then generates the electric fluid. A part of this fluid combines itself immediately with these vapours, and serves even to form them. The vessel in which this operation is performed, will acquire a positive electricity, none at all, or a negative, according as the quantity of the fluid generated is superior, equal, or inferior to that which the formation of the vapour consumes. When no decomposition accompanies the evaporation, the electricity ought to be constantly negative, because there is nothing to replace the quantity of this fluid which is employed in forming the vapour.

209 Observations upon it.

If in the foregoing experiments, those substances which were susceptible of calcination had constantly given a positive electricity, and those which do not calcine had always given the negative, every thing would have been explained by these principles, and they would thence have acquired a greater degree of probability: but the phenomena have not always followed this law. We have seen iron and copper sometimes give a negative electricity, and silver the positive. The first case is not difficult to account for; it is well known with what facility iron and copper calcine in a brisk fire; they become covered with a scaly crust, which is not susceptible of any further alteration with the same heat. If the bottom of the crucible acquires this crusty coating, the drop of water placed thereon will be no longer in contact with a calcinable substance; there will be no farther decomposition, no generation of the electric fluid: the vapours, however, which are still formed, will absorb a part of the fluid naturally contained in the apparatus, and this will therefore be electrified negatively. If some of the scales should be so far detached, that the water may gain some points of contact, the quantity thus generated may compensate for what is absorbed by the vapours, and thus the electricity will be null. If more are detached, it will superabound and be positive. For the same reasons, a large mass of water, by attracting the iron in a greater number of points, always gives positive electricity; and hence, also, a strong positive electricity is obtained, by throwing a piece of red-hot iron into a mass of water.

It is not so easy to explain why silver gives sometimes a positive electricity, but by supposing it to have been mixed with some substances capable of calcination; and this the more, as the white porcelain always gave negative electricity. This supposition was verified by some subsequent experiments, in which the same silver, when purified, always gave a negative electricity.

M. Saussure owns himself incapable of explaining why heated charcoal always gives a negative electricity; unless it can be attributed to the promptitude with which so rare a substance loses its heat by the contact of water.

210 No signs of electricity to be obtained from combustion.

One fact astonished him, namely, that by combustion properly so called, although it is an evaporation, nay, the highest degree of evaporation, he never obtained any signs of electricity, though he tried to obtain it in a variety of ways. Probably the current produced by the flame disperses and dissipates the electricity as soon as it is formed. The case, however, must not be looked upon as general, because M. Volta obtained signs of electricity from bodies in combustion by means of his condenser.

Another singular fact was, his not being able to obtain electricity without ebullition, though he endeavoured to compensate by the quantity of surface for the quantity of vapours that were elevated by boiling water; and indeed, the same quantity of water, if extended over too large a surface, will not give any electricity.

211 Mr Bennet's electrometer described.

But of all the instruments by which it hath been attempted to measure electricity, none have been found to answer the purpose equally well with that invented by Mr Bennet, of which an account is given in the 77th volume of the Philosophical Transactions, and which is represented fig. 64. It consists of two slips of leaf-gold, *a a*, suspended in a glass cylinder *b*. The foot *c* may be made of wood or metal, and the cap *d* of metal; the latter being made flat at top for the convenience of putting any thing upon it that is to be electrified. The cap is about an inch wider than the diameter of the glass, and its rim about three quarters of an inch broad, hanging parallel to the glass to keep it sufficiently insulated, and to turn off the rain. Within this is another circular rim about half as broad as the former, lined with silk or velvet, so that it

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it may be made to fit the outside of the glass exactly, while the cap may be easily taken off to repair any accident happening to the gold-leaf. From the centre of the cap hangs a tin tube somewhat longer than the depth of the inner rim, in which a small peg *f* is placed, which may be taken out occasionally. To this peg, which is rounded at one end and flat at the other, two slips of leaf-gold are fastened with paste, gum-water, or varnish. These are about a fifth-part of an inch broad, and two inches long, tapering to a sharp point. In one side of the cap is a small tube *g*, to place wires in: *h h* are two long pieces of tin-foil fastened with varnish on opposite sides of the internal surface of the glass, where the leaf-gold may be expected to strike, and in connection with the foot. The upper end of the glass is covered and lined with sealing-wax as low as the outermost rim, to make the insulation more perfect. An improvement on this electrometer is to make the cylinder pretty long, and to have a small additional tube of gum-lac on the end of it. The slips of tin-foil reach almost to the edge of the outer rim, and are sharp pointed at top; widening in the middle, and decreasing in breadth again as they descend.

212 Its extreme sensibility.

The sensibility of this electrometer is extreme, as appears from the following examples.

1. On putting powdered chalk into a pair of bellows, and blowing it upon the cap, the latter was electrified positively when the nozzle of the bellows was about six inches from it; but at the distance of three feet from the nozzle, the same stream electrified it negatively. Thus it appears that the electricity may be changed from positive to negative from the mere circumstance of the wider diffusion of this stream of chalk in the air. It may also be changed by placing a bunch of fine wire, silk, or feathers, in the nozzle of the bellows; and it is likewise negative when blown from a pair of bellows without their iron-pipe, so that it may come out in a larger stream: but this last experiment was found to answer best in wet weather. There is likewise a remarkable difference between the experiment in which the electricity is positive and that in which it is negative; the former being communicated with some degree of permanency to the cap, so that the gold-leaf continues for some time to diverge; but the latter being only momentary, and the gold-leaf collapsing as soon as the cloud of chalk is dispersed. The reason why the former continues is, that the chalk sticks to the cap.

2. A piece of chalk drawn over a brush, or powdered chalk put into the brush, and projected upon the cap, electrifies it negatively; but its electricity is not communicated.

3. Powdered chalk blown with the mouth or bellows from a metal plate placed upon the cap, electrifies it permanently positive. Or if the chalk is blown from the plate, either insulated or not, so that the powder may pass over the cap, if not too far off, it is also positive. Or if a brush is placed upon the cap, and a piece of chalk drawn over it, when the hand is withdrawn, the leaf-gold gradually opens with positive electricity as the cloud of chalk disperses.

4. Powdered chalk falling from one plate to another placed upon the instrument, electrifies it negatively.

Other methods of producing electricity with chalk and other powders have been tried; as projecting chalk from a goose wing, chalking the edges of books and clapping the book suddenly together, also sifting the powder upon the cap; all which electrified it negatively: but the instrument being placed in a dusty road, and the dust struck up with a stick near it, electrified it positively. Breaking the *glass-tear* upon a book electrified it negatively, but when broken in water it did not electrify it.

Wheat-flour and red-lead are strongly negative in all cases where the chalk is positive. The following powders were like chalk: red ochre and yellow rosin, coal ashes, powdered crocus metallorum, aurum mosaicum, black-lead, lampblack (which was only sensible in the two first methods), powdered quick lime, umber, lapis calaminaris, Spanish brown, powdered sulphur, flowers of sulphur, iron-filings, rust of iron, sand. Rosin and chalk, separately alike, were changed by mixture; this was often tried in dry weather, but did not succeed in damp: white lead also sometimes produced positive and sometimes negative electricity when blown from a plate.

If a metal cup be placed upon the cap with a red-hot coal in it, a spoonful of water thrown in electrifies the cap negatively; and if a bent wire be placed in the cap, with a piece of paper fastened to it to increase its surface, the positive electricity of the ascending vapour may be tried by introducing the paper into it. Perhaps the electrification of fogs and rain is well illustrated by pouring water through an insulated cullender containing hot coals, where the ascending vapour is positive and falling drops negative.

213 Considerably augmented by means of a lighted candle.

The sensibility of this electrometer may be considerably increased by placing a candle upon the cap. By this means, a cloud of chalk, which in the other case only just opens the leaf-gold, will cause it to strike the sides for a long time together; and the electricity, which was not before communicated, now passes into the electrometer, causing the leaf-gold to repel after it is carried away. Even sealing-wax by this means communicates its electricity at the distance of 12 inches at least, which it would scarcely otherwise do by rubbing upon the cap.

A cloud of chalk or wheat flower may be made in one room, and the electrometer with its candle be afterwards leisurely brought from another room, and the cloud will electrify it before it comes very near. The air of a room adjoining to that wherein the electrical machine was used, was very sensibly electrified, which was perceived by carrying the instrument through it with its candle.

214 Its application to electrical kites.

In very clear weather, when no clouds were visible, the electrometer has been often applied to the insulated string of kites without metal, and their positive electricity caused the leaf-gold to strike the sides; but when a kite was raised in cloudy weather with a wire in the string, and when it gave sparks about a quarter of an inch long, the electricity was sensible by the electrometer at the distance of ten yards or more from the string; but when placed at the distance of six feet, the leaf-gold continued to strike the sides of the electrometer for more than an hour together, with a velocity increasing and decreasing with the density or distance of the unequal clouds which passed over.

Sometimes the electricity of an approaching cloud has

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has been sensible without a kite, though in a very unfavourable situation for it, being in a town surrounded with hills, and where buildings encompassed the wall on which the electrometer was placed. A thunder-cloud passing over, caused the leaf-gold to strike the sides of the glass very quick at each flash of lightning.

215 Other experiments, showing the great sensibility of this electrometer.

No sensible electricity is produced by blowing pure air, projecting water, by smoke, flame, or explosions of gunpowder.

A book was placed upon the cap, and struck with silk, linen, woollen, cotton, parchment, and paper, all which produced negative repulsion; but when the other side of the book was struck with silk, it became positive; this side, struck at right angles with the former, was again negative; and by continuing the strokes which produced positive, it changed to negative for a little while; and, by stopping again, became positive. No other book would do the same, though the sides were scraped unchalked, upon a supposition that altering the surface would produce it. At last, one side of a book was moistened, which changed it; whence it was concluded, that one edge of the book had lain in a damp place; which conjecture was farther confirmed by all the books becoming positive in damp weather, and one of them being dried at the fire again became negative.

When the cap is approached with excited sealing-wax, the leaf-gold may be made to strike the sides of the glass more than twelve times; and as the sealing-wax recedes, it strikes nearly as often; but if it approaches much quicker than it recedes, the second number will sometimes be greater.

The quantity of electricity necessary to cause a repulsion of the leaf-gold is so small, that the sharpest point or edges do not draw it off without touching; hence it is unnecessary to avoid points or edges in the construction of this instrument.

To the experiments on blowing powders from a pair of bellows it may be added, that if the powder is blown at about the distance of three inches upon a plate which is moistened or oiled, its electricity is contrary to that produced by blowing upon a dry plate. This shows that the electricity of the streams of powder issuing out of the bellows is only contrary to the more expanded part, because it is within the influence of its atmosphere; for when this is destroyed by the adhesion of the powder to the moistened plate, it is negative when the bellows are positive, as it was before positive when the more expanded cloud was negative.

216 How to make experiments on the evaporation of water.

The experiments on evaporation of water may be tried with more ease and certainty of success by heating the small end of a tobacco-pipe, and pouring water into the head; which running down to the heated part, is suddenly expanded, and will show its electricity when projected upon the cap of the electrometer more sensibly than any other way that has been tried. If the pipe be fixed in a cloven stick, and placed in the cap of one electrometer whilst the stream is projected upon another, it produces both electricities at once. Spirit of wine and ether are electrified like water. Oil and vitriolic acid produced smoke without any change of electricity. In these experiments a long pipe is better than a short one.

Besides these instruments, there are several others invented by Mr Cavallo which answer the purpose of observing the electricity of the atmosphere extremely well, tho' not with such great accuracy as that just now described; and of which he gives the following account.

217 Mr Cavallo's instrument for observing the electricity of the atmosphere.

"Fig. 67. represents a very simple instrument for making experiments on the electricity of the atmosphere; and which, on several accounts, seems to be the most proper for that purpose. *A B* is a common jointed fishing-rod, without the last or smallest joint. From the extremity of this rod proceeds a slender glass tube *C*, covered with sealing-wax, and having a cork *D* at its end, from which a pith-ball electrometer is suspended. *H G I* is a piece of twine fastened to the other extremity of the rod, and supported at *G* by a small string *F G*. At the end (*I*) of the twine a pin is fastened; which when pushed into the cork *D*, renders the electrometer *E* uninsulated. When I would observe the electricity of the atmosphere with this instrument, I thrust the pin (*I*) into the cork *D*; and holding the rod by its lower end *A*, project it out from a window in the upper part of the house, into the air, raising the end of the rod with the electrometer, so as to make an angle of about 50° or 60° with the horizon. In this situation I keep the instrument for a few seconds; and then pulling the twine at *H*, the pin is disengaged from the cork *D*: which operation causes the string to drop in the dotted situation *KL*, and leaves the electrometer insulated, and electrified with an electricity contrary to that of the atmosphere. This done, I draw the electrometer into the room; and examine the quality of the electricity without obstruction either from wind or darkness. With this instrument I have made observations on the electricity of the atmosphere several times in a day for several months."

218 His electrometer for rain.

His electrometer for rain is shown Plate CLXXVII. fig. 70. and of this he gives the following description. "*A B C I* is a strong glass tube about two feet and a half long, having a tin funnel *D E* cemented to its extremity, which funnel defends part of the tube from the rain. The outside surface of the tube from *A* to *B* is covered with sealing-wax; so also is the part of it which is covered by the funnel. *F D* is a piece of cane, round which brass wires are twisted in different directions, so as to catch the rain easily, and at the same time to make no resistance to the wind. This piece of cane is fixed into the tube; and a slender wire proceeding from it goes through the bore of the tube, and communicates with the strong wire *A G*, which is thrust into a piece of cork fastened to the end *A* of the tube. The end *G* of the wire *A G* is formed in a ring, from which I suspend a more or less sensible pith-ball electrometer as occasion requires. This instrument is fastened to the side of the window-frame, where it is supported by strong brass hooks at *C B*; which part of the tube is covered with a silk lace, in order to adapt it better to the hooks. The part *F C* is out of the window, with the end *F* elevated a little above the horizon. The remaining part of the instrument comes through a hole in one of the lights of the sash within the room, and no more of it touches the side of the window than the part *C B*. When it rains, especially in passing showers, this instrument, standing in the situation above described, is frequently electrified; and, by the diverging of the electrometer, the quantity and quality of the electricity of the rain may be observed without any danger of a mistake. With this instrument I have observed, Methods of measuring Electricity &c.

served, that the rain is generally, though not always, electrified negatively; and sometimes so strongly, that I have been able to charge a small coated phial at the wire *AG*. This instrument should be fixed in such a manner that it may be easily taken off from the window and replaced again as occasion requires; for it will be necessary to clean it very often, particularly when a shower of rain is approaching."

219 All these instruments imperfect.

Notwithstanding the great accuracy of these instruments, however, there are still many degrees of electricity too small to be observed by any of them. To be able to collect these, it is necessary to have one capable of retaining the electricity it receives for a considerable time, and of allowing it to accumulate till it becomes capable of being measured by some of the common methods. Upon instruments of this kind Mr Cavallo gives the following dissertation.

220 Mr Cavallo's dissertation on measuring small degrees of electricity.

"Besides the way of ascertaining small quantities of electricity by means of very delicate electrometers, two methods have been communicated to the philosophical world, by which such quantities of electricity may be rendered manifest as could not be perceived by other means. The first of those methods is an invention of M. Volta, the apparatus for it being called the *condenser of electricity*, and is described in the Philosophical Transactions, Vol. LXXII. The second is a contrivance of the abovementioned Mr Bennet, who calls the apparatus *the doubler of electricity*. A description of it is inserted in the Philosophical Transactions, Vol. LXXVII.

221 Volta's condenser.

"M. Volta's condenser consists of a flat and smooth metal plate, furnished with an insulating handle, and a semiconducting, or imperfectly insulating, plane. When one wishes to examine a weak electricity with this apparatus, as that of the air in calm and hot weather, which is not generally sensible to an electrometer, he must place the abovementioned plate upon the semiconducting plane, and a wire, or some other conducting substance, must be connected with the metal plate, and must be extended in the open air, so as to absorb its electricity; then, after a certain time, the metal plate must be separated from the semiconducting plane; and being presented to an electrometer, will electrify it much more than if it had not been placed upon the abovementioned plane.

"The principle on which the action of this apparatus depends is, that the metal plate, whilst standing contiguous to the semiconducting plane, will both absorb and retain a much greater quantity of electricity than it can either absorb or retain when separate, its capacity being increased in the former and diminished in the latter case.

"Whoever considers this apparatus, will easily find, that its office is not to manifest a small quantity of electricity, but to condense an expanded quantity of electricity into a small space: hence, if by means of this apparatus one expected to render more manifest than it generally is, when communicated immediately to an electrometer, the electricity of a small tourmalin, or of a hair when rubbed, he would find himself mistaken.

222 Mr Bennet's doubler objected to.

"It is Mr Bennet's doubler that was intended to answer that end; viz. to multiply, by repeated doubling, a small, and otherwise unperceivable, quantity of electricity, till it became sufficient to affect an electrometer, to give sparks, &c. The merit of this invention is certainly considerable; but the use of it is far from precise and certain.

"This apparatus consists of three brass plates, which we shall call *A*, *B*, and *C*; each of which is about three or four inches in diameter. The first plate *A* is placed upon the gold-leaf electrometer, or it may be supported horizontally by any other insulating stand, and its upper part only is thinly varnished. The second plate *B* is varnished on both sides, and is furnished with an insulating handle, which is fastened laterally to the edge of it. The third plate *C* is varnished on the under side only, and is furnished with an insulating handle, which is perpendicular to its upper surface.

"This apparatus is used in the following manner. The plate *B* being laid upon the plate *A*, the small quantity of electricity, which is required to be multiplied, is communicated to the upper part of the plate *A*, and at the same time the upper part of *B* is touched with a finger; then the finger is first removed; the plate *B* is afterwards removed from over the plate *A*. The plate *C* is now laid upon *B*, and its upper surface is touched, for a short time, with a finger. By this operation it is clear, that if the electricity communicated to the plate *A* is positive, the plate *B* must have acquired a negative electricity, and the plate *C* must have acquired the positive, viz. the same of the plate *A*. Now the plate *B*, being separated from *C*, is laid as before upon *A*; the edge of *C* is brought into contact with the under part of the plate *A*, and at the same time the upper part of *B* is touched with a finger; by which means the plate *B*, being acted upon by the atmospheres of both the plates *A* and *C*, will acquire nearly twice as much electricity as it did the first time, and of course will render the plate *C*, when that is laid upon it, proportionably more electrified than before: thus, by repeating this operation, the electricity may be increased to any required degree.

"The varnish on those surfaces of the plates which are to lie contiguous to each other, serves to prevent the metal of one touching the metal of the other; for in that case, instead of one plate causing a contrary electricity in the other, the electricity of the first would be gradually communicated to the others, and would be dissipated.

"As soon as I understood the principle of this contrivance, I hastened to construct such an apparatus, in order to try several experiments of a very delicate nature, especially on animal bodies and vegetables, which could not have been attempted before, for want of a method of ascertaining exceedingly small quantities of electricity; but after a great deal of trouble, and many experiments, I was at last forced to conclude, that the doubler of electricity is not an instrument to be depended upon, for this principal reason, viz. because it multiplies not only the electricity which is willingly communicated to it from the substance in question; but it multiplies also that electricity which in the course of the operation is almost unavoidably produced by accidental friction; or that quantity of electricity, however small it may be, which adheres to the plates in spite of every care and precaution.

"Having found, that with a doubler constructed in the above described manner, after doubling or multiplying

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tiplying 20 or 30 times, it always became strongly electrified, though no electricity had been communicated to it before the operation, and though every endeavour of depriving it of any adhering electricity had been practised; I naturally attributed that electricity which appeared after repeatedly doubling, to some friction given to the varnish of the plates in the course of the operation. In order to avoid entirely this source of mistake, or at least of suspicion, I constructed three plates without the least varnish, and which, of course, could not touch each other, but were to stand only within about one-eighth of an inch of each other. To effect this, each plate stood vertical, and was supported by two glass sticks, which were covered with sealing-wax. These were inserted into a wooden pedestal $7\frac{1}{4}$ inches long, $2\frac{1}{4}$ broad, and $1\frac{1}{4}$th inch thick, being kept fast by cement both to the pedestal and likewise to another piece of wood fastened to the back of the plate. The plate itself is of strong tin, and measures about eight inches in diameter. The stand projects very little before the plate; by which means, when two of those plates are placed upon a table facing each other, the wooden stands will prevent their coming into actual contact.

"I need not describe the manner of doubling or of multiplying with those plates; the operation being essentially the same as when the plates are constructed according to Mr Bennet's original plan, excepting that, instead of placing them one upon the other, mine are placed facing each other: and in performing the operation they are laid hold of by the wooden stand *AB*; so that no friction can take place either upon the glass legs or upon any varnish; for these plates have no need of being varnished. Sometimes, instead of touching the plates themselves with the finger, I have fixed a piece of thin wire to the back of the plate, and have then applied the finger to the extremity of the wire, suspecting that some friction and some electricity might possibly be produced when the finger was applied in full contact to the plate itself.

"It is evident, that as the plates do not come so near to each other in this as they do in the other construction, the electricity of one of them cannot produce so great a quantity of the contrary electricity in the opposite plate: hence, in this construction, it will be necessary to continue the operation of doubling somewhat longer; but this disadvantage is more than repaid by the certainty of avoiding any friction.

"Having constructed those plates, I thought that I might proceed to perform the intended experiments without any further obstruction: but in this I found myself quite mistaken: for on trying to multiply with those new plates, and when no electricity had been previously communicated to any of them, I found, that after doubling 10, 15, or at most 20 times, they became so full of electricity as to afford even sparks. All my endeavours to deprive them of electricity proved ineffectual. Neither exposing them, and especially the glass sticks, to the flame of burning paper, nor breathing upon them repeatedly, nor leaving them untouched for several days, and even for a whole month, during which time the plates remained connected with the ground by means of good conductors, nor any other precaution I could think of, was found capable of depriving them of every vestige of electricity; so that they might show none after doubling 10, 15, or at most 20 times.

"The electricity produced by them was not always of the same sort; for sometimes it was negative for two or three days together; at other times it was positive for two or three days more; and often it changed in every operation. This made me suspect, that possibly the beginning of that electricity was derived from my body, and being communicated by the finger to the plate that was first touched, was afterwards multiplied. In order to clear this suspicion, I actually tried those plates at different times, viz. before and after having walked a great deal, before and after dinner, &c. noting very accurately the quality of electricity produced each time; but the effects seemed to be quite unconnected with the abovementioned concomitant circumstances; which independence was further confirmed by observing that the electricity produced by the plates was of a fluctuating nature, even when, instead of touching the plates with the finger, they had been touched with a wire, which was connected with the ground, and which I managed by means of an insulating handle.

"At last, after a great variety of experiments, which it is unnecessary to describe, I became fully convinced, that those plates did always retain a small quantity of electricity, perhaps of that sort with which they had been last electrified, and of which it was almost impossible to deprive them. The various quality of the electricity produced was owing to this, viz. that as one of those plates was possessed of a small quantity of positive electricity, and another was possessed of the negative electricity, that plate which happened to be the most powerful, occasioned a contrary electricity in the other plate, and finally produced an accumulation of that particular sort of electricity.

"Those observations evidently show, that no precise result can be obtained from the use of those plates; and of course, that when constructed according to the original plan, they are still more equivocal, because they admit of more sources of mistake.

"As those plates, after doubling or multiplying only four or five times, show no signs of electricity, none having been communicated to them before, I imagined that they might be useful so far only, viz. that when a small quantity of electricity is communicated to any of them in the course of some experiment, one might multiply it with safety four or five times, which would even be of advantage in various cases; but in this also my expectations were disappointed.

"Having observed, after many experiments, that, *cæteris paribus*, when I began to multiply from a certain plate, which we shall call *A*, the electricity which resulted was generally positive; and when I began with another plate *B*, viz. considered this plate *B* as the first plate, the resulting electricity was generally negative; I communicated some negative electricity to the plate *A*, with a view of destroying its inherent positive electricity. This plate *A* being now electrified negatively, but so weakly as just to affect an electrometer, I began doubling; but after having doubled three or four times, I found, by the help of an electrometer, that the communicated negative electricity in the plate was diminished instead of being increased; so that sometimes it vanished entirely, though by continuing the opera-

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tion it often began to increase again, after a certain period. This shows, that the quantity of electricity, which however small it may be, remains in a manner fastened to the plates, will help either to increase or to diminish the accumulation or multiplication of the communicated electricity, according as it happens to be of the same or of a different nature.

"After all the abovementioned experiments made with those doubling or multiplying plates, we may come to the following conclusion, viz. that the invention is very ingenious, but their use is by no means to be depended upon. It is to be wished that they may be improved so as to obviate the weighty objections that have been mentioned; the first desideratum being to construct a set of such plates as, when no electricity is communicated, they will produce none after having performed the operation of doubling for a certain number of times.

223 Cavallo's opinion of the methods by which small quantities of electricity can be measured.

"Upon the whole, the methods by which small quantities of electricity may be ascertained with precision are, as far as I know, only three. If the absolute quantity of electricity be small and pretty well condensed, as that produced by a small tourmalin when heated, or by a hair when rubbed, the only effectual method of manifesting its presence, and ascertaining its quality, is to communicate it immediately to a very delicate electrometer, viz. a very light one, that has no great extent of metallic or of other conducting substance; because if the small quantity of electricity that is communicated to it be expanded throughout a proportioably great surface, its elasticity, and of course its power of separating the corks of an electrometer, will be diminished in the same proportion.

"The other case is, when one wants to ascertain the presence of a considerable quantity of electricity, which is dispersed or expanded into a great space, and is little condensed, like the constant electricity of the atmosphere in clear weather, or like the electricity which remains in a large Leyden phial after the first or second discharge.

224 His apparatus for this purpose.

"To effect this, I use an apparatus, which in principle is nothing more than M. Volta's condenser; but with certain alterations, which render it less efficacious than in the original plan, but at the same time render it much less subject to equivocal results. I place two of the above described tin-plates upon a table, facing each other, and about $\frac{1}{8}$th of an inch asunder. One of those plates, for instance *A*, is connected with the floor by means of a wire, and the other plate *B* is made to communicate, by any convenient means, with the electricity that is required to be collected. In this disposition the plate *B*, on account of the proximity of the other plate, will imbibe more electricity than if it stood far from it, the plate *A* in this case acting like the semiconducting plane of M. Volta's condenser, though not with quite an equal effect, because the other plate *B* does not touch it; but yet, for the very same reason, this method is incomparably less subject to any equivocal result. When the plates have remained in the said situation for the time that may be judged necessary, the communication between the plate *B* and the conducting substance which conveyed the electricity, must be discontinued by means of a glass stick, or other insulating body; then the plate *A* is removed, and the plate *B* is presented to an electrometer, in order to ascertain the quality of the electricity; but if the electrometer be not affected by it, then the plate *B* is brought with its edge into contact with another very small plate, which stands upon a semiconducting plane, after the manner of M. Volta's condenser (N); which done, the small plate, being held by its insulating handle, is removed from the inferior plane, and is presented to the electrometer: and it frequently happens, that the small plate will affect the electrometer very sensibly, and quite sufficient for the purpose: whereas the large plate itself showed no clear signs of electricity.

"If it be asked, why I use the semiconducting plane for this small plate, and not for the large one? the answer is, first, because the large semiconducting plane is incomparably more difficult to be procured than the small one; and, secondly, because the small plane may be easily deprived of any accidental electricity which may adhere to it; but the large one is more difficultly rendered fit for the purpose, especially as the large plate ought in general to remain upon it a much longer time than the small plate is to remain upon its semiconducting plane.

"The third and last case is, when the electricity to be ascertained is neither very considerable in quantity nor much condensed; such is the electricity of the hair of certain animals of the surface of chocolate when cooling, &c. In this case the best method is to apply a metal plate, furnished with an insulating handle, like an electrophorus plate, to the electrified body, and to touch this plate with a finger for a short time whilst standing in that situation; which done, the plate is removed, and is brought near an electrometer; or its electricity may be communicated to the plate of a small condenser, as directed in the preceding case, which will render the electricity more conspicuous. It is evident, that in this case the metal plate will acquire the electricity contrary to that of the substance in question: but this answers the same purpose; for if the electricity of the plate be found to be positive, one must conclude, that the electricity of the body in question is negative, and contrariwise. In this operation, care must be had not to put the metal plate too near, or in full contact with the substance to be examined, lest the friction, likely to happen between the plate and the body, should produce some electricity, the origin of which might be attributed to other causes.

"Having thus far described the surest methods of ascertaining the presence and quality of electricity, when its quantity or degree of condensation is small, I shall now beg leave to add some farther remarks on the subject of electricity in general, and which have been principally suggested by what has been mentioned.

"On the hypothesis of a single electric fluid, it is said, that every substance in nature, when not electrified

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(N) This small plate is nearly of the size of a shilling, and the semiconducting plane is of wood covered with copal varnish.

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fied, contains its proper share of electric fluid, which is proportionate to its bulk, or to some other of its properties; and it is generally believed, that this equal or proportionate distribution of electric fluid takes place with the greatest part of natural bodies. However, the fact is far from being so; and I may venture to assert, that, strictly speaking, every substance is always electrified, *viz.* that every substance, and even the various parts of the same body, contain at all times more or less electric fluid than that quantity of it which it ought to contain, in order to be in an electrical equilibrium with the bodies that surround it.

225 Every substance electrified at all times.

"At first sight it may be thought quite immaterial to know, whether the electric fluid is dispersed in the just proportion among the various substances which are not looked upon as electrified, or whether it deviates in a small degree from that proportionate distribution; but it will hereafter appear, that one of those assertions will lead us to the explanation of an interesting phænomenon in electricity, whereas the other does not admit of it; besides, what is called a small difference of the proportionate distribution, insomuch as it does not affect our instruments, may be sufficient for several operations of nature, which it is our interest to investigate.

"If we enquire what phenomena evince this altered distribution, or the actually electrified state of all bodies, the preceding observations will furnish some very unequivocal ones; especially that of the doubling plates made after my plan, which showed to be electrified even after having remained untouched for a whole month, during which time they had been in communication with the ground; for if each of them had contained an equal share of electric fluid, the electric atmosphere of one of them could not possibly occasion a contrary electricity in the other, and consequently no accumulation of that power could have happened.

226 Experiment showing the truth of this doctrine.

"A great number of instances are related in books on the subject of electricity, and in the Phil. Transf. of pieces of glass, of sulphur, of sealing-wax, &c. having remained electrified so far as to affect an electrometer for months after they had been excited, or even touched; but the following experiment will show, in a clearer manner, the great length of time that a quantity of electricity will remain upon a body.

"Having constructed a gold-leaf electrometer in the nicest manner I could, and which, on account of the non-conducting nature and construction of its upper part, could remain sensibly electrified for several hours together, I communicated some electricity to it, which caused the slips of gold-leaf to diverge with a certain angle; and as the electricity was gradually dissipated, the divergency diminished in the same proportion. Now, whilst this diminution of divergency was going on, I looked through a small telescope, and, by means of a micrometer, measured the chords of the angles of divergency, setting down the time elapsed between each pair of contiguous observations; and as the chord of the angle of divarication is in the direct simple proportion of the density of the electric fluid (A), I could by this means know how much electric fluid was lost by the electrometer in a certain time, and of course what portion of the electricity first communicated to the electrometer still remained in it. Let us make the chord of the angle of divarication on first electrifying the electrometer, or rather when first observed, equal to 16; or let us conceive that quantity of electricity to be divisible into 16 equal parts.

"I observed, that, when the chord of the angle became equal to eight, the time elapsed between this and the first observation was one minute; when the chord became equal to four, the time elapsed between this point and the preceding observation was 3′ 30″; when the chord became equal to two, the time elapsed since the preceding observation was 17′; and when the chord became equal to one, the time elapsed since the preceding observation was one hour and a quarter; after which the electrometer remained sensibly electrified for a long time.

"In repeating this experiment, the times elapsed between the corresponding observations did not follow strictly the same proportion of increase; nor did they increase regularly in the same experiments, which may be attributed in great measure to the inaccuracy in observing, and to the fluctuating state of the air; but it could be safely inferred from all the experiments, that the times required for the dispersion of the electricity were at least greater than the inverse duplicate proportion of the densities of the electricity remaining in the electrometer. And if we imagine, that they continue to diminish in the same proportion of increasing time, which is far from being an extravagant supposition, we shall find, by a very easy calculation, that about two years after the electrometer would still retain the $\frac{1}{100}$th part of the electricity communicated to it in the beginning of the experiment; and as we do not know how far a quantity of electricity is divisible, or to what extent it may be expanded, we may conclude with saying, that strictly speaking, the electrometer would remain electrified for many years.

"It may be inferred from this, as well as from many other experiments, that the air, or in general any substance, is a more or less perfect conductor of electricity, according as the electricity which is to pass through it is more or less condensed; so that if a given quantity of electric fluid be communicated to a small brass ball, one may take it away by simply touching the ball with a finger; but if the same quantity of electric fluid be communicated to a surface of about 100 or 1000 square feet, the touching with the finger will hardly take away any part of it.

"If it be asked, what power communicates the electricity, or originally disturbs the equilibrium of the natural quantity of electric fluid in the various bodies of the universe? we may answer, that the fluctuating electric state of the air, the passage of electrified clouds, the evaporation and condensation of fluids, and the friction arising from divers causes, are perpetually acting upon the electric fluid of all bodies, so as either to increase or diminish it, and that to a more considerable degree than is generally imagined.

"I shall conclude, with briefly proposing an explanation of the production of electricity by friction, which is dependent upon the above stated proposition, *viz.*

(A) This proposition was first ascertained by F. Beccaria. See Philosophical Transactions, Vol. LVI.

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viz. that bodies are always electrified in some degree; and likewise upon the well known principle of the capacity of bodies for holding electric fluid being increased by the proximity of other bodies in certain circumstances.

"It seems to me, that the cylinder of an electrical machine must always retain some electricity of the positive kind, though not equally dense in every part of its surface; therefore, when one part of it is set contiguous to the rubber, it must induce a negative electricity in the rubber. Now, when, by turning the cylinder, another part of it (which suppose to have a less quantity of positive electricity than the preceding) comes quickly against the rubber; the rubber being already negative, and not being capable of losing that electricity very quickly, must induce a stronger positive electricity in the former part which is now opposite to it: but this part cannot become more positively electrified, unless it receives the electric fluid from some other body, and therefore some quantity of electric fluid passes from the lowest part of the rubber to this part of the glass; which additional quantity of electric fluid is retained by it alone only whilst it remains in contact with the rubber; for after that, its capacity being diminished, the electric fluid endeavours to escape from it. Thus we may conceive how every other part of the glass acquires the electric fluid, &c. and what is said of the cylinder of an electrical machine may, with proper changes, be applied to any other electric and its rubber."

227 Cavallo's instrument for observing small quantities of electricity.

An instrument for observing very small quantities of electricity has likewise been invented by the same author and described in the second part of the volume just quoted. The properties of this machine, which from its office may be called *a collector of electricity*, are, *first*, that when connected with the atmosphere, the rain, or in short with any body which produces electricity slowly, or which contains that power in a very rarefied manner, it collects the electricity, and afterwards renders both the presence and quality of it manifest, by communicating it to an electrometer. *2dly*, This collecting power, by increasing the size of the instrument, and especially by using a second or smaller instrument of the like sort to collect the electricity from the former, may be augmented to any degree. *3dly*, It is constructed, managed, and preserved with ease and certainty; and it never gives, nor can it give, an equivocal result, as he has proved experimentally, and as will appear by considering its construction.

Plate CLXXVIII. exhibits two perspective views of this collector. Fig. 93. shows the instrument in the state of collecting the electricity; and fig. 94. shows it in the state in which the collected electricity is to be rendered manifest. An electrometer is annexed to each. The letters of reference indicate the same parts in both figures.

ABCD is a flat tin plate, 13 inches long and 8 inches broad; to the two shorter sides of which are soldered two tin tubes *AD* and *BC*, which are open at both ends. *DE* and *GF* are two glass sticks covered with sealing-wax by means of heat, and not by dissolving the sealing-wax in spirits. They are cemented into the lower apertures of the tin tubes, and also in the wooden bottom of the frame or machine at *E* and *F*; so that the tin plate *ABCD* is supported by those glass sticks in a vertical position, and is exceedingly well insulated. *GHILKM* and *NOPV* are two frames of wood, which being fastened to the bottom-boards by means of brass hinges, may be placed so as to stand in an upright position and parallel to the tin-plate, as shown in fig. 94. or they may be opened, and laid upon the table which supports the instrument, as shown in fig. 93. The inward surfaces of those frames from their middle upwards are covered with gilt paper *XY*; but it would be better to cover them with tin-plates hammered very flat. When the lateral frames stand straight up, they do not touch the tin-plate; but they stand at about one-fifth part of an inch asunder. They are also a little shorter than the tin-plate, in order that they might not touch the tin-tubes *AD*, *BC*. In the middle of the upper part of each lateral frame is a small flat piece of wood *S* and *T*, with a brass hook; the use of which is to hold up the frames without the danger of their falling down when not required, and at the same time it prevents their coming nearer to the tin-plate than the proper limit. It is evident, that when the instrument stands as shown in fig. 94. the gilt surface of the paper *XY*, which covers the inside of the lateral frames, stands contiguous and parallel to the tin-plate.

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When the instrument is to be used, it must be placed upon a table, a window, or other convenient support; a bottle electrometer is placed near it, and is connected, by means of a wire, with one of the tin tubes *AD*, *BC*; and by another conducting communication the tin-plate must be connected with the electrified substance, the electricity of which is required to be collected on the plate *ABCD*: thus, for instance, if it be required to collect the electricity of the rain or of the air, the instrument being placed near a window, a long wire must be put with one extremity into the aperture *A* or *B* of one of the the tin-tubes, and with the other extremity projecting out of the window. If it be required to collect the electricity produced by evaporation, a small tin pan, having a wire or foot of about six inches in length, must be put upon one of the tin-tubes, so that, the wire going into the tube, the pan may stand about two or three inches above the instrument. A lighted coal is then put into the pan, and a few drops of water poured upon it will produce the desired effect. Thus far may suffice with respect to the mechanical description of the instrument: the power and use of it will be made apparent by the following experiments.

1. Communicate to the tin-plate *ABCD* a quantity of electricity, for instance, as much as would very sensibly affect a common cork-ball electrometer; then, if the lateral frames *GHM*, *NOP*, stand upright as in fig. 94. the electrometer *W* will show no divergency; but if the frames are opened and let down, as in fig. 93. the balls of the electrometer *W* will immediately repel each other, and by the approach of an excited piece of sealing-wax, the quality of the electricity may be easily ascertained after the usual manner. Put up the lateral frames again, and the electricity will apparently vanish; let them down, and the electricity will re-appear, and so on. If you touch any part of the tin-plate or tin-tubes with your finger, the electricity is thereby entirely removed, and that will be the case whether the lateral frames are up or down.

2. Take

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2. Take an extended piece of tin-foil, about four yards square, and, holding it by a silk thread, electrify it so weakly as not to be capable of affecting an electrometer; then bring it in contact with the tin-plate of the collector, whilst the lateral frames are up. This done, remove the tin-foil, let down the lateral frames one after the other; and on doing this the electrometer *W* will immediately manifest a considerable degree of electricity. But if the electrometer were to show no sensible degree of electricity, a smaller collector, *viz.* one having a tin-plate of about four square inches, must be brought into contact with the tin-plate of the large collector, whilst the lateral frames of the latter only are down; and then the small collector being removed from the large one, its lateral frames are opened, and its tin-plate is presented to an electrometer, which will thereby be electrified to a much greater degree than the electrometer *W* was by the large collector.

3. Let a common cork-ball electrometer be fastened to an insulated conductor, having about two or three square feet of surface, and communicate to it such a quantity of electricity as may be sufficient to let the balls of the electrometer stand at about one inch asunder. In this state bring the conductor in contact with the tin-plate of the collector for a very short time, and it will be found, that the balls of its electrometer will immediately approach and touch each other, showing that the electricity of the conductor is gone to the plate of the collector; and, in fact, if you let down the lateral frames, the balls of the electrometer *W* will immediately repel each other to a very great degree.

It seems, therefore, to be clearly shown by these experiments, that the tin-plate of this instrument can collect and retain a vast quantity of electricity, when the conducting surfaces of the lateral frames are contiguous to it, in comparison to that quantity which it can either collect or retain when those surfaces are removed from its vicinity.

The quantity of electricity which the tin-plate *ABCD* is capable of collecting, principally depends on three circumstances, *viz.* 1st, on the distance between the tin-plate and the conducting lateral surfaces; the smaller that distance is, the greater being the collecting power; 2dly, on the size of the instrument: and, 3dly, on the quantity of electricity possessed by the body from which it must be collected or taken away.

The principle upon which the action of this instrument depends, is the same as that of the electrophorus of M. Volta's condenser, and of many other electrical experiments; namely, that a body has a much greater capacity for holding electricity when its surface is contiguous to a conductor which can easily acquire the contrary electricity, than when it stands not in that situation.

Plate CLXXV.

228 Electrical air thermometer.

The electrical air thermometer, fig. 34. is an instrument designed to show the power of electricity by its rarefaction of the air through which the fluid passes. But though this instrument in theory might be supposed capable of manifesting the very least degrees of electricity, the rarefaction of the air by its means is so very small, that unless the power of electricity be very considerable, no expansion will be perceived. The instrument, however, certainly has its uses, and many curious experiments may be performed with it. *AB* represents a glass cylinder having a brass cap, with a wire and knob passing through it, and which is cemented on the open part of the glass. The under part is inverted into a small dish *B C*, containing quicksilver or some other liquid, which may rise in the small tube *AH* by any expansion of the air in the cylinder *AB*. *CD* is an insulating stand, which serves to sustain the whole; *E* is an hook by which a communication may be made to the ground; and *F* another for connecting the whole with the prime conductor of an electrical machine. The discharges of electricity made by the sparks between the knobs *G* and *I* expand the air, and force up the fluid into the small tube *A H*; and its rise there is marked upon a graduated scale. This instrument will likewise answer for showing the diminution or increase of any kind of air by the electric spark, at well as its sudden expansion by a spark or shock of a phial. Mr Morgan has shown that the mercury in a common thermometer, if well made, may be raised by the electric blast.

229 Mr Bennet's doubler of electricity improved by Mr Nicholson.

In a treatise lately published by the Reverend Mr Abraham Bennet, he gives an account of the machine called the *doubler of electricity*, with some improvements upon it by Mr Nicholson; by which means the machine becomes less liable to the objections of Mr Cavallo abovementioned. In its improved state, it consists of two insulated and immoveable plates about two inches in diameter, and a moveable plate also insulated, which revolves in a vertical plane parallel to the two immoveable plates, passing them alternately.

Plate CLXXVI. Fig. 65.

"The plate *A* is constantly insulated, and receives the communicated electricity. The plate *B* revolves; and when it is opposite the plate *A*, the connecting wires at the end of the cross piece *D* must touch the pins of *A* and *C* at *E F*, and a wire proceeding from the plate *B* must touch the middle piece *C*, which is supported by a brass, wooden, or other conducting pillar in connection with the earth. In this position, if electricity be communicated to the plate *A*, the plate *B* will acquire a contrary state; and passing forwards, the wires also moving with it by means of the same insulating axis, the plates are again insulated till the plate *B* is opposite to *C*, and then the wire at *H* touches the pin in *C*, connecting it with the earth, and communicating the contrary state of electricity to that of *B*, but of the same kind with that of *A*. By moving the handle still further, *B* is again brought opposite to *A*; and the connecting wires joining *A* and *C*, they both act upon *B*, which is connected with the earth as before, and nearly double its intensity, whilst the electricity of *C* is absorbed into *A*; because of the increased capacity of *A*, whilst opposed to *B*, capable by its connection with the earth of acquiring a contrary state sufficient to balance the influential atmospheres of both plates.

"Thus by continuing to revolve the plate *B*, the process is performed in a very expeditious and accurate manner.

"The ball *I* is made heavier on one side than the other, and screwed upon the axis opposite to the handle, to counterbalance the plate *B*, which may therefore be stopped in any part of its revolution.

"Yet notwithstanding the convenience and accuracy of the doubler, it always produced spontaneous electricity,

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city, even after all the resinous substances used in its construction had been melted over a candle, and after standing a long time with its plates in connection with the earth. I therefore conjectured that this spontaneous electricity was not owing to accidental friction, but to the increased capacity of approximating parallel plates which might attract and retain their charge tho' neither of them were insulated. To prove my hypothesis, I first endeavoured more effectually and speedily to deprive the instrument of the electricity last communicated, and that I might know whether this spontaneous charge, supposed to arise from the increased capacity of the parallel plates, would be always of the same kind.

"To effect this deprivation, I connected the plates *A* and *C* together by a wire hooked at each end upon two small knobs on the backs of the plates, the middle of the same wire touching the pillar which supports the doubler. Another wire was hooked at one end upon the back of the plate *B*, and at the other end to the brass ball which counterbalances this plate. Thus all the plates were connected with the earth; and by turning the handle of the doubler, it might be discharged of electricity in every part of its revolution.

"After often trying this method of depriving the doubler, I observed that its spontaneous charge was almost always negative. I then touched *A* and *C* with a positively charged bottle, and turned the doubler till it produced sparks for a long time together; and after this strong positive charge, I hooked on the wires as above, and revolved the plate *B* about 100 times, which so deprived the doubler of its positive electricity, that when the wires were taken off, it produced a negative charge at about the same number of revolutions which it required before.

"The positively charged bottle was again applied; and the wires being hooked upon the plates as before, *B* was revolved only 50 times; yet this was found sufficient to deprive it of its positive charge, and in many experiments 5 or 6 revolutions were sufficient: but I never thought it safe to stop at so few, and have therefore generally turned the handle 40 or 50 times between every experiment.

"Lest electricity adhering to the electrometer should obstruct the above experiments, I did not let it stand in contact with the doubler during its revolutions, but touched the plate *A* with the cap of the electrometer, after I supposed its electricity was become sufficiently sensible: but lest even this contact should communicate any electricity, I made a cap for my electrometer of shell-lac, having a small tin tube in the centre, to which the gold-leaf was suspended within the glass, and a bent wire was fixed to the top, which might easily be joined to the plate *A* of the doubler; and thus the gold-leaf was more perfectly insulated, and the electricity could not be diffused over so large a surface. The glass which insulates the plates and cross piece of the doubler was also covered with shell-lac."

230 Nicholson's instrument for distinguishing the two electricities.

Fig. 66. shows an instrument invented by Mr Nicholson for distinguishing the two electricities from one another. *A* and *B* are two metallic balls placed at a greater or less distance from each other by means of the joint at *C*; the two branches *C A* being made of varnished glass. From one of the balls B proceeds a short point towards the other ball *A*. If the two be placed in the course or current of the electric matter, so that it may pass through the air from one to the other, its direction will be known. For if the electric matter pass from *A* to *B*, there will be a certain distance of the balls dependent on the strength of electricity, within which the dense sparks will pass from the point; but if its course be in the contrary direction, no spark will be seen, unless the balls be almost in contact with the point.

231 Observations on the electrical kite.

We shall conclude this section with some observations on the electrical kite; which perhaps may after all be found the only instrument that will certainly show the electricity of the atmosphere upon all occasions. The use of it, however, is very troublesome, as it obliges the observer always to go abroad, which sometimes must be disagreeable. By means of the apparatus represented fig. 72. this inconvenience may be avoided. *A B* represents the string of the kite, insulated by means of the silk cord *C*, tied about the foot of a table in the room where the experiments are to be made. This string passes out through a window of the room, and supports the kite; the electricity being conveyed by means of a small wire to the insulated conductor *D*, having a quadrant electrometer applied to it, as in the figure. *G* is a glass tube about 18 inches long, with a brass wire and knob proceeding from it; by taking a small spark with which from the conductor, the quality of the electricity may be observed.

Plate CLXXVII.

232 A convenient pocket electrometer.

Fig. 68. 69. represent a pocket electrometer, which may be very conveniently used when the atmospheric electricity is collected in any quantity. The case or handle of this electrometer is formed by a glass tube about three inches long and $\frac{3}{16}$ths of an inch in diameter, half of which is covered with sealing-wax. From one extremity of this tube, *viz.* that without sealing-wax, a small loop of silk proceeds, which serves occasionally to hang the electrometer, on a pin, &c. To the other extremity of the tube a cork is adapted, which, being cut tapering on both ends, can fit the mouth of the tube with either end. From one extremity of this cork two linen threads proceed, a little shorter than the length of the tube suspending each a little cone of pith of alder. When this electrometer is to be used, that end of the cork which is opposite to the threads is pushed into the mouth of the tube; then the tube forms the insulated handle of the pith electrometer, as represented fig. 69. But when the electrometer is to be carried in the pocket, then the threads are put into the tube, and the cork stops it as represented fig. 68. The peculiar advantages of this electrometer are, its convenient small size, its great sensibility, and its continuing longer in good order than any other. Fig. 68. represents a case to carry the above described electrometer in. This case is like a common toothpike-case, except that it hath a piece of amber fixed on one extremity *A*, which may occasionally serve to electrify the electrometer negatively; and on the other extremity it hath a piece of ivory fastened upon a piece of amber *B C*. This amber *B C* serves only to insulate the ivory: which when insulated, and rubbed against woollen cloths, acquires a positive electricity, and is therefore useful to electrify the electrometer positively.

In making experiments with the kite, it is sometimes necessary to act with caution, on account of the

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the great quantity of electricity collected by it. Of this we have already given some instances, to which we shall add the following from Mr Bennet; viz. that having on the 5th of July, 1788, raised a kite with 200 yards of string, when it had been flying about an hour, a dark cloud appeared at a great distance, and changed the electricity from positive to negative. The electric power increased till the cloud became nearly vertical, when some large drops of rain fell, and our author attempting to secure the string from wet, received such a strong shock in his arm, as deprived it for a few seconds of sensation. The explosion was heard at the distance of about 40 yards, like the loud crack of a whip.

233 Experiments with the kite sometimes dangerous.

Sect. XI. *Of the Effects of Electricity on Vegetation.*

It is a very considerable time since electricians began to make experiments on this subject; and it was generally agreed that the electric fluid was favourable to the growth of vegetables. For a long time, however, such researches seem to have been laid aside; nor indeed did it seem very probable that any quantity of the fluid could be collected artificially sufficient to be of use. But in a late treatise the subject has been revived by the Abbe Bertholon; who not only shows a method of collecting the fluid from the atmosphere so as to be useful in ordinary practice, but endeavours to cure by means of this fluid some of those diseases to which plants are liable from insects, and which cannot be removed by any of the ordinary remedies.

234 The upper parts of the atmosphere always abound with electric matter.

"In the first place (says the Abbe) there is continually and every where diffused in the atmosphere (particularly in the upper regions) a considerable quantity of the electric fluid. On the mountains especially, it is always felt with most energy, and shows itself in greater abundance than on the plains. On the former, if you erect conductors, or lanch electric *paper-kites*, in order to seek out and direct this fluid towards the surface of the earth, where several causes sometimes prevent its appearance; you will find it very soon subjected to your power, descend, as if at your command, from heaven itself, and creep at your feet to execute your orders. These are facts extremely well ascertained; but if one doubts of them, he has nothing to do but to erect a similar apparatus or set off electric kites to be convinced of the truth. These will immediately and at all times obtain an electricity so much the more strong as the height of the apparatus shall be the more considerable. Being informed, that in England this experiment was tried with the most convincing effect, I mention it as it has hitherto not been published. Upon a high mountain there were launched two electric paper-kites, one of which was fixed to the inferior extremity of the other, thus gaining a double advantage in point of height; the consequence of which was, that the electric effects were incomparably greater than those produced by a single instrument. But I suppose it entirely useless to insist longer upon a fact so well demonstrated and universally admitted.

235 Electro-vegetometer described.

"This principle being granted: in order to remedy the deficiency of electric fluid which has already been proved to be hurtful to vegetation, we must erect in the spot which we want to fecundate the following new apparatus, which has had all possible success, and which I shall call by the name of the *electro-vegetometer*. This machine is as simple in its construction as efficacious in its manner of acting; and I doubt not but it will be adopted by all those who are sufficiently instructed in the great principles of nature.

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"This apparatus is composed of a mast *A B* (Plate CLXXX. fig. 82.), or a long pole thrust just so far into the earth as to stand firm and be able to resist the winds. That part of the mast which is to be in the earth must be well dried at the fire; and you must take care to lay on it a good coat of pitch and tar after taking it from the fire, that the resinous particles may enter more deeply into the pores of the wood, which will then be dilated, at the same time that its humidity will be expelled by the heat. Care must likewise be taken to throw around that part fixed in the earth a certain quantity of coal-dust, or rather a thicker layer of good cement, and to build besides a base of masonwork of a thickness and depth proportionable to the elevation of the instrument, so as to keep it durable and solid. As to the portion of it above the ground, it will be sufficient to put upon it some coats of oil-paint, except one chooses rather to lay on a coat of bitumen the whole length of the piece.

"At the top of the mast there is to be put an iron-console or support *C*; whose pointed extremity you are to fix in the upper end of the mast, while the other extremity is to terminate in a ring, in order to receive the hollow glass tube which is seen at *D*, and in which there is to be glued an iron rod rising with the point *E*. This rod, thus pointed at its upper extremity, is completely insulated, by reason of its keeping a strong hold of a thick glass tube, which is filled with a quantity of bituminous matter, mixed with charcoal, brick-dust, and glass-powder; all together forming a sufficiently good and strong cement for the object in view.

To prevent rain wetting the glass tube, care must be taken to solder to the rod *E* a funnel of white-iron; which consequently is entirely insulated. From the lower extremity of the rod *F* hangs a chain *G*, which enters into a second glass tube *H*, supported by the prop *I*. The lower end of the abovementioned chain rests upon a circular piece of iron wire, which forms a part of the horizontal conductor *KLMN*. In *L* is a breaker with a turning joint or hinge, in order to move to the right or left the iron-rod *LMN*; there is likewise another in *Q*, to give still greater effect to the circular movement. *O* and *P* are two supports terminating in a fork, where there is fixed a silken cord tightly stretched, in order to insulate the horizontal conductor: in *N* are several very sharp iron-points.

"In fig. 83. you see an apparatus in the main like the former but with some difference in the construction. At the upper extremity of the mast *a b* there is bored a hole into which enters a wooden cylinder *c*, which has been carefully dried before a great fire, in order to extract its humidity, dilate its pores, and saturate it with tar, pitch, or turpentine, applied at repeated intervals. The more heat the wood and bituminous matter receives, the more the substance penetrates, and the insulation will be the more complete. It is moreover proper to besmear the circumference of the little cylinder with a pretty thick coat of bitumen. This preparation being made, we next insert the cylinder *c* into 236

236 Another form of this instrument.

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into the hole *b* of the mast; and it is easy to join together these two wooden pieces in the most perfect manner.

"At the upper extremity of the cylinder *c* we strongly attach an iron-rod *g f*; which, instead of one, is terminated by several sharp points all of gilded iron. In *e* you see a branch of iron resembling the arm of an iron-crow, from whence hangs an iron chain *h i*, at the end of which there is a crooked piece of iron resembling a mason's square, and ending in a fork. The piece of iron *l* is a ring with a handle entering a little into the glass tube *m* filled with mastiche, in the same manner as does the iron rod *n*. The conductor *p o* is to be considered as an additional piece to act in that marked *p*. There are likewise put iron spikes in *q*: the support *s* resembles those of *O* and *P* in the former figure. In this new machine you can lengthen or shorten the horizontal conductor as you please; and as the iron-ring *l* turns freely in a circular gorge made in the mast, the conductor is enabled to describe the entire area of a circle.

237 Effects of these instruments.

"The construction of this *electro-vegetometer* once well understood, it will be easy for us to conceive its effects. The electricity which prevails in the aerial regions will soon be drawn down by the elevated points of the upper extremity. This effect of the points is proved by the most decisive experiments, and is called by philosophers the *power of points*.

"The electric matter brought down by the point *E*, or by those marked *f f f*, will be necessarily transmitted both by the rod and chain; because the insulation produced at the upper extremity of the mast completely prevents its communication with the timber. The electric fluid passes from the chain to the horizontal conductor *K M* or *n o*: it then escapes by the points at *P* and *q*; because the same points that have the power of bringing down the electric fluid, have likewise that of pushing it forward; a thing well known by experience.

238 Method of using them.

"The manner of using this instrument is not more difficult than the knowlegde either of its conductor or effects. Suppose, for example, we are to place it in the midst of a kitchen-garden. By making the horizontal conductors turn round successively, you will be able to carry the electricity over the whole surface of the proposed ground. The electric fluid thus drawn down, will extend itself over all the plants you want to cultivate; and this at a time when there is little or no electricity in the lower regions nigh the surface of the earth.

"On the other hand, when it happens that the electric fluid shall be in too great abundance in the atmosphere, in order to take off the effect of the apparatus in *K* fig. 82. and in *n* fig. 83. you have only to hang to it an iron-chain reaching to the ground, or else a perpendicular iron-rod, which will have the same effect, *viz.* that of destroying the insulation, and of insensibly transmitting the electric fluid in the same proportion as it is drawn by the points; so that there shall never be an overcharge of this fluid in the instrument, and its effect shall be either something or nothing, according as you add or remove the second chain or the additional rod.

"There will be nothing to fear from the spontaneous discharge of this apparatus, because it is terminated below by proper points in *P* and *q* of both machines; and it is a certain fact, that a pointed conductor makes no explosion, and that instead of flashes there are only luminous streams. However, it will be easy to furnish one, by means of which we may approach the apparatus with perfect security; it is only necessary to hold the hand before it. This has the form of a great C, and is of a height equal to the distance that takes place betwixt the horizontal conductor and the surface of the earth. This discharger near the middle must be furnished with a glass-handle; and at the extremity which is directed towards the conductor, there must hang an iron-chain made to trail on the ground. This instrument is an excellent safeguard. See fig. 84.

239 Great advantages to be expected from these instruments.

"By means of the electro-vegetometer just now described, one may be able to accumulate at pleasure this wonderful fluid, however diffused in the regions above, and conduct it to the surface of the earth, in those seasons when it is either scantily supplied, or its quantity is insufficient for vegetation; or although it may be in some degree sufficient, yet can never produce the effects of a multiplied and highly increased vegetation. So that by these means we shall have an excellent vegetable manure or nourishment brought down as it were from heaven, and that too at an easy expence; for after the construction of this instrument, it will cost you nothing to maintain it: It will be moreover the most efficacious you can employ, no other substance being so active, penetrating, or conducive to the germination, growth, multiplication, or reproduction of vegetables. This heavenly manure is that which nature employs over the whole habitable earth; not excepting even those regions which are esteemed barren, but which, however, are often fecundated by those agents which nature knows so well to employ to the most useful purposes. Perhaps there was nothing wanting to bring to a completion the useful discoveries that have been made in electricity, but to show this so advantageous an art of employing electricity as a manure; consequently, that all the effects which we have already mentioned, depend upon electricity alone; and lastly, that all these effects, *viz.* acceleration in the germination, the growth, and production of leaves, flowers, fruit, and their multiplication, &c. will be produced, even at a time when secondary causes are against it: and all this is brought about by the electric fluid, which we have the art of accumulating over certain portions of the earth where we want to raise those plants that are most calculated for our use. By multiplying these instruments, which are provided at no expence (since iron-rods of the thickness of one's finger, and even less, are sufficient for the purpose), we multiply their beneficial effects, and extend their use *ad infinitum*.

"This apparatus having been raised with care in the midst of a garden, the happiest effects were perceived,

240 Vegetation most vigorous near thunder-rods.

viz. different plants, herbs, and fruits, in greater forwardness than usual, more multiplied, and of better quality. At the same time, it was observable, that, during the night, the points *P* and *q*, as well as the upper extremities, were often garnished with beautiful luminous sparks. These facts are analogous to an observation which I have often made, *viz.* that plants grow best and are most vigorous near thunder-rods, where their situation favours their developement. They like-

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likewise serve to explain why vegetation is so vigorous in lofty forests, and where the trees raise their heads far from the surface of the earth, so that they seek, as it were, the electric fluid at a far greater height than plants less elevated: while the sharp extremities of their leaves, boughs, and branches, serve as so many points granted them by the munificent hand of nature, to draw down from the atmosphere that electric fluid, which is so powerful an agent in forwarding vegetation, and in promoting the different functions of plants.

"This electro-vegetometer may be set up not only in a kitchen-garden, but in an orchard, in a field of corn, olive-yard, &c. &c. Everywhere the same effects are produced, namely, fecundity in the soil, quickness of vegetation, increase of produce, superiority in the quality, &c. This machine is applicable to all kinds of vegetable productions, to all places, and all seasons; and if I am to believe the most enlightened and intelligent of my friends, the electro-vegetometer is one of the most noble and useful discoveries that have been made in the present century.

241 The electricity of the air may be thus determined by a large electrometer.

"Besides the advantages of the electro-vegetometer, of which we have been speaking above, there is still another very important one, namely, that by applying to it a large electrometer or grand conductor, fig. 85. we may thus find out the electricity of the atmosphere. For this purpose we must take away the points *H R* (fig. 82. and *r*. fig. 83.) which are seen in *R r*. This machine will likewise serve the purpose of a thunder-rod, if one takes care to thrust into the earth, to the depth of about 10 or 15 feet, a leaden tube, whose upper extremity may rise a few inches above the surface of the ground; and into this tube you are to pass the long iron chain or perpendicular rod set apart for destroying the insulation, and whose upper end is to be hooked to a chain in *H*, fig. 82. or in *k*, fig. 83. These two chains are very strong, and are fit for serving as an excellent conductor. Or if you choose, you may substitute in their room wefts of white thread, or iron-wires, which will make no difference in the effects of the apparatus. In the figures we have preferred chains, that the distinction of the different parts may be the more sensibly perceived. With these additions the electro-vegetometer will be as good a thunder-rod as any that are ordinarily constructed.

242 How to augment the powers of vegetation by artifical electricity.

"It is not only by means of the electricity in the atmosphere, collected by the above apparatus, that one can supply the electric fluid, which is so necessary to vegetation; but the electricity named *artificial* answers the same purpose. However astonishing the idea may be, or however impossible it may appear to realize it, yet nothing will be found more easy upon trial. Let us suppose that one wants to augment the vegetation of trees in a garden, orchard, &c. without having recourse to the apparatus destined to pump down as it were the electricity from the atmosphere, it is sufficient to have a large insulating stool. This may be made in two ways; either by pouring a sufficient quantity of pitch and melted wax upon the above stool, whose borders being more raised than its middle, will form a kind of frame; or more simply, the stool (which is likewise called the *insulator*) shall only be composed of a plate longer than broad, supported by four glass-pillars, like those used for electrical machines. One must take care to place above the insulator a wooden tray full of water, and to cause mount upon the stool a man carrying a small pump in the form of a syringe. If you establish a communication between the man and an electrical machine put in motion (which is easily done by means of a chain that connects with the conductor of the machine), then the man thus insulated (as well as every thing upon the stool) will be able, by pushing forward the sucker, to water the trees, by pouring upon them an electrical shower; and thus diffusing over all the vegetables under its influence a principle of fecundity that exerts itself in an extraordinary manner upon the whole vegetable economy: and this method has moreover this advantage, that at all times and in all places it may be practised and applied to all plants whatever.

"Every one knows that the electricity is communicated to the water thus employed; and it would be easy to obtain the most ample conviction (if any one doubted it), by receiving upon his face or hand this electrical shower; he immediately feels small punctures or strokes, which are the effects of the sparks that issue from each drop of water. This is perceived most sensibly if there is presented a metal-dish to this electrical dew; for at the very instant of contact, brilliant flashes are produced.

"That the electricity received by the man from the chain may be communicated to the tray, we must put a small cake of white-iron, upon the end of which he may place his foot. The tray filled with water is a kind of magazine or reservoir to serve as a continual supply to the pump. After watering one tree, you transport the stool to a second, a third, and so on successively; which is done in a short time, and requires very little trouble.

"Instead of the chain, it is better to employ a cord or twist of pinchbeck or any other metal; by means of which there can be no loss of the electric matter, as there is in the case of the chain by the ring-points. Moreover, this metal cord or thread being capable of being untwisted and lengthened, there will be no occasion of transporting so often the electrical machine. It is almost needless to add, that this string or metallic cord, which is always insulated, may rest upon the same kind of supports with those which have been exhibited in *O P* and *s* of fig. 82. and 83. This method is simple, efficacious, and nowise expensive, and cannot be too much employed.

243 Easy method of applying electricity in this manner.

"If one wants to water either a parterre or common garden beds and platforms of flowers, or any other plots in which are sown grain or plants of different ages and kinds, no method is more easy and expeditious than the following: Upon a small carriage with two wheels there is placed a framed insulator in form of a cake of pitch and rosin, as we have mentioned before in fig. 82. The carriage is drawn the whole length of the garden by a man or horse fixed to it. In proportion as you draw the carriage, the metallic cord winds itself upon a bobbin, which turns as usual. This last is insulated, either because the little apparatus that sustains the bobbin is planted in a mass of rosin (when you choose the axle to be of iron), or else because this

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this moveable axis is a tube of solid glass. There must also be a support, which serves to prevent the gold-thread or the metallic-cord from trailing on the ground, and thus dissipating the electricity; and, moreover, it serves as an insulator. To accomplish this last purpose, it is necessary that the ring into which it passes be of glass. One may likewise employ the insulators and supports marked *O P* and *s*, in fig. 82. and 83. If a gardener, mounted upon an insulator, holds in one hand a pump full of water, and with the other takes hold of a metallic-cord, in order to transmit the electricity which comes from the conductor; in this case, the water being electrified, you will have an electrical shower; which falling on the whole surface of the plants which you want to electrify, will render the vegetation more vigorous and more abundant. A second gardener is to give additional pumps full of water to him who is upon the insulator, when he shall have emptied those he holds; and thus in a little time you will be able to electrify the whole garden. This method takes hardly longer time than the ordinary one; and although it should be a little longer, the great advantages resulting from it will abundantly recompence the small additional trouble.

" By repeating this operation several days successively, either upon seed sown or plants in a state of growth, you will very soon reap the greatest advantages from it. This operation, equally easy with the preceding described upon the subject of watering trees, has been put in practice with the greatest success. Several other methods, answering the same purpose, might be devised; but they are all of them pretty similar to that just described.

244 To electrify water kept in reservoirs, &c.

" I cannot finish this article without mentioning another method relative to the present object, although it be much less efficacious than the preceding ones. It consists in communicating to water kept in basons, reservoirs, &c. (for the purpose of watering), the electric fluid, by means of a good electrical machine. To this end, one must plaster over with a bituminous cement all the interior surface of the bason destined to receive the water that serves for irrigation: the nature of this cement answering the purpose of insulation, will prevent the electric fluid that communicates with the water from being dissipated; and the water thus charged with electricity will be the more fitted for vegetation.

" The method just now laid down of electrifying water for the purpose of watering trees is both easy and cheap; the expence of the cement being inconsiderable, as it requires but once to be done, and as it prevents the water from filtrating and being lost, as well as from hurting the walls themselves, which would otherwise have occasion to be oftener repaired; consequently you are sufficiently indemnified by its utility for all the trouble you take. A machine applied to the extremity of the axle of the electric apparatus might communicate to it a rotatory movement, and still further diminish the expence of the operation.

245 Vegetables injured by the electric shock.

" If the deficiency of the electric fluid, or rather a small quantity of it, is apt to be hurtful to vegetables, a too great abundance of this matter will likewise sometimes produce pernicious effects. The experiments made by Messrs Nairns, Banks, and other learned men of the Royal Society of London, prove sufficiently this truth. An electric battery, very strong, was discharged upon a branch of balsam still holding by its trunk. Some minutes after, there was observed a remarkable alteration in the branch, of which the less woody parts immediately withered, drooped towards the ground, died next day, and in a short time entirely dried up; at the same time that another branch of the same plant that had not been put under the electric chain, was not in the smallest degree affected.

"This experiment repeated upon other plants showed the same effects; and it was remarked that the attraction, occasioned by a strong discharge of the electricity, produced an alteration different according to the different nature of the plants. Those which are less woody, more herbaceous, more aqueous, experience in proportion impressions that are stronger and much more speedy in their operation.

" A branch of each of the following plants, composing an electrical chain, it was observed by these able philosophers, that the balsam was affected by the discharge of the battery in a few moments after, and perished next day. The leaves of a marvel of Peru did not drop till the day following that; and the same phenomenon happened to a geranium. Several days elapsed before there was observed any fatal effect on the cardinal flower. The branch of a laurel did not show any symptoms till after the lapse of about 15 days, after which it died; but it was a full month before they perceived any sensible change on the myrtle; at the same time they constantly observed that the bodies of those plants and branches which had formed no part of the chain, continued to be fresh, vigorous, and covered with leaves in good condition.

"It hardly ever happens that the superabundance of the electric fluid existing in a small portion of the atmosphere where a plant is situated, can be so great as that which took place by the explosion of the strong battery of Mr Nairne, directed particularly upon one branch; or if this should happen, it can only be upon a few individual plants in very small number; as when lightning falls upon a tree, breaks it, strips it of its bark, or withers its leaves; or in the case of blasting or mildew in corn, which several farmers ascribe to the force of lightning. " This sentiment (says M. du Hamel) has acquired much probability since the discovery of the great effects of that electricity which is diffused so abundantly in the atmosphere when the weather is disposed to be stormy." (*Elemens d'Agric.* Tom. I. p. 346.)

246 Blasting or mildew supposed to be owing to lightning.

"It is not proposed here to prescribe the means of remedying the pernicious effects which may be produced upon this occasion; as there are none of them in circumstances exactly similar to that of the experiments of the philosopher just now quoted. But although this enormous excess of the electric fluid of which we have been speaking, never takes place through any great extent of space, nevertheless this excess, though even but inconsiderable, may be too great in several respects regarding the vegetable economy; and it is in this case that it is proper to seek the means of remedying it.

" Let us suppose that one has some plants or shrubs, or

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or some valuable trees or exotics that he wants to preserve, and is sensible that too great a quantity of electricity predominant in the atmosphere becomes hurtful to them, there are two methods that may serve to obviate the evil of which he is apprehensive. One is, to water plentifully these vegetables, so that their whole surface may be kept sufficiently wet; the consequence of which is, that the electricity prevailing in the atmosphere will be transmitted to the earth by the water adhering to the outside of the plants, as it is well known that water is an excellent conductor of the electric fluid: The other is, to place near these trees metallic points, which may be easily accomplished by simple lathes or wooden-poles; along which one must fasten by bandages plain iron wires, so as to overtop them by some inches. These poles thus prepared, being thrust into the earth, will then draw down the electric fluid, and transmit it to the earth."

247 Methods of destroying insects by electricity.

Our author now proceeds to consider of methods of destroying the insects which frequently infest and destroy vegetables; which, he thinks, may be obtained by means of the electric fluid.

"Experience (says he) proves, that in years when vegetation is most vigorous and abundant, insects, if nothing opposes them, will then be most multiplied; and in fact they are sometimes so to an astonishing degree. How great mischief they produce on these occasions, every body knows, and as ardently desires to find a remedy for the calamity. The damage is indeed so considerable, that people imagine it is not possible by any means to put a stop to it; but I am of opinion, it is one of those evils to which electricity may be applied with effect.

248 Mischief done by caterpillars getting into the heart of twigs.

"It has been often remarked, that, several species of worms or caterpillars are found in the heart of shoots, twigs, and even the trunks of trees, of shrubs, and of plants of different sorts. There are numbers, for example, in pear and other fruit trees. As soon as the animal has got to the inside of a branch, he forms a gallery according to the length of it: armed with strong scaly jaws, he soon reduces the woody substance to powder; and this same delicate caterpillar makes the wood, hard as it is, his favourite nourishment. Other insects generally show themselves in open day: but this one like a pioneer, marches always in obscurity within; and we are apprised of his presence only by the mischief he produces, namely, by observing the tops of branches to wither, the leaves to fade and incline to the earth, and in fine the whole infected bough to decay and die away. In vain do you seek for this frail through terrible animal on the leaves; he enters the skin and penetrates the thickest bark of the surface; he goes even to the heart of the woody substance; and you can extirpate him only by cutting off the wood; and if this be a remedy, you must confess that it is at least equal to the mischief.

"This evil so much the more merits attention, that it extends itself particularly over a very great number of fruit trees; in which, for the same reason, we are as particularly interested. Electricity, however, furnishes us with a remedy of the most efficacious sort to stop the progress of the evil, by attacking the enemy in his quarters, and destroying him in his own mine; which in this event is to become his tomb.

"The Leyden phial, by the mere force of its shock, which can be augmented gradually, is capable of destroying not only rabbits and pigeons, but bulls and oxen, especially when we employ electrical batteries of great size, and containing a great number of electrified jars. Of consequence then it may be employed even with little apparatus to kill a tender and delicate caterpillar, which, in order to shelter itself from the impressions of the air, is obliged to keep perpetually shut up in the heart of trees, or in that of twigs, branches, or trunks themselves.

249 Easily killed by an electric shock.

"In order to succeed in killing these animals at the time when they begin to show their ravages, which mark likewise the place where the caterpillar is concealed, it is sufficient to make an electric chain with two plain iron-wires, and to place betwixt the two that part of the tree where it is supposed the insect resides. One need not be afraid of taking in even a larger space, for the experiment will succeed as well in a great extent as in a small; and besides, one runs no risk of missing the enemy he wants to combat. Let us suppose, that one be assured from the forementioned symptoms, that there is an insect in the tree; in this case you place iron-wines above and below the place where you suspect it to be lodged. Next, you must take care to make the one communicate with the exterior surface of an ordinary jar charged with electricity, and the other with the interior surface, which it is easy to do by bending these iron-wires so as to make them approach the electrical jar; then upon discharging this vessel where the electric fluid superabounds, the explosion is made to traverse the part where the animal lodges: the violence of the shock makes him die without recovery, and so destroys the evil in its source. If the ravage has not been carried to a high pitch, the tree recovers very soon, as I have often observed: but whatever be the result as to the re-establishment in certain circumstances, the evil proceeds no further; its progress stops; and it is always a great advantage to have arrested it in its march.

"Several experiments have convinced me of the success of this method. Upon cutting off several branches on which I discharged my jar or Leyden bottle, I constantly observed the animal dead; and you never fail of killing it when the distance betwixt the two extremities of the iron-wires is not too great, and when you take care to approach or remove them successively by repeating the shock several times.

"The bottle here employed cannot hurt the vegetable economy, because its dimensions are not too great, and no batteries are brought in play. The electric shock, given in certain bounds, is useful to animals; it therefore cannot be noxious to plants in the same circumstances.

250 How to perform the operation on a great number of trees at once.

"This operation is not tedious even when employed upon a great number of trees; but if one wants still further to abridge it, I here give him a method by which the experiment can be made in the same instant upon all the trees of an orchard, and will not be more tedious than if it were employed upon one tree only. You have only to provide a sufficient number of iron-wires, and to dispose them as was done for the first tree we spoke of just now, and in the same manner; by which means all these trees form an electrical

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trical chain, and the fluid in the explosion of the bottle will run over through the whole, supposing that you have discharged the bottle in the ordinary way, and at the same time taken care of what is very essential, that while the free extremity of the first wire touches the exterior surface of the electrical jar, the end of the other may communicate with the inside of the same charged phial.

251 How to destroy a caterpillar in the root of a tree.

"If the caterpillar be in the root, the operation is pretty much the same. By taking away, for an instant, a little earth, you easily put the affected roots within the chain: but if one is ignorant of the particular ramification of the root which is attacked, without uncovering the tree, you need only insert in the earth two wires opposite in their directions, and then perform the Leyden experiment, which is easily done. After having placed these two wires north and south, you may repeat the experiment by placing them east and west. You can hardly then miss the insect, especially if, in order to take in more space, you insert one of the wires farther than the other: for in this case the electric fluid will describe a diagonal, as we have already shown in regard to branches.

252 To prevent these animals from generating in plants.

"This method serves not only to prevent the progress of the evil, but in some sense to anticipate it. In regard to these destructive insects there are epochs as for plants; both of them have marked times for their birth, their developement, their growth, their multiplication, and that relative both to their genera and species. When the time is come that insects, caterpillars, and other animals attack plants, one must employ, by way of precaution, the method we have just now laid down; and by repeating the same from day to day for a certain space of time, we will at last succeed in preserving trees from the ravages of insects. The operation is neither tedious nor expensive; why then not have recourse to it for those curious and rare trees which come from afar at a great expence, and those valuable other trees that yield us yearly the most delicious fruits?

253 Advantages to be expected from this method.

"The method just mentioned is the most effectual that can be imagined, since it pursues the enemy to his most concealed corners in the inmost texture of the wood, and is capable of killing him in the very heart of trees, under the bark when he is to be found there, in the branches, and in the heart of the roots themselves: all which we have made appear in the foregoing remarks. I may further add, that there is no other remedy known but by electricity; for how is it possible to find out under the bark of a tree one or more insects that gnaw and destroy it? Must we not in this case strip them entirely of their bark? and would not, therefore, the remedy be often worse than the disease? Besides, by what means could we penetrate into the heart of the tree? Would not the instrument employed to cut and lop it, rather add to the mischief, especially in the beging of its progress? How again could we rummage to the inside of the roots? The tree thus uncovered, would it not suffer, especially in the great heats, when a perspiration more abundant must render necessary a nourishment, whose quantity ought at all times to be equal at least to the waste? Thus the celebrated Linnæus, struck with the calamities which fruit-trees in particular suffer from insects and their catepillars, cried out: "Who shall deliver us from this scourge?" *Quis possit liberare arbores fructiferas a larvis?*"

On this subject we cannot help observing, that there is some reason to suppose that the Abbe has over-rated the power of his remedy with regard to the destruction of insects. There is not the least doubt that an insect will be destroyed by sending a shock of electricity through its body; but while this insect is defended by the vegetable which it has pierced, and in which it lodges, the vegetable will also receive a very considerable part; and thus the insect may still escape, unless the shock be augmented to such a degree as to injure the vegetable also. His other experiments, it is said, have been confirmed by the observations of modern electricians.

Sect. XII. *Effects of Electricity on Animals; of the Gymnotus, Torpedo, and other Electric Fishes; Medical Electricity.*

Soon after the discovery of the electrical shock, and the method of augmenting the power of electricity, it naturally became an object with philosophers to investigate the effects of it upon animal bodies. These were quickly found to be entirely similar to such as are produced upon any other conducting substances, viz. an emission of sparks, attraction and repulsion, &c. By degrees it was found, that very strong signs of electricity were exhibited by some animals, even without the application of any artificial apparatus. 254 Some animals naturally electrified.

The experiment of producing sparks by stroking the back of a cat in frosty weather, readily showed that the electric fluid may exist in a very active state in the body of animal without injuring any of its functions. From animals of the inferior kind a transition was made to the human species; and signs of electricity were discovered in them where it it had not been suspected before. Some people have been remarkable for an extreme lustre of their eyes: and others have been so much electrified naturally, as to give evident signs of it when a sensible electrometer had been applied to them. Others have manifested an extreme sensibility of even the smallest degrees of electricity, insomuch that they would be affected by a flash of lightning, though so remote that the thunder could not be heard. All this showed that the subtile fluid we treat of bears a very active part in the animal economy, and led to more important researches on the subject. One of the first discoveries was, that some creatures are so strongly electrified naturally as to have it in their power to give a strong shock at pleasure, capable of destroying any small animal that comes near them. Of these, however, only three, and those of the aquatic kind, have yet been observed, viz. the gymnotus electricus, the torpedo, and another called the *silurus electricus*.

The gymnotus* hath the astonishing property of giving the electric shock to any person or number of persons, either by the immediate touch with the hand, or by the mediation of any metallic conductor; and a person who kept some of them told Dr Garden, that they had this property much stronger when first catched than afterwards.

* See the article *Gymnotus*.

Effects on Animals.

255 Electrical properties of the gymnotus.

wards. "The person (says he) who is to receive the shock, must take the fish with both hands, at some considerable distance asunder, so as to form the communication, otherwise he will not receive it, at least I never saw any one shocked from taking hold of it with one hand only; though some have assured me, that they were shocked by laying one hand on it. I myself have taken hold of the largest with one hand often without ever receiving a shock; but I never touched it with both hands, at a little distance asunder, without feeling a smart shock. I have often remarked, that when it is taken hold of with one hand, and the other is put into the water over its body without touching it, the person received a smart shock; and I have observed the same effect follow when a number joined hands, the person at one extremity of the circle taking hold of or touching the fish, and the person at the other extremity putting his hand into the water over the body of the fish. The shock was communicated through the whole circle as smartly as if both the extreme persons had touched the fish. In this it seems to differ widely from the torpedo, or else we are much misinformed of the manner in which the benumbing effect of that fish is communicated. The shock which the gymnotus gives seems to be wholly electrical; and all the phenomena or properties of it exactly resemble those of the electric *aura* of our atmosphere when collected, as far as they are discoverable from the several trials made on this fish. This stroke is communicated by the same conductors, and intercepted by the interposition of the same origi-nal electrics, or electrics *per se* as they used to be called. The keeper of this fish informs me, that he catched them in Surinam river, a great way up, beyond where the salt-water reaches; and that they are a fresh-water fish only. He says, that they are eaten, and by some people esteemed a great delicacy. They live on fish, worms, or any animal-food if it is cut small so that they can swallow it. When small fishes are thrown into the water, they first give them a shock, which kills or so stupifies them, that they can swallow them easily and without any trouble. If one of these small fishes, after it is shocked, and to all appearance dead, be taken out of the vessel where the electrical fish is, and put into fresh water, it will soon revive again. If a larger fish than they can swallow be thrown into the water, at a time that they are hungry, they give him some smart shocks till he is apparently dead, and then they try to swallow or suck him in; but, after several attempts, finding he is too large, they quit him. Upon the most careful inspection of such fish, I could never see any mark of teeth, or the least wound or scratch on them. When the electrical fish are hungry, they are pretty keen after their food; but they are soon satisfied, not being able to contain much at one time. An electrical fish of three feet and upwards in length cannot swallow a small fish above three or at most three inches and a half long. I am told, that some of these have been seen in Surinam river upwards of 12 feet long, whose stroke or shock proved instant death to any person that unluckily received it."

256 Some very large ones found in Surinam river.

Several other accounts of this fish have been published by different persons, but none of them so full and distinct as the above. They all agree that the electric virtue of the fish is very strong. Mr Fermin, in his natural history of Surinam, published in 1765, tells us, that one cannot touch it with the hands, or even with a stick, without feeling a horrible numbness in the arms up to the shoulders; and he farther relates, that, making 14 persons grasp each other by the hands, while he grasped the hand of the last with one of his, and with the other touched the eel with a stick, the whole number felt so violent a shock, that he could not prevail on them to repeat the experiment. V. Vanderlott, in two letters from Rio Essequebo, dated in 1761, makes two species, the black and the reddish; though he acknowledges, that, excepting the difference of colour and degree of strength, they are not materially different. In most experiments with these animals, he remarked a surprising resemblance between them and an electrical apparatus: nay, he observed, that the shock could be given to the finger of a person held at some distance from the bubble of air formed by the fish when he comes to the surface of the water to breathe; and he concluded, that at such times the electrical matter was discharged from his lungs. He mentions another characterizing circumstance, which is, that though metals in general were conductors of its electric property, yet some were found to be sensibly better than others for that purpose. Of this property Dr Priestley takes notice, and says, that a gold ring is preferable to any thing else. The same is likewise observed by Linnæus. Dr Priestley adds, that the sensation is strongest when the fish is in motion, and is transmitted to a great distance; so that if persons in a ship happen to dip their fingers or feet in the sea, when the fish is swimming at the distance of 15 feet from them, they are affected by it. He also tells us, that the gymnotus itself, notwithstanding all its electric powers, is killed by the lobster.

257 Remarkable difference of the conducting power of metals with regard to this shock.

258 Of the torpedo.

The surprising property of the torpedo * in giving a violent shock to the person who takes it in his hands, or who treads upon it, was long an object of wonder. For some time it was in general reckoned to be entirely fabulous; but at last the matter of fact being ascertained beyond a doubt, philosophers endeavoured to find out the cause. M. Reaumur resolved it into the action of a vast number of minute muscles, which by their accumulated force gave a sudden and violent stroke to the person who touched it. But solutions of this kind were quite unsatisfactory, because the stroke was found to be communicated through water, iron, wood, &c. When the phenomena of electricity began to be better known, it was then suspected that the shock of the torpedo was occasioned by a certain action of the electric fluid; but as not the least spark of fire, or noise, could ever be perceived, this too seemed insufficient. Of late, however, Mr Walsh has with indefatigable pains, not only explained this surprising phenomenon on the known principles of electricity, but given a demonstration of his being in the right, by constructing an artificial torpedo, by which a shock resembling that of the natural one, can be given.

* For its natural history, see *Raja*, of which the torpedo is a species.

259 Artificial one made by Mr Walsh.

The electric organs of the torpedo consist of two sets of very small cylinders lying under the skin, one of which is electrified positively and the other nega-

 tively,

tively, seemingly at the pleasure of the fish. When a communication is made between the set of cylinders positively electrified and those which are negatively so, a discharge and shock ensue, like what happens in the case of the Leyden phial. The only difficulty now is to account for the total absence of a spark (which in the case of the torpedo never exists even in the smallest degree), and the impossibility of conducting the shock through the smallest interval of air. But this also is explained in a satisfactory manner by Mr Walsh, and shown to be nothing else than what every day takes place in our electrical experiments. It is well known, that a small charge of electricity, if put into a little phial, will occasion a bright spark and loud noise when discharged: but if the same charge is put into a phial much larger, the spark and noise will be less in proportion; neither will the spark break through near such a space of air in the latter case as in the former; though the shock would in both cases be the same to a person who received it through his body. If, instead of a large phial, we suppose the charge to be diffused all over a large battery, the shock would still be the same, and yet the spark and noise attending it would be almost imperceptible. The case is just the same with the torpedo. Each of the electric organs is a battery composed of innumerable small cylinders, which discharging themselves all at once produce a formidable shock; but by reason of the smallness of the charge of each, the spark is imperceptible, and cannot break through the least space of air. The truth of this was exemplified in Mr Walsh's artificial torpedo, which though it would give a very considerable shock through a conductor totally uninterrupted, yet on the least breach therein, even for the breadth of a hair, no shock was felt.

230 Why no spark is discovered in the shock given by the torpedo.

In every other respect the electricity of the torpedo agrees with that exhibited by the common electrical machines. An insulated person cannot receive a shock by touching one of the electric organs of the fish: but a violent stroke is given to the person, whether insulated or not, who lays one hand on the positive and the other on the negative organ. The fish, as is reasonable to imagine, seems to have this electric property in its own power; and appears sensible of his giving the shock, which is accompanied by a kind of winking of his eyes.

261 Of the silurus electricus.

The third fish which is known to have the power of giving the shock, is found in the rivers of Africa, but we have a very imperfect account of its properties (o). This animal belongs to the order called in Willoughby's system *silurus*; hence it is commonly called *silurus electricus*. Some of those fishes have been seen even above 20 inches long. The body of the silurus electricus is oblong, smooth, and without scales; being rather large, and flattened towards its anterior part. The eyes are of a middle size, and are covered by the skin which envelopes the whole head. Each jaw is armed with a great number of small teeth. About the mouth it has six filamentous appendices, viz. four from the under lip and two from the upper; the two external ones, or farthermost from the mouth on the under lip, are the longest. The colour of the body is greyish, and towards the tail it has some blackish spots. The electric organ seems to be towards the tail, where the skin is thicker than on the rest of the body; and a whitish fibrous substance, which is probably the electric organ, has been distinguished under it. It is said that the silurus electricus has the property of giving a shock or benumbing sensation like the torpedo, and that this shock is communicated through substances that are conductors of electricity; but no other particular about it is known with any considerable degree of certainty.

An inquisitive mind will immediately ask, for what purpose has nature furnished those animals with so singular a property? But the present knowledge of the subject seems to furnish no other answer, except that they are endowed with the power of giving the shock for the sake of securing their prey, by which they must subsist, and perhaps of repelling larger animals which might otherwise annoy them.

The ancients considered the shocks given by the torpedo as capable of curing various disorders; and a modern philosopher will hardly hesitate to believe their assertions, after that electricity has been found to be a remedy for many diseases.

262 Other electric animals.

Besides these animals which manifest their electric power evidently by giving a strong shock, there are others in which the fluid seems to act by the emission of light. This indeed has not been proved by actual experiment, tho' it would certainly be well worth while to try whether by insulating a number of them, any more evident signs of electricity could be obtained. These creatures are of the insect tribe; some of them furnished with wings, as the shining flies in the warm countries; while others, as the glow-worm, crawl perpetually on the earth. It is most probable also, that the sparkling of sea-water is owing to the electricity of the insects which occasion it. Be this as it will, however, from the instances already adduced, it is certain that the electric fluid pervades at all times the whole body of every animal; whence, by exciting or diminishing its action, it is reasonable to suppose that many important changes might be made in the human body, and hence the foundation of *Medical Electricity*.

263 Medical electricity.

Though the effects of this fluid as a remedy for diseases fall particularly to be mentioned under the article Medicine, we cannot help here taking notice, that a very strange uncertainty remains concerning what we should imagine to be its first and most obvious effects; namely, whether simple electrification has any effect in quickening and augmenting the pulse? This was said to be the case by the first electricians, but denied by their successors; and even when the great machine at Haarlem is made use of, it still remains doubtful whether there be any effect of this kind or not.

264 Appartus for applying it for the purposes of medicine.

The shock of the Leyden phial having been found effectual in removing some complaints, the use of it was introduced into the common practice of medicine; and is still continued, though a more gentle method of using the fluid is now generally preferred. The apparatus for the medical electrician, besides the machine already described, consists of the following parts. 1. An insu-

(o) Messrs Adanson and Forskal make a short mention of it, and M. Broussonet describes it under the French name of *le Trembleur* in the Hist. de l'Academie Royale des Sciences for the year 1782.

Medical Electricity.

insulating stool with glass feet, or, what is much better, an arm chair, well rounded at the edges of the wooden parts, and fixed on a large stool with glass feet, which should be at least nine or ten inches in length; for the longer the feet are, the better will the insulation be. The inside part of the back of the chair should move on an hinge, that it may occasionally be let down to the stool, and so the back of the patient be electrified more conveniently; the arms of the chair should be made longer than ordinary. 2. A Leyden bottle with a discharging electrometer. 3. A pair of directors of considerable size, with glass handles and wooden points. 4. A large metallic ball of brass or copper, with a metallic handle to receive the sparks. The ball should be unscrewed, and the wire long and sharp pointed to receive the stream of electric fire. 5. A few glass tubes of different bores, some of them with capillary points. 6. Several yards of brass wire or chain; or, which is much better, several lengths of wires with loops at the end; the part of the wire between these being covered with some non-conducting substance, as a silk ribbon, &c.

Plate CLXXV.

The directors are represented by fig. 29. the handles being of glass, one of them having a ball on its end represented by *A*; the other is without the ball, having its wire bent for the conveniency of conducting the electric stream on the eye, &c. Either of the balls may be unscrewed from the wires, and the wooden point *B* screwed in its place, or the pointed end of the brass wire used. The glass handles should be held as far from the brass work as possible. To convey the electric fluid to the ear or throat, glass tubes with sliding brass wires through them should be made use of, such as are represented in fig. 30.

Fig. 31, 32. represent the electric forceps, which is thought by some electricians to be more convenient for giving the shock than the directors. Fig. 33. is the medical jar, with an electrometer, that regulates the strength of the shock, and enables the operator to give a succession of them of nearly equal force. On the upper part of a bent piece of glass *C* is cemented a brass socket *D*, which is fastened to a spring-tube *E*; a wire *F* moves in this tube, so that the ball *G* may be set at any required distance from the ball *H*. The end *I* of the bent piece of glass is also cemented to a spring tube, which slides upon the wire *K*, communicating with the inside of the jar.

265
How to give a shock to a particular part of the body

To use this medical jar, the ball *H* must be placed in contact with the conductor of the electrical machine, or at least be connected with it by a wire; after which it is to be charged in the usual manner. If a wire proceeds from the ball *L* to the outside coating, the jar will be immediately discharged, as the accumulation of the electric fluid is sufficiently powerful to pass through the space of air between the two balls; hence a shock may be communicated to the arm by means of the wires and directors as in the figure, and it will be stronger in proportion as the distance of the ball *G* from *H* is augmented. This electrometer acts in the manner of the common discharging rod, and therefore has received the name of the *discharging electrometer*.

Plate CLXXIII.

In fig. 4. we have a representation of Mr Lane's electrometer applied to the machine for medical electricity. *G*, the lower part of which is inclosed in the pillar *F*, is made of wood baked and boiled in linseed-oil, and bored cylindrically for two-thirds of its length. The brass work is fixed to the pillar by the screw *H*, and is moveable in the groove *I*, so that it may be raised higher or lower as the height of the jar *D* requires. A steel screw *L* passes through the brass work, having its threads about $\frac{1}{17}$th of an inch distant from one another. To the end of this, and opposite to *K*, is fixed a hemispherical and well polished piece of brass; and a brass ball *M*, likewise well polished, is fixed to the prime conductor. To this screw is annexed a circular plate *O*, divided into 12 equal parts; and in every revolution of this screw pointing to the divisions of the scale *N*, each of which are equal to one turn of the screw. The use of this electrometer is to discharge the jar *D*, or any battery connected with the prime conductor, when the machine is not applied to medical purposes. If a person holds a wire fastened to the screw *H* in one hand, and another wire (fixed to *E* by a loop of brass) passing from the frame of the machine to a tin-plate on which the jar *D* stands, or the hook *E* connected with it, he will perceive no shock when *K* and *M* are in contact; and the degree of explosion, as well as the quantity of electricity accumulated in the jar, will be regulated by the distance of *K* and *M* from each other.

The improved way of applying the discharging electrometer to the conductor, is found to be much more convenient and ready than any other; as it has also the advantage of being useful to a jar or battery of any size. See fig. 6. where *a A* represents the electrometer as applied to the conductor; *c d* the improved medical jar suspended at a small distance from it. A small glass tube *e f* is fixed in this jar, a part of the lower end of which is coated. Two wires pass through the brass ball *C* on the top of this tube; one of which is connected with the bottom of the jar, and the other goes only to the internal coating of the small tube. The wires are moveable at pleasure, and the jar is suspended from the conductor by a brass ring; and a chain or wire must be fixed to the hook *d* at the bottom. From a bare inspection of the figure, it appears that the arm will receive the shock by the discharge of the jar *a c d*: for, by turning the cylinder round, the jar soon becomes charged either with one or both wires in it; and directly as the charge becomes sufficiently strong to pass thro' the air, it will explode, and the fluid pass to the end of *b* next to it, going through the wire to the wrist, and from thence up to the other chain at the shoulder. By reversing the positions or the connections of the two wires, the progress of the shock will be reversed, *viz.* from the shoulder to the wrist. If the short wire alone be left in the jar *c d*, and the discharging ball of the electrometer *a b c* be placed from a quarter of an inch to a whole one from the conductor, a most delicate small shock may be given, and repeated any number of times at pleasure. This is called the *electrical vibrating shock*.

Plate CLXXV.

Fig. 31. *g* represents the bottle director. It is hollow, and coated like a common jar, acting as such, and in some cases is looked upon as convenient. With this, as with the common director, it is proper to press the ends against the part where the shock is to be applied.

Fig.

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Plate CLXXVI.

266 Pocket electrical apparatus.

Fig. 56. represents a small pocket electrical apparatus, which may sometimes be of use for medical purposes as well as others. It is packed up in a very small size, being only five inches long, two broad, and one deep. It is capable of a tolerable strong charge or accumulation of electricity, and will give a small shock to one, two, three, or a greater number of persons.

A is the Leyden phial or jar that holds the charge; *B* is the discharger to discharge the jar when required without electrifying the person that holds it; *C* is a silk ribbon prepared by a coating of varnish, so as to be excited, and communicate its electricity to the jar; *D* are two hair, &c. skin rubbers, which are to be placed on the first and middle fingers of the left hand, and serve to excite the ribbon *C*.

To charge the jar. Place the two finger-caps *D* on the first and middle finger of the left hand; hold the jar *A* at the same time at the joining of the red and black *E* on the outside between the thumb and first finger of the same hand; then take the ribbon in your right hand, and steadily and gently draw it upwards between the two rubbers *D*, on the two fingers, taking care at the same time the brass ball of the jar is kept nearly close to the ribbon while it is passing through the fingers. By repeating this operation 12 or 14 times the electrical fire will pass into the jar, which will become charged; and by placing the discharger *C* against it, as in the plate, you will see a sensible spark pass from the ball of the jar to that of the discharger. If the apparatus is dry and in good order, you will hear the crackling of the fire when the ribbon is passing through the fingers, and the jar will discharge at some distance.

To electrify a person. You must desire him to take the jar in one hand, and with the other touch the knob of it: or, if diversion is intended, desire the person to smell at the knob *A* of it, in expectation of smelling the scent of a rose or a pink: this last mode has occasioned it to be sometimes called the *magic smelling bottle*.

The following are the principal methods by which electricity may be applied to the human body with a medical view.

267 Various methods of applying electricity.

1. *By merely placing the patient in an insulated chair, and connecting him with the prime conductor*.—When the machine is in action, he will thus be filled with the electric fluid, which will be continually dissipated from the points and edges of his clothes: and though the effects of this are probably too slow to be rendered very advantageous, yet a sedentary person might perhaps derive some benefit from sitting in an insulated chair, having before him an insulated table, the chair to be connected with the ball of a large charged jar or battery; by which means a small quantity of the fluid will be continually passing through those innumerable capillary vessels, on the right state of which our health so much depends.

2. *By throwing the fluid upon, or extracting it from a patient, by means of a wooden point*.—This may be effected in a twofold manner: 1*st*, by insulating the patient, and connecting him either with the cushion or the positive prime conductor, the operator presenting the point. 2*d*, Let the patient stand upon the ground, and the wire of the director be connected either with the positive or negative parts of the machine. The sensation produced by the fluid when acting in this manner is mild and pleasing, resembling the soft breezes of a gentle wind; generating a gentle warmth, and promoting the secretion and dissipation of tumors, inflammations, &c.

3. *By the electric friction*.—Cover the part to be rubbed with woollen cloth or flannel. The patient may be seated in an insulated chair, and rubbed with the ball of a director that is in contact with the conductor; or he may be connected with the conductor, and rubbed with a brass ball which communicates with the ground. The friction thus produced is evidently more penetrating, more active, and more powerful, than that which is communicated by the flesh brush; and there is very little fear of being thought too sanguine. This, when used but for a few minutes, will be found more efficacious than the other after several hours application.—Electricity applies here with peculiar propriety to spasm, pleurisy, and some stages of the palsy; and in every case answers the end of blistering where the discharge is not wanted, being the most safe and powerful stimulant we know.

4. *By taking strong sparks from the patient*. Here, as in every other case, the operator may connect the ball of the director with the positive or negative conductor, or he may connect the patient with either of these and the ball with the ground. Now it is clear from what has been already laid down, that if the director be connected with the positive conductor, the fluid is thrown upon the patient, if with the cushion the fluid is extracted from him. Let the patient be insulated, and the action is in some measure reversed; if he is joined to the negative conductor or cushion he will receive a spark from a person standing on the floor; but if he communicates with the positive conductor, he will give the spark to the person on the ground.

5. *By causing a current of the electric fluid to pass from one part of the body, and thus confining and concentrating its operation without communicating the shock*. Place the patient in an insulated chair, and touch one part of the body with a director, joined to a positive conductor; then with a brass-ball communicating with the ground touch another part; and when the machine is in action the fluid will pass through the required part from the conductor to the ball; the force of the stream will be different according to the strength of the machine, &c. Or connect one director with the cushion and the other with the positive conductor, and apply these to the part through which the fluid is to pass, and when the machine is in action the electricity will pass from one ball to the other. It is not necessary to insulate the patient in this case.

6. *By the shock*. Which may be given to any part of the human body, by introducing that part of the body into the circuit which is made, between the outside and inside of the bottle. This is conveniently effected, by connecting one director by a piece of wire with the electrometer and the other with the outside of the bottle; then hold the directors by their glass-handles, and apply the balls of them to the extremity of the parts through which the shocks are to be passed. The force of the shock, as we have already observed, is augmented or diminished by increasing or lessening the distance

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between the two balls, which must be regulated by the operator to the strength and sensibility of the patient. Instead of the common bottle, we may have a small one with a glass tube proceeding from it, through which proceeds a wire and hook to hang it upon the machine, with a longer one from the outside coating, and which is to be carried by means of a director to the patient. When this is used as a common bottle, both wires are to be left there, and the shock is communicated by two directors, one connected with the bottom, the other with the top. The operator will often find himself embarrassed in giving small shocks, the fluid passing from the conductor to the ball of the electrometer, instead of going through the circuits he desires: when this happens, which may be known by the chattering noise of the spark, the resistance formed to the discharge is so great, that the fluid cannot force its way through the circuit: to remedy this, pass two metallic pins through the cloathing, so that they may be in contact with the skin, which will lessen the resistance and conduct the fluid.

7. *By a sensation between a shock and the spark, which does not communicate that disagreeable feeling attending the common shock.* This is effected by taking out the long wire from the small medical bottle, and leaving the shorter one which is connected with the tube in its place, the directors to be connected and used as before. The effect of this species of shock, if it may be called one, is to produce a great vibration in the muscular fibres, without inducing that pungent sensation which the shock effects. It is therefore applicable to some stages of palsy and rheumatism; it may also serve as an artificial means of excercise.

Fig. 31. 8. *By the bottle-director.* Insulate the patient, and place one of the balls in contact with him; by which means this director is charged. Now if a wire is conveyed from the bottom of this to the top of another director, the bottle-director will be discharged whenever the other ball *h* is brought in contact with the patient; so that by bringing it down with rapidity, any number of small shocks may be procured in a minute: or connect the insulated patient with the top or inside of a large charged jar, and then this apparatus used in the foregoing manner will discharge from the large jar at each spark its own contents, and by repetition discharge the whole jar: thus a number of shocks may be given without continually turning the machine or employing an assistant.

9. *By passing the whole fluid contained in the Leyden phial through a diseased part without giving the shock.* Connect a director, by means of a wire, with the ball of a Leyden jar; charge the jar either completely or partially, and then apply the ball or point of the conductor to the part intended to be electrified, and the fluid which was condensed in the phial will be thrown on the part in a dense slow stream, attended with a pungent sensation which produces a considerable degree of warmth. If a wire that communicates with the ground is placed opposite to the end of the director, the passage of the fluid will be rendered more rapid, and the sensation stronger. Or insulate the patient, connect him with the top of a jar, charge this, and then apply a metal wire or piece of wood to the part thro' which you mean to make the fluid pass. It is obvious, that in this case the circuit between the inside and the outside of the jar is not completed, therefore the shock will not be felt. The condensed fluid passes in a dense slow stream through the required part, while the outside acquires a sufficient quantity from substances near it to restore the equilibrium.

It is in all cases most advisable to begin with the more gentle operations, and proceed gradually to increase the force as the strength and constitution of the patient or the nature of the disorder requires. The stream from a wooden point, a wooden ball, or brass point, may be first used; sparks, if necessary, may then be taken, or small shocks given.

In rheumatic cases the electric friction is generally used. If the pains are local, small shocks may be given. To relieve the toothache, very small shocks may be passed through the tooth; or, cover the part affected with flannel, and rub it with a director communicating with the machine.

In inflammations and other disorders of the eyes, the fluid should be thrown from a wooden point: the sensation here produced is that of a gentle cooling wind; but, at the same time, it generates a genial warmth in the part affected.

In palsies, the electric friction and small shocks are administered. Streams of the fluid should always be made to pass through the affected part.

The only treatise we have yet had from the faculty on the subject of medical electricity is a pamphlet, intituled, Considerations on the Efficacy of Electricity in removing Female Obstructions, by Mr Birch; and if its merits were to be confined to this disease alone (in which it may be reckoned a specific), it would be intitled to the attention of practitioners; but we have reason to expect much more from it, since the prejudices of the faculty seem removed, and the practice is becoming more general every day.

Sect. XIII. *Of the Uses of the Electric Fluid in the System of Nature at large.*

These are so many and so various, that it may be said without much exaggeration, that whether we look to the heaven above or to the earth beneath, we can scarce perceive any thing that is not acted upon, and in a manner perfectly subjected to the operations of this wonderful fluid. If we attend to the common phenomena of our atmosphere, experiments show that electricity is connected with every one of them. If we evaporate water by means of heat, it appears from the experiments of M. Saussure, related n° 201. *et seq.* that a strong electricity is produced. If vapour is condensed into rain, a quantity of electricity is also produced; and if water is frozen into ice, if it descends in hail or snow, electricity appears to be equally concerned. When clouds emit their electricity in great quantities, they instantly dissolve in rain; which is more or less heavy according to the quantity of electricity discharged, as in thunder-storms; and when this quantity is excessive, a vast many discharges are frequently made before the rain can descend. Hence it is reasonable to conclude, that though heat may be the cause of the first rise of vapour, it is the electric fluid which unites it with the air in such a manner as to

268 Electricity concerned in the production of clouds, rain, hail, snow, &c.

be

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be perfectly dissolved and become transparent in it (p). This is confirmed by an observation related under the article Cloud; namely, that small clouds floating in the atmosphere will frequently be seen to attract one another, and so meet together; after which, if they have been of nearly an equal size, both will almost instantly vanish. Transparency itself, as we have seen in many instances through the course of this treatise, depends on the vibratory motion of the electric fluid; and when we are assured that it depends on this in several cases, we may conclude from analogy that it does so in all. In the case of vapour dissolved in the atmosphere, therefore, as long as this particular motion continues through it, the vapour remains dissolved and transparent; but when the electricity comes to be disposed to assume the other motion, of which it is exceedingly susceptible, *viz.* that of running in a stream from one place to another, the vibratory motion ceases, the vapour formerly dissolved loses its transparency, and appears in the form in which it was originally raised by heat, *viz.* that of an opaque smoke or mist. As this mist must always be electrified (for it is in the disposition of the fluid to fly to a distant place that electricity consists), the fluid then begins to exert its power of attraction, and the mist collects in bodies larger or smaller according to the quantity of motion with which the electric matter is affected: and thus we see how by means of this disposition of the fluid, cloudy weather, rain, or the most violent thunder-storms, may be produced.

269
It regulates the heat of the different climates.

On looking farther into the operations of nature, we find the electric fluid acting in a still higher capacity, and regulating the temperature of the different climates throughout the world. Under the article Chemistry, n° 99. it has been shown, that what is heat in summer becomes electric fluid in winter; and under the article Cold, it has been shown that cold as well as heat is a positive substance. In the present treatise it has been proved at length, that the electric fluid and the light of the sun are the same; the former being in truth no other than the solar light absorbed by the earth, entangled among its particles, becoming subject to new laws, and acting in many cases as if it were a distinct fluid. Hence it becomes a proper antagonist to the light itself: for as the latter is only the fluid of electricity moving in a vibratory manner, and what we call electricity is the same fluid either in a comparatively stagnant situation, or disposed to run with violence from one place to another; it is plain that the motion of the light must be opposed by the fluid tho' stagnant, and much more if it be moving in an opposite manner. But the action of light when augmented is heat: the power which opposes it therefore, *i. e.* the electric fluid moving in an opposite direction, as explained under Chemistry, n° 102. is *cold* itself; and hence the strong electric appearances in the atmosphere in cold countries, or in cold weather even in our own country. Hence also the electricity of the serene sky is weaker in summer than in winter; and combustion, which is a very strong vibratory action of the electric matter, produces no electricity, the one action being inconsistent with the other. The electric fluid therefore regulates the light and heat of the sun throughout the whole world, and is itself regulated by them; so that neither heat nor cold can ultimately predominate any where.

270
Acts in many various ways in the substance of the earth itself.

Descending from the atmosphere into the earth itself, we find the electric matter no less concerned there than in the atmosphere. It has been already observed, that is vibratory motion probably gives transparency to all bodies. Sometimes this motion is augmented to a great degree, as in the waters of the ocean, which become unusually clear before tempests and hurricanes. Its action in producing earthquakes is explained at large under the article Earthquake, as well as in setting fire to volcanoes under the article Volcano. Like other fluids, its action seems to gain a great increase of power when its runs for a considerable way along any conductor. This may be easily conceived from the consideration, that the substance along which it runs is every where pressed by a fluid of the same kind, which continually accelerates its motions, and at last gives them an intensity capable of acting as the most vehement fire. The fact has been long observed, and is confirmed by the experiments of Mr Wilson in the pantheon as well as by those of later electricians. In the former, the spark taken from a vast conductor of 155 feet in length, was so strong that it resembled the discharge of a large jar, or rather a small battery; and was so very pungent, that few who had tried it once would venture on a second experiment. The latest experiments were made with a number of tin conductors joined to each others ends: in which situation it was found that the spark taken from them was much stronger than when they were laid at each others sides, though the surface was in both cases exactly the same. Hence we see, that if by any means the electric fluid shall meet with an unusually good conductor for a considerable way through the earth, the extremity of that conducting part may be heated, set on fire, or violent explosions issue from it; and the same thing will take place in the atmosphere. Upon this principle then we may account for natural hot-baths; explosions suddenly issuing from the earth, by which people have sometimes been killed; clouds and whirlwinds charged with an enormous quantity of electricity, and far beyond what in the ordinary way they could contain, &c.

271
Almost all terrestrial phenomena to be ascribed to it.

Thus, to the action of the electric fluid we are in an especial manner to ascribe the temperature of the air throughout the whole globe; all the phenomena of rain, snow, hail, lightning, tempests, and in all probability the currents of air itself named *winds*. Certain it is at least, that every electrified substance has an atmosphere round it resembling a gentle blast of

(p) In this there appears some inaccuracy of expression: but as it is somewhat difficult to find terms at once sufficiently accurate and intelligible, we shall here observe, that by the word *heat* we mean the electric or universal fluid moving in a certain manner, *viz.* from a centre to the circumference; by *cold*, the same fluid pressing from a circumference to a centre; by the *electric fluid* simply, the same either comparatively stagnant, or moving in any other way than those just mentioned.

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of cool air; and it is also very remarkable, that the electric fluid itself cannot be blown away from any substance, even by the most violent blast of air we can imagine. An undoubted evidence of this is, that if you set up a small ball or pointed body upon the conductor of a strong machine, so that a stream of electric light may issue from it, it will not be in your power to turn this flame aside in the smallest degree by the most violent blast of a bellows. On the contrary, if any body is presented to it which has a tendency to attract, the flame will move across the blast of air directly contrary to it, or in the same direction with it, in the very same manner as if no such thing was present. As the electric fluid therefore acts independent of the air, and cannot have its motions controlled by it, it is highly probable that all the motions of the atmosphere, are controlled by this fluid alone: and indeed if we allow it to be the proper antagonist to the light of the sun itself, we must readily allow it also to be the regulator of every other power on this earth.

272
Is probably the cause of vegetation.

Its effects on vegetation have been treated of in the last section, though we cannot certainly say that it is the original cause of this process. It seems, however, to be the true cause of CRYSTALLIZATION; which, as remarked under that article, probably is only an incipient or imperfect vegetation. The most convincing proof of this is from the experiments of Mr Lichtenberg with a large electrophorus; in which the knob of an electrified phial being drawn over the surface of the electric plate, finely powdered rosin afterwards sifted upon the plate assumed the figure of stars and other beautiful ramifications, indicating not only an inclination to arrange itself in the same regular order with the crystals of salts, but to run out into branches like those of vegetables. These experiments have been repeated to great advantage by the Reverend Mr Bennet, according to whose method the figures represented in Plate CLXXIX were made. The apparatus used for making them consisted only of a common Leyden phial, and a plate of glass 15 inches square covered on one side with a varnish of gum-lac dissolved in spirit of wine (Q), and several times laid over. The other side is covered with tin-foil laid on with common paste. When it is to be used, the glass-plate is put upon a metallic stand with the tin-foiled side laid undermost; the phial is to be charged, and the knob drawn over the varnished side. Thus any kind of figure may be drawn or letters made as represented in the plate; and from every figure beautiful ramifications will proceed, longer or shorter according to the strength of the charge. On some occasions, however, the charge may be too strong, particularly where we wish to represent letters, so that the whole will be blended into one confused mass. The round figures are formed by placing metallic rings or plates upon the electrical plate; and then giving them a spark from the electrified bottle, or sending a shock through them. The figures may be rendered permanent by blowing off the loose chalk, and clapping on a piece of black-sized paper upon them; or if they are wanted of another colour, they may easily be obtained by means of lake, vermilion, rose-pink, or any of the ordinary colours ground very fine. The easiest way of applying them seems to be by a barber's puff-bellows.

273
Curious figures made by its means on a varnished plate of glass.

This tendency of the electrical fluid to produce ramifications in its passage through other substances, is likewise evident from the figure of the positive flashes described by Mr Nicholson, and represented Plate CLXXVIII. It may indeed be objected, that in both cases the fluid has to make its way thro' nonconducting substances, where it meets with a considerable resistance; so that the case cannot be applicable to vegetation, where a ready conductor is always found in the moisture with which the earth abounds. But if we consider that the earth, and every thing contained in it, is already saturated with electric mater, it must readily appear that no new quantity can be forced into it without meeting with a considerable resistance; and therefore it will branch out and divaricate in the very same manner when passing through the earth, that it does when artificially sent through the air, or made to diffuse itself on the surface of an electric substance. If in the earth it meets with such particles as serve to facilitate its passage, these will be arranged according to the direction of the fluid itself; and thus these particles being consolidated by other powers, or by electricity itself acting in a different manner, may be supposed to assume the figures of branched roots; while the continual accumulation of new matter augments them into bulk, and is what we call the *growth* of the plant, or its drawing nourishment from the ground. It is not indeed pretended that we can explain the manner in which plants grow; the utmost we can do is to attain some slight and general idea of the cause, and how by the action of that cause, directing itself according to the laws given it by the author of nature, the effects may be produced. This is sufficient to satisfy the curiosity natural to the human mind; a farther knowledge would not only be entirely useless, but in all probability is inconsistent with the limited state of our faculties at present. What is here said concerning vegetation, may be applied equally to the formation and growth of animal bodies; but this subject is still more obscure and difficult: it has been supposed by many, however, that the nervous fluid is the same with that of electricity; for which many probable reasons might be assigned, though the subtilty and invisibility of both must for ever prevent us from obtaining any direct proof on this subject.

274
Is the cause of magnetism, and probably of attraction of every kind.

When we consider the rest of the terrestrial phenomena, we find the same fluid concerned in every one of them, or rather acting as their only cause. There is not in nature a more surprising phenomenon than that of the magnet; and this, by repeated experiments, has been proved to depend on electricity. Magnetical needles have often been endowed with their virtue by means of artificial electricity, and iron has been known to receive it from lightning: whence we may reasonably conclude, that the power of the magnet at all times depends upon the secret operation of the electric fluid. By extending its power to the production of attractive and repulsive forces in all cases, and which from many na-

(Q) Two ounces of shell-lac powdered and mixed with six ounces of spirit of wine answers very well for this purpose. The glass must be warmed, and the varnish spread upon it with a camel's hair pencil. Care must be taken, however, not to lay it on too thick, otherwise the effect will not follow.

Uses in the System of Nature.

natural phenomena is extremely probable, we shall still give it a higher rank in the system of nature. We shall now find it guiding the planets in their courses through the heavens, giving stability and cohesion not only to terrestrial substances, but to the globe of earth itself, and to all other bodies in the universe.

275 Count Tressan's system of natural philosophy.

A system of natural philosophy on this principle was begun in the year 1747, and lately published by the Count de Treslan. In this the electric fluid is considered as the first principle of motion in the universe, and the immediate agent by which the system of nature is governed. According to him, the fixed stars themselves are no other than as many foci of action communicating electricity to their surrounding planets, which have electric atmospheres of different extents. He shows the operation of the fluid in all the different phenomena of earth, air, water, fire, &c. descending even to the most minute, as well as considering the most grand and sublime, exhibitions of nature. That the electric fluid is capable of imitating many of these phenomena, is certain; as for example, those of earthquakes, water-spouts, tides, &c. of which an account is given under their proper articles. By means of the same fluid also we may imitate the planetary motions; and for this several contrivances have been fallen upon: the principal are as follow.

276 Methods of imitating the planetary motions.

1. From the prime conductor of an electric machine suspend six concentric hoops of metal at different distances from one another, in such a manner as to represent in some measure the proportional distances of the planets. Under these, and at the distance of about half an inch, place a metallic plate, and upon this plate, within each of the hoops, a glass-bubble blown very thin and light. On electrifying the hoops, the bubbles will be immediately attracted by them, and will continue to move round the hoops as long as the electrification continues. If the electricity is very strong, the bubbles will frequently be driven off, run hither and thither on the plate, making a variety of surprising motions round their axis; after which they will return to the hoop, and circulate as before; and if the room is darkened, they will all appear beautifully illuminated with electric light.

2. Provide a ball of cork about three quarters of an inch in diameter, hollowed out in the internal part by cutting it in two hemispheres, scooping out the inside, and then joining them together with paste. Having attached this to a silk thread between three and four feet in length, suspend it in such a manner that it may just touch the knob of an electric jar, the outside of which communicates with the ground. On the first contact it will be repelled to a considerable distance, and after making several vibrations will remain stationary; but if a candle is placed at some distance behind it, so that the ball may be between it and the bottle, the ball will instantly begin to move, and will turn round the knob of the jar, moving in a kind of ellipsis as long as there is any electricity in the bottle. This experiment is very striking, tho' the motions are far from being regular; but it is remarkable that they always affect the elliptical rather than the circular form.

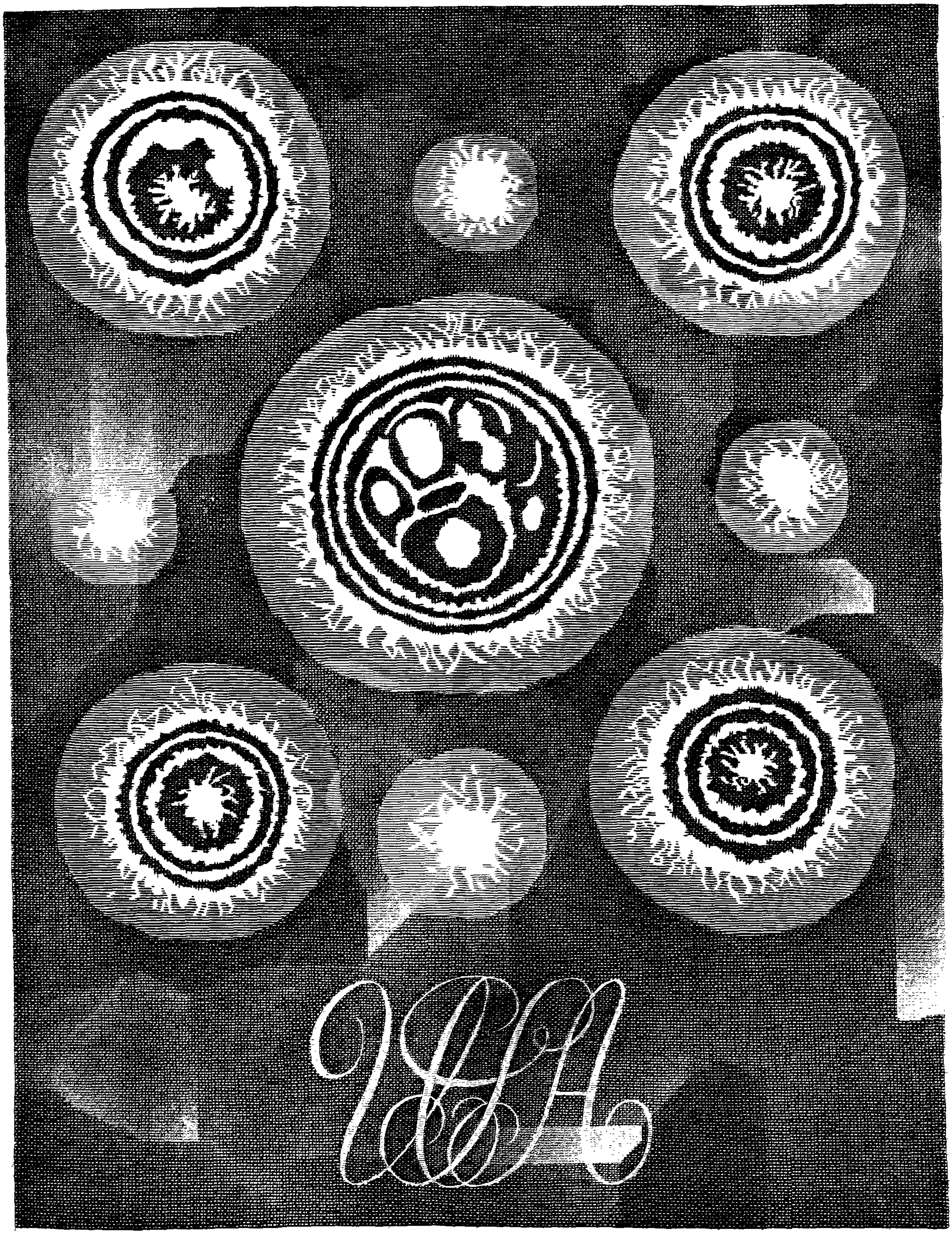
3. Cut a piece of India paper in the shape of an isosceles triangle, whose sides are about two inches long, and two-tenths of an inch in breadth; then erect a brass ball of two or three inches in diameter on a brass wire one-sixth of an inch in thickness, and two feet six inches long, on the prime conductor: electrify the conductor, and then bring the obtuse end of the piece of paper within the atmosphere of the ball: let it go, and it will revolve round the ball, turning often round its own axis at the same time.

277 Objections from an experiment of Mr Morgan's answered.

We shall not here enter into any speculations concerning the way in which it might be supposed possible to produce the planetary motions by means of the efflux of the sun's light, and the return of the electric fluid towards him. Before we can make excursions into these celestial spaces, it is absolutely necessary to remove an objection derived from Mr Morgan's experiment, that the electric fluid cannot pervade a perfect vacuum; and from which he concludes, that the electric fluid cannot pass beyond the limits of our atmosphere. On this experiment, however, we must observe, that though it were really proved in a much more decisive manner than is done by this experiment, that the fluid cannot be *artificially* driven through a vacuum, this would not prove that it cannot naturally pass through it, unless we should suppose the powers of nature and of art to be equal to one another. But that even the powers of art, in Mr Morgan's experiment, have not a fair chance of success, is evident from an inspection of fig. 80. Here he endeavours to force the electric fluid through a long course of perfect vacuum, and finds the power of his machine insufficient for the purpose. Yet one of Mr Morgan's own experiments might have led him to vary this one in such a manner as would perhaps have shown the possibility of transmitting the fluid through the most perfect vacuum that can be made. He informs us, that a spark, which in the open air cannot exceed one quarter of an inch diameter, will appear to fill the whole of an exhausted receiver four inches wide and eight inches long; tho' in the latter case it will be excessively faint in comparison with what it would have been in the atmosphere, yet, in order to prove that the faintness of the electric light *in vacuo* depends on the enlarged space through which it is diffused, we have only to introduce two pointed wires into the vacuum, so that the fluid may pass from the point of the one to the point of the other; and when the distance between them is not more than the tenth of an inch, in this case we shall find the spark as bright as in the open air.

The inference to be derived from this experiment is obvious. Had Mr Morgan, instead of attempting to cause the fluid pass through the whole length of the vacuum, put two wires in the inside at a small distance from each other, as described in the experiment just now mentioned, it is very probable that the fluid would have made its way through that small distance. It must be acknowledged, indeed, that considering the very great difficulty of making this experiment at any rate, we could scarce expect that this additional trouble could be taken: but without this, or something equivalent, his conclusion cannot by any means be allowed to be just; nor, even if it had been tried, would it have determined the question in his favour.

The great difficulty in this experiment is to give a reason why in a certain degree of exhaustion the vacuum should be so easily penetrated by the fluid, and in another should make such resistance: but the following considerations will probably throw some light on this



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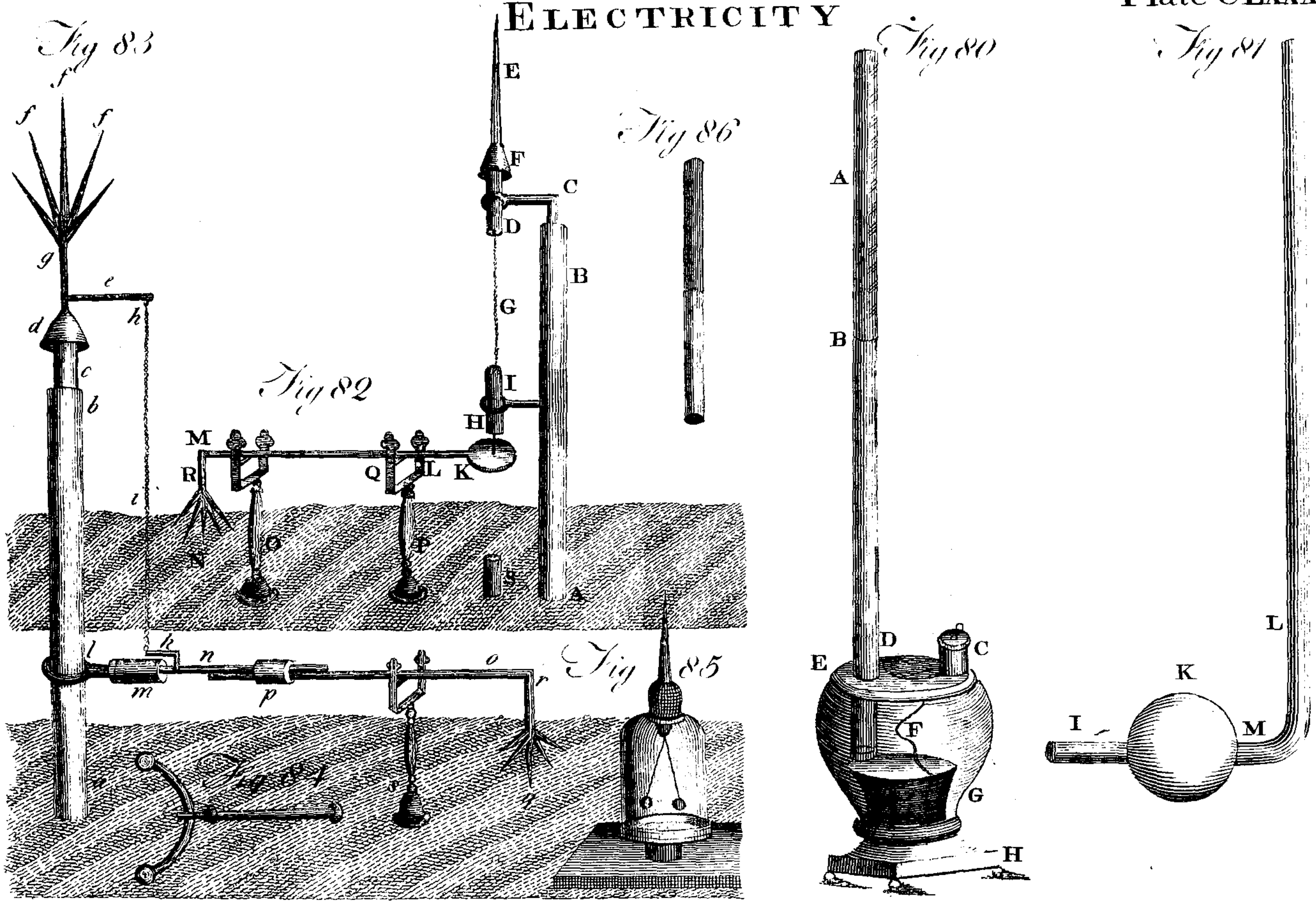

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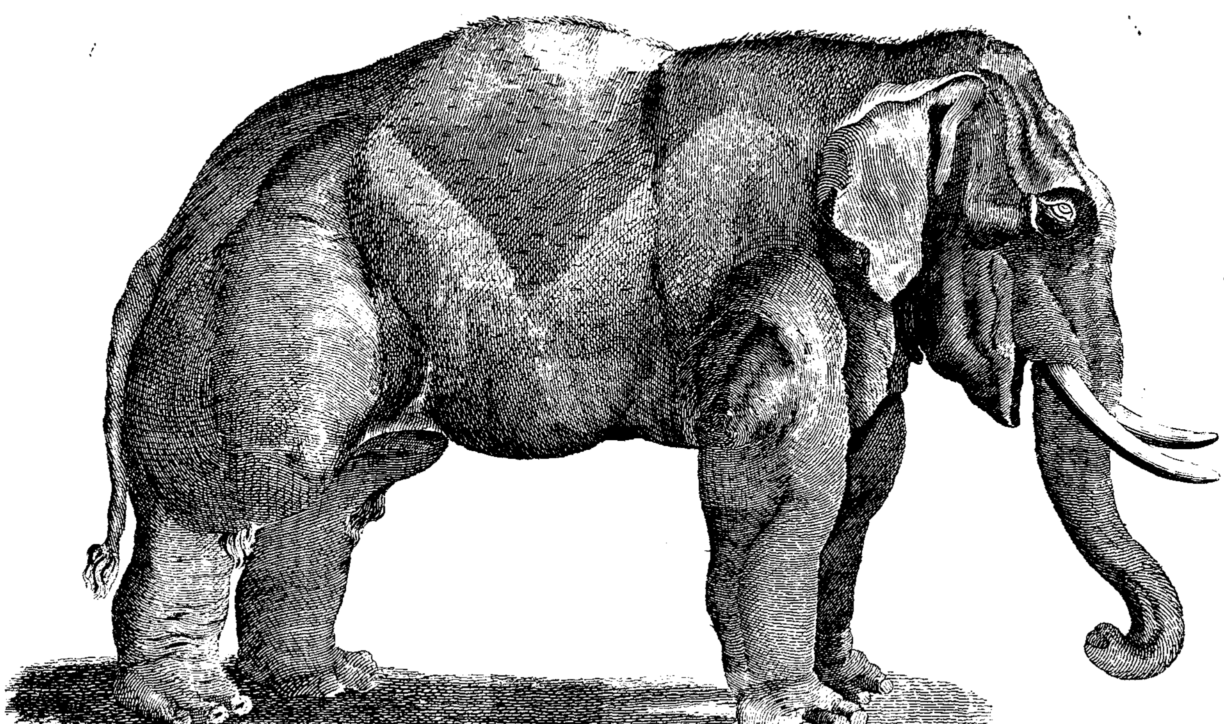

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Uses in the System of Nature.

this subject. 1. In all cases where the fluid is obliged to pervade the substance of any medium whatever, it moves with difficulty. Thus, if a vast quantity of electricity is sent through a small wire, the resistance it meets with is so great that the wire is dispersed with violence; and if the battery is large, it cannot be totally discharged, as was the case with Dr Van Marum's battery, mentioned, n° 150. Again, if the spark be taken in water, a most violent explosion takes place; and yet both metals and water are good conductors of electricity. 2. In all cases where we set the electric fluid in motion, the utmost we can do is to give it a tendency to circulate; and unless we allow it to do so, no electricity will be produced. Thus, if we extricate the fluid from the earth by means of an electrical machine, discharge it upon a conductor, and form a communication between that and another part of the earth, the circulation will go on very readily, and the fluid will easily return to the place from whence it came. If the communication betwixt the earth and conductor be cut off by an electric, the circulation will nevertheless go on; the fluid will evaporate in the air, and from thence reach the earth by channels invisible to us. The effect will be the same in all cases where its motion in a certain direction is stopped: but what we call *stopping* it, is only rendering its passage more difficult in one particular place than in another; for as to any absolute stop or impediment, such as could resist the whole force of the fluid, as Mr Morgan supposes, there is not the least probability that it exists in nature. The whole that can be inferred from Mr Morgan's experiment therefore is, that the electric fluid will more readily evaporate and pass silently thro' the air than through a complete vacuum. The question, however, still recurs: Since this fluid passes very readily thro' rarefied air, why does it hesitate after a certain degree of rarefaction, and at last stop altogether when the air is totally exhausted? To this it may be replied, that when air is heated it becomes less electric than when cold, and by an increase of heat becomes at last an excellent conductor. On the other hand, by an increase of cold its electric properties become proportionably greater, and consequently the difficulty with which the fluid gets thro' it increases in proportion. Under the article *Elastic Vapours*, it is shown that the true principle of elasticity is *heat*; and under the article Chemistry, n° 99. it is shown, that heat and electricity are convertible into one another. In proportion as the air is rarefied, therefore, it absorbs heat, and consequently becomes a better conductor; but when it is totally exhausted, nothing remains but the fluid of electricity itself; the same indeed with that of heat, but deprived of motion, and consequently capable of making a much greater resistance. Now the strongest spark that can be drawn from any of our machines, perhaps does not equal $\frac{1}{100}$th of an inch in diameter, as appears from the holes made by them in paper or cards when pierced, as directed in Sect. VIII. But when a perfect vacuum is made, this small spark is obliged to act upon a cylinder of electric matter perhaps 6000 or 7000 times greater in diameter than itself, each point of which resists with the whole force the explosion itself has; and what is worse, the whole of this must be put in motion before any discharge can be made. The resistance therefore is so violent, that the fluid rather passes through the air as already explained: nevertheless, if it were possible to make a perfect vacuum of no greater diameter than that of the electric spark, there is no reason to suppose that it would not be penetrated by it; and of this Mr Morgan's experiments with the two wires abovementioned seems to be a confirmation.

On the whole, it is evident, that we cannot from this, or indeed any other experiment, argue against the possibility of the passage of the electric fluid from any part of the creation to another. *We* cannot force it, it is true, because it is disposed by its own natural laws to resist our efforts; but where it is disposed by these laws to yield in one place, there will undoubtedly be a current of it thither from some other, which we would find ourselves equally unable to stop by all the machines that ever have been or will be invented. There is as yet therefore not the least proof that the electric fluid does not pervade the most distant regions of space, and there perform all those great operations which have been ascribed to unknown and inexplicable powers. For a further account of the operations of this fluid in producing the phenomena of nature, see the articles, Atmosphere, *Aurora Borealis*, Earthquake, Hail, Hurricane, Lightning, Meteor, Rain, Snow, &c.

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ELECTRIDES, anciently islands in the Adriatic sea, which received their name from the quantity of amber (*electrum*) which they produced. They were at the mouth of the Po, according to Apollonius of Rhodes, but some historians doubt of their existence.

ELECTROMETER. See ELECTRICITY, nº 27.

ELECTROPHORUS. *Ibid*. nº 16.

ELECTRUM, in natural history. See AMBER.

ELECTUARY, in pharmacy, a form of medicine composed of powders and other ingredients, incorporated with some conserve, honey, or syrup; to be divided into doses, like boluses, when taken.

Vossius observes, that all the remedies prescribed for the sick, as well as the confections taken by way of regale, were called by the Greeks εκλειγματα, and εκλεικτα, of the verb λειχω, "I lick;" whence, says he, was formed the Latin *electarium*, and afterwards *electuarium*. This conjecture he supports from the laws of Sicily, where it is ordained, that *electuaries*, syrups, and other remedies, be prepared after the legal manner. The Bollandists, who relate this etymology, seem to confirm it. For the composition and different sorts of electuaries, see PHARMACY.

ELEEMOSYNA *Carucarum*, or *pro Aratris*, or *Aratri*, in ancient customs, a penny which king Ethelred ordered to be paid for every plough in England towards the support of the poor. Sometimes it is also called *eleemosyna regis*, because first appointed by the king.

ELEEMOSYNARIUS, in old English writers, is used for the almoner or peculiar officer who received the eleemosynary rents and gifts, and distributed them to pious and charitable uſes. There was ſuch an officer in all religious houſes. The biſhops alſo uſed to have their almoners, as now the king has.

ELEGANCE, (from *eligo* "I chooſe,") denotes a manner of doing or ſaying things politely, agreeably, and with choice. With choice, ſo as to riſe above the common manners; politely, ſo as to ſtrike people of delicate taſte; and agreeably, ſo as to diffuſe a reliſh which gratifies every body.

ELEGANCE, in oratory and compoſition, an ornament of politeneſs and agreeableneſs ſhown in any diſcourſe, with ſuch a choice of rich and happy expreſſions, as to riſe politely above the common manners, ſo as to ſtrike people of a delicate taſte.

It is obſerved, that elegance, though irregular, is preferable to regularity without elegance: that is, by being ſo ſcrupulous of grammatical conſtruction, we loſe certain licences wherein the elegance of language conſiſts.

ELEGIAC, in ancient poetry, any thing belonging to elegy. See ELEGY.

ELEGIT, in law, a writ of execution, which lies for a perſon who has recovered debt or damages; or upon a recognizance in any court, againſt a defendant that is not able to ſatisfy the ſame in his goods.

ELEGY, a mournful and plaintive kind of poem. See the article POETRY.

ELEMENTS, in phyſics, the firſt principles of which all bodies in the ſyſtem of nature are compoſed.

Theſe are ſuppoſed to be few in number, unchangeable, and by their combinations to produce that extenſive variety of objects to be met with in the works of nature.

That there is in reality ſome foundation for this doctrine of elementary bodies is plain; for there are ſome principles evidently exempted from every change or decay, and which can be mixed or changed into different forms of matter. A perſon who ſurveys the works of nature in an inattentive manner, may perhaps form a contrary opinion, when he conſiders the numerous tribes of foſſils, plants, and animals, with the wonderful variety that appears among them in almoſt every inſtance. He may from thence be induced to conclude, that nature employs a vaſt variety of materials in producing ſuch prodigious diverſity. But let him inquire into the origin of this apparent diverſity, and he will find that theſe bodies which ſeem the moſt different from each other are at bottom nearly the ſame. Thus the blood, chyle, milk, urine, &c. as well as the various ſolid parts of animals, are all compoſed of one particular ſubſtance; graſs, for inſtance, by the aſſiſtance of air and water, and even ſometimes of very inſipid kinds of graſs. The ſame ſimplicity preſents itſelf in the original compoſition of the nouriſhment of vegetables, notwithſtanding the variety among them with reſpect to hardneſs, ſoftneſs, elaſticity, taſte, odour, and medical qualities. They chiefly depend, for theſe, upon water and the light of the ſun; and the ſame ſimplicity muſt take place in animals that are fed on vegetables. The analyſis of animal ſubſtances confirm this hypotheſis; for they can all be reduced into a few principles, which are the ſame in all, and only differ with regard to the proportions in which they are combined. With regard to animals, the caſe appears to be the ſame: and the more we are acquainted with them, the more reaſon we have to believe that the variety in their origin is very ſmall.

Notwithſtanding the infinite variety of natural productions, therefore, it appears, that the materials employed in their production are but few; that theſe are uniformly and certainly the ſame, totally exempted from any change or decay; and that the conſtant and gradual change of one body into another is produced by the various ſeparations and combinations of the original and elementary parts, which is plain from the regularity and uniformity of nature at all times. There is a change of forms and combinations through which it paſſes, and this has been the caſe from the earlieſt accounts of time; the productions of nature have always been of the ſame kind, and ſucceeded one another in the ſame order. If we examine an oak, for inſtance, we find it compoſed of the ſame matter with that of any other that has exiſted from the earlieſt ages. This regularity and uniformity in the courſe of nature ſhows that the elementary parts of bodies are permanent and unchangeable: for if theſe elementary particles which conſtituted an oak ſome thouſand years ago, had been undergoing any gradual decay, the oaks of the preſent times would have been found conſiderably different from thoſe that exiſted long ago; but as no difference has been obſerved, it would ſeem that the ultimate elements of bodies have always continued the ſame.

Reflections of this kind have ſuggeſted an idea of ſeveral principal elements of which all other bodies are compoſed, which by their various combinations furniſhed all the variety of natural bodies. Democritus, and other great philoſophers of antiquity, fixed the number to four, which have retained the name of elements ever ſince. Theſe are, fire, air, earth, and water; each of which they imagined was naturally diſpoſed to hold its own place in the univerſe. Thus, the earth, as heavieſt, naturally tended towards the centre, and occupied the lower parts; the water, as approaching next to it in gravity, was ſpread chiefly on the outſide of the earth; the air, being more ſubtile and rare, occupied the middle place; while the fire, being ſtill more ſubtile and active, receded to the greateſt diſtance of all, and was ſuppoſed to compoſe the planets and ſtars. This ſyſtem was extended to all the productions of nature. Meteors were produced from a combination of fire and air; animals were conſidered as compoſed of earth and water; and thoſe that were warm had likewiſe a proportion of the element of fire. Thus they went on, explaining ſome of the moſt ſtriking qualities of the ſeveral productions of nature from the different proportions of the four elements they contained.

But though this ſyſtem appears not at all deſtitute of beauty and propriety, and on this account has been in ſome meaſure received even to the preſent time, we find reaſon to doubt whether theſe four ſubſtances be really elementary bodies; nor do they anſwer our purpoſe in forming a ſyſtem, as we know too little of the intimate ſtructure and texture of them to enable us to explain other bodies by them.

Any other attempts that have been made to aſſign the number of elementary bodies have been much leſs fortunate. The chemiſts, with Paracelſus at their head, pretend to ſpeak of four elementary bodies, ſalt, ſulphur, earth, and mercury: but when we attempt to form an idea of what they mean, we find it very perplexed; and that the expreſſions concerning them are enveloped in ſo much obſcurity, that they cannot be comprehended; and the theory is built entirely upon experiments made on metallic ſubſtances.

Under the article Chemistry, n° 26. we have ſhown, that the elements, whatever they are, muſt neceſſarily be inviſible or imperceptible by any of our ſenſes. An inquiry into their number or properties therefore muſt be attended with very little ſucceſs; and all the knowledge we can have upon the ſubject muſt be drawn from a view of their combinations, and reaſoning analogically from the tranſmutations we obſerve to take place in nature. The modern diſcoveries in aerology have enabled us to proceed farther in this way than what it was poſſible for the ancient philoſophers to do. We now find that all the different kinds of air are compoſed of that inviſible and ſubtile fluid named *heat*, united in a certain way with ſome other ſubſtance: by which union the compound acquires the properties of gravitation, expanſion, rarefaction, &c. for pure heat, unleſs when united with ſome terreſtrial ſubſtance, neither gravitates nor expands. This is evident from the phenomena of the burning-glaſs, where the light concentrated in the focus will neither heat the air nor water, unleſs it meets with ſomething with which it can form a permanent union. Heat therefore is juſtly to be conſidered as one of the original elements; being always capable of uniting with bodies, and of being extricated from them unchanged; while the ſame bodies are by their union with it changed into various forms; water, for inſtance, into ice or vapour, both of which return into their original ſtate by the abſtraction or addition of heat in a certain degree. Hence it becomes almoſt natural to conclude, that there are only two elements in the univerſe: and this opinion we find adopted by ſeveral philoſophers, particularly the Count de Treſſan in his Eſſay on the Electric Fluid. According to this doctrine, two primitive material ſubſtances ſeem to exiſt in nature; one that inceſſantly acts, and to which it is eſſential to be in motion; the other abſolutely paſſive, and whoſe nature it is to be inert, and move entirely as directed by the former. Should this doctrine be adopted, little difficulty would occur in determining the active matter to be that univerſal fluid which in its various modifications of light, heat, and electricity, has ſuch a ſhare in the operations of nature. But in fixing on the paſſive element we are greatly embarraſſed; nor are the diſcoveries in aerology or any other ſcience as yet able to remove the difficulty entirely. In our experiments on this and ſome other parts of chemiſtry, we find three things that ſeem to be unchangeable, viz. earth; phlogiſton; and that inviſible, though terreſtrial and gravitating principle called by the antiphlogiſtians the *oxygenous* or acidifying principle, and by the phlogiſtians the baſis of dephlogiſticated air. In our experiments on the firſt, we find that earth, tho' vitrified by the moſt intenſe fire, may be recovered in its proper form; and ſome very pure earths, particularly magneſia alba, cannot be changed even in the focus of the moſt powerful mirror. In like manner we may diſſipate charcoal *in vacuo* by the ſolar rays, and the compound is inflammable air: we may decompoſe this compound by a metallic calx, and we have our charcoal again unchanged, for all metals contain charcoal in ſubſtance. Let us try to deſtroy it by common fire, and we have it then in the fixed air produced, from which it may be recovered unchanged by means of the electric ſpark. With the baſis of dephlogiſticated air the caſe is ſtill more difficult; for we cannot by any means procure a ſight of it by itſelf. We may combine it with heat, and we have dephlogiſticated air; to the compound we may add charcoal, and we have fixed air; by decompoſing the former by burning iron in it, we have the metal greatly increaſed in weight by ſome unknown ſubſtance; and if we attempt to ſeparate the latter, we have water, or ſome kind of vapour, which ſtill conceals it from our view.

In ſome experiments made by Mr Watt, and of which an account is given under the article Acid, n° 12. we find that nitrous acid might be phlogiſticated by the pureſt earth or metallic calx; whence it is not unreaſonable to ſuppoſe that phlogiſton may be only a certain modification of earth, and not an element diſtinct from it: but with regard to the baſis of dephlogiſticated air, no experiment has ever ſhown that it can either be procured by itſelf, or changed into any other ſubſtance; ſo that it appears to have the nature of an element as much as light or heat. Though we ſhould therefore be inclined to divide the whole matter of the univerſe into two claſſes, the one active and the other acted upon, we muſt allow that the paſſive matter even on this earth is not preciſely of the ſame kind: much leſs are we to extend our ſpeculations in this reſpect to the celeſtial regions; for who can determine whether the ſubſtance of the moon is the ſame with that of our earth, or that the elements of Jupiter are the ſame with thoſe of Saturn? There is even a difficulty with regard to the diviſion which ſeems ſo well eſtabliſhed, *viz.* of matter in general into active and paſſive; for no perſon can prove, that the matter which is active in one caſe may not be paſſive in another, and occaſionally reſume its activity. Something like this certainly happens in the caſe of the electric fluid, which is modified into heat or light, according to different circumſtances; and we cannot know but it is the very ſame ſubſtance that conſtitutes the moſt ſolid bodies. This opinion at leaſt did not ſeem abſurd to Sir Iſaac Newton, who propoſed it as a query, Whether groſs bodies and light were not convertible into one another? The end of our inquiries on this ſubject therefore muſt be, That the univerſe may be compoſed of many elements, or of one element; and of the nature of theſe elements, or of the ſingle one, we know nothing.

Element, in a figurative ſenſe, is uſed for the principles and foundations of any art or ſcience; as Euclid's Elements, &c.

Elements, in aſtronomy, are thoſe principles deduced from aſtronomical obſervations and calculations, and thoſe fundamental numbers which are employed in the conſtruction of tables of the planetary motions. Thus, the elements of the theory of the ſun, or rather of the earth, are his mean motion and eccentricity, and the motion of the aphelia. The elements of the theory of the moon are its mean motion; that of its node and apogee, its eccentricity, the inclination of its orbit to the plane of the ecliptic, &c.

ELEMI, or ELEMY, in the materia medica. See AMYRIS.

ELENCHUS, in antiquity, a kind of ear-rings set with large pearls.

ELENCHUS, in logic, by the Latins called *argumentum* and *inquisitio*, is a vicious or fallacious argument, which deceives under the appearance of a truth; the same with what is otherwise called *sophism*.

ELEPHANT, in zoology. See ELEPHAS.

American ELEPHANT: An animal only known in a fossile state, and that but partially, from the teeth, some of the jaw-bones, the thigh-bones, and vertebræ, found with many others five or six feet beneath the surface on the banks of the Ohio. But these bones differ in several respects from those of the elephant; for which, see *Fossil Bones*. As yet the living animal has evaded our search. Mr Pennant thinks it "more than probable, that it still exists in some of those remote parts of the vast new continent unpenetrated yet by Europeans. Providence maintains and continues every created species; and we have as much assurance that no race of animals will any more cease while the earth remains, than *seed-time and harvest, cold and heat, summer and winter, day or night*. See MAMMUTH.

ELEPHANT-*Beetle*. See SCARABÆUS.

Knights of the ELEPHANT, an order of knighthood in Denmark, conferred upon none but some persons of the first quality and merit. It is also called the *order of St Mary*. Its institution is said to have been owing to a gentleman among the Danish croises having killed an elephant, in an expedition against the Saracens, in 1184; in memory of which, king Canutus instituted this order, the badge of which is a towered elephant, with an image of the holy virgin encircled with rays, and hung on a watered sky-coloured ribbon, like the George in England.

ELEPHANTA, a small, but very remarkable island about five miles from the castle of Bombay in the East Indies. Of this we have the following description in Mr Grose's Voyage to the East Indies, "It can at most be but about three miles in compass, and consists of almost all hill: at the foot of which, as you land, you see, just above the shore, on your right, an elephant, coarsely cut out in stone, of the natural bigness, and at some little distance not impossible to be taken for a real elephant, from the stone being naturally of the colour of that beast. It stands on a platform of stones of the same colour. On the back of this elephant was placed, standing, another young one, appearing to have been all of the same stone, but has been long broken down. Of the meaning, or history of this image, there is no tradition old enough to give any account. Returning then to the foot of the hill, you ascend an easy slant, which about half way up the hill brings you to the opening or portal of a large cavern hewn out of a solid rock, into a magnificent temple: for such surely it may be termed, considering the immense workmanship of such an excavation; and seems to me a far more bold attempt than that of the pyramids of Egypt. There is a fair entrance into this subterraneous temple, which is an oblong square, in length about 80 or 90 feet, by 40 broad. The roof is nothing but the rock cut flat at top, and in which I could not discern any thing that did not show it to be all of one piece. It is about 10 feet high, and supported towards the middle, at equidistance from the sides and from one another, with two regular rows of pillars of a singular order. They are very massive short in proportion to their thickness, and their capital bears some resemblance to a round cushion pressed by the superincumbent mountain, with which they are also of one piece. At the further end of this temple are three gigantic figures; the face of one of them is at least five feet in length, and of a proportionable breadth. But these representations have no reference or connection, either to any known history or the mythology of the Gentoos. They had continued in a tolerable state of preservation and wholeness, considering the remoteness of their antiquity, until the arrival of the Portuguese, who made themselves masters of the place; and in the blind fury of their bigotry, not suffering any idols but their own, they must have even been at some pains to maim and deface them, as they now remain, considering the hardness of the stone. It is said they even brought field-pieces to the demolition of images, which so greatly deserved to be spared for the unequalled curiosity of them. Of this Queen Catherine of Portugal was, it seems, so sensible, that she could not conceive that any traveller would return from that side of India without visiting the wonders of this cavern; of which too the sight appeared to me to exceed all the descriptions I had heard of them. About two-thirds of the way up this temple, on each side, and fronting each other, are two doors or outlets into smaller grots or excavations, and freely open to the air. Near and about the door-way, on the right hand, are several mutilated images, single and in groupes. In one of the last, I remarked a kind of resemblance to the story of Solomon dividing the child, there standing a figure with a drawn sword, holding in one hand an infant with the head downwards, which it appears in act to cleave through the middle. The outlet of the other on the left hand is into an area of about 20 feet in length and 12 in breadth; at the upper end of which, as you turn to the right, presents itself a colonade covered at top, of 10 or 12 feet deep, and in length answering to the breadth of the area: this joins to an apartment of the most regular architecture, an oblong square, with a door in perfect symmetry; and the whole executed in quite a contrary taste and manner from any of the oldest or best Gentoo buildings any where extant. I took particular notice of some paintings round the cornices, not for any thing curious in the design, but for the beauty and freshness of the colouring, which must have lasted some thousands of years, on supposing it, as there is all reason to suppose it, cotemporary with the building itself. The floor of the apartment is generally full of water, its pavement or ground-work not permitting it to be drawn off or to be soaked up. For it is to be observed, that even the cavern itself is not visitable after the rains until the ground of it has had time to dry into a competent hardness."

ELEPHANTIASIS, called also the *lepra of the Arabians*, in medicine, a chronical disease, one of the two species of leprosy which affects the whole body, where even the bones as well as the skin are covered with spots and tumours, which being red at last turn black. See MEDICINE-*Index*.

ELEPHANTINE, or ELEPHANTIS (anc. geog.), an island in the Nile to the south of Syene; with a cognominal town, where the navigation on the Nile ends, because just below the less cataract. And here to the west of the Nile stood the last Roman garrison (Notitia Imperii).

Elephantine, in Roman antiquity, an appellation given to the books wherein were registered the transactions of the senate and magistrates of Rome, of the emperors or generals of armies, and even of the provincial magistrates; the births and classes of the people, and other things relating to the census.

They are supposed to have been so called, as being made of leaves of ivory or elephants tusks.

ELEPHANTOMACHI. See Ethiopia.

ELEPHANTOPUS, in botany: A genus of the polygamia segregatæ order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Compositæ*. The calyculus is quadriflorous, with hermaphrodite florets ligulated or plane; the receptacle is naked; the pappus bristly.

ELEPHAS, the Elephant, in zoology, a genus of quadrupeds belonging to the order of bruta. The characters are these: The elephant has no foreteeth in either jaw, and the dog-teeth are very long: the proboscis or trunk is long, and capable of laying hold of any thing; and the body is somewhat naked.

The elephant is the largest of all land animals. From the front to the origin of the tail he is generally about 16 feet long, from the end of the trunk 25 feet, and about 14 feet high. The circumference of the neck is 17 feet, and the circumference of the body at the grossest part 25 feet 10 inches; the tail is about 6 feet long, and $2\frac{1}{2}$ in circumference. The circumference of the legs is about 6 feet. These are the largest dimensions. But the animal differs in size in different countries; in some not exceeding 7 feet in height. The eyes are small in proportion to the size of the animal. The muzzle is very different from that of any other quadruped; it is nothing but the origin of a long trunk which hangs between the two large tusks; the mouth appears behind the trunk, which serves in place of an upper lip, and the under lip terminates in a point. The feet are short, round, clumsy, and only distinguishable by the toes. The trunk is, properly speaking, the nose extended, and terminated by a couple of nostrils. But, besides serving as an organ of smell, the trunk performs all the functions of a strong and dexterous arm. The trunk of an elephant is about 8 feet long, $5\frac{1}{2}$ feet in circumference near the mouth, and one foot and a half near the extremity: it is a pipe of an irregular conical figure, and widened at the end: the superior side of the trunk is convex, and furrowed transversely; and the inferior side is flat, and has two longitudinal rows of small protuberances resembling the tentacula of the silk-worm and most other caterpillars. The upper part of the trunk corresponds with the extremity of the nose in other quadrupeds, and answers the same intention; the inferior part serves as an upper lip, including the nostrils at the same time. For the trunk is a continued canal, divided into two cavities by a longitudinal partition: these cavities ascend along the forepart of the upper jaw, where they make a turn inward, and descend into the palate, and then terminate in two separate orifices; they have likewise each a separate orifice at the end of the trunk. At the place where these cavities make a turn, and before they enter into the bones of the head, there is a moveable cartilaginous plate situated in such a manner as enables the animal to shut the canal, and to prevent the water with which it occasionally fills the trunk from entering into the passage of the nose where the organs serving for the sensation of smell are placed. The elephant can move the trunk in all directions; he can extend or shorten it at pleasure, without altering the diameters of the two canals within. By this means respiration is not interrupted, whatever be the situation of the trunk; and the water is allowed to remain till the animal chooses to throw it out by an exspiration. Each canal is lined with a smooth strong membrane, and the surface of the trunk is covered with another strong membrane or skin. The substance contained between the exterior and interior membranes is a composition of longitudinal and transverse muscles, which serve to extend and contract the length of the trunk. At the extremity of the trunk there is a concave protuberance, in the bottom of which are the two passages of the nostrils. The inferior part of the protuberance is thicker than the sides, and the superior part is stretched out like a finger about five inches long; which, together with the edges of the whole extremity of the trunk, takes on different figures according to the necessities of the animal. It is by this organ that the animal lays hold of food or other substances; which he manages with as much dexterity as a man does his hand, taking up grains of corn, or the smallest piles of grass, and conveying them to his mouth. When he drinks, he thrusts his trunk into the water, and fills it by drawing in his breath and exhausting the air: when the trunk is thus filled with water, he can either throw it out to a great distance, or drink it by putting the end of the trunk in his mouth.

The two large tusks, which some call the *horns* of the elephant, are of a yellowish colour, and extremely hard. The bony substance of which they are composed is known by the name of Ivory, and much used in different branches of manufacture.

The ears are very large, and resemble those of an ape. The skin of the elephant has but few hairs on it, and placed at great distances from each other. It is full of wrinkles, like those on the palm of a man's hand, besides many chapped and greasy ridges. The female has two dugs, one on each side of the breast.

M. Buffon supposed the ancients to have been "deceived, when they tell us, that the elephants copulate like other quadrupeds, the female only lowering her crupper for the more easy reception of the male. The situation of the parts seems to render this mode of junction impossible. The female elephant has not like other quadrupeds the orifice of the vagina adjacent to the anus; for it is situated nearly in the middle of the belly, about two and a half or three feet distant from the anus. On the other hand, the male organ is by no means proportioned to the magnitude of his body, nor to so long an interval, which in the situation supposed would preclude the practicability of his approach. Naturalists as well as travellers agree in affirming, that the male organ of the elephant exceeds not either in length or diameter that of a horse. It is, therefore, impossible that he should attain his end in the ordinary position of quadrupeds. The female must necessarily lie on her back. De Feynes and Tavernier positively assert, and the situation of the parts confirms their evidence, that these animals cannot intermix in any other manner. They require, therefore, more time and conveniency for this operation than other quadrupeds: and it is perhaps for this reason that they never copulate but when they enjoy full liberty, and have every necessary article at their command. The female must not only consent, but solicit the male, by a position which she never assumes unless when she thinks herself in perfect retirement." The fact, however, has been controverted by others. Dr Sparrman informs us, that in order if possible to determine the question, he let slip no opportunity of interrogating on the subject every elephant-hunter he met with at the Cape; who all agreed in replying that they were most inclined to the common opinion, if they had not been differently informed by two of their companions, Jacob Kok and Marcus Potgieter, who had actually seen elephants copulate. "I met (says our author) only with the former of these hunters, who told me he had likewise himself been of opinion that the female was obliged to lie on her back on this occasion; till at length, being out along with Potgieter hunting of elephants, he had occasion to think otherwise. On a certain spot they came to, they could reckon about eight elephants, which, on account of the small size of their tusks, they took for females, excepting two large ones; which making several circles round one of these that they took for females (the only one perhaps in rut) frequently, in all probability by way of caressing her, struck her with their trunks, till at length she threw herself down upon her knees, and keeping the spine of her back in a stiff and extended position, brought her hind-feet quite close to her fore-feet, or somewhat beyond them; so that she almost as it were stood upon her head. In this forced posture they saw her wait a long while together for the caresses of the males, who, in fact, likewise endeavoured to perform the matrimonial rites, but from jealousy hindered each other whenever either of them began to mount. After two hours had thus elapsed, the patience of our hunters began to tire; and the rather, because on account of the uneven and stoney nature of the ground, which, however, had no wood upon it, and of a river being between them, they could not dare to advance and fire at these animals. I will not dissemble, that though I have not the least occasion to doubt the veracity of my informer, and though what he told me is by no means impossible, I yet find great difficulty in this matter. But on the other hand, the same may be said of M. Buffon's or the common opinion; first, as they have not been able to confirm it by the testimony of any eye-witness, nor even by any instance of this kind in other quadrupeds properly so called; that is, in such animals as have some degree of affinity with elephants; secondly, as the female lying on her back can hardly be more convenient for the male, especially as the vagina, according to what I am told, goes from the fore-part backwards; thirdly, it is besides well known, that the older elephants, on account of the unwieldiness of their bodies, chiefly stand when they sleep, in order to avoid the trouble and difficulty of lying down and getting up again. Tavernier, indeed, in his third volume, informs us, that the tame females when in rut make themselves a kind of bed, and lay themselves in it on their backs, at the same time inviting the male elephant by a peculiar cry, &c. but as the author did not see this himself, and that besides it is entirely contrary to the modesty and dislike to copulation for which the female elephants have always been remarked, I cannot do otherwise than leave M. Tavernier's relation and different opinions touching the subject to the test of future experience."

Mr J. C. Wolf, however, in his Voyage to Ceylon lately published, confirms the common opinion, and gives an account of the operation in question as if he had more than once seen it performed. "The male (he informs us) makes a pit or hollow in the ground, and assists his consort to lay herself on her back; and in case he finds her perfectly compliant and agreeable, very complaisantly helps her up again after the business is finished (for she cannot possibly rise of herself), by throwing his trunk round her neck: but if she at first stood shilly-shally, and gave herself prudish airs, he then even lets her lie, and goes about his business." But concerning the credit due to this author, the public seem not to be agreed. On the other hand, M. Buffon, in his Supplement, has retracted his former opinion, upon the authority of M. Bles (secretary during 12 years to the Dutch government in Ceylon); who describes the copulation of these animals in the same manner as Farmer Kok does in the extract above given from Dr Sparrman. "Having perceived (says M. Bles) that the Count de Buffon, in his excellent work, is deceived with regard to the copulation of the elephants, I know, that in several parts of Asia and Africa these animals, especially during the season of love remain almost in the most inaccessible places of the forests; but in the island of Ceylon, where I lived 12 years, the land being every where inhabited, they cannot so easily conceal themselves; and having often examined them, I perceived that the female organ is situated nearly under the middle of the belly, which would lead us to think, with M. Buffon, that the males cannot cover the females in the manner of other quadrupeds. However, there is only a slight difference of situation. When they inclined to copulate, I perceived that the female bowed down her head and neck, and leaned her two fore-legs, which were also bended, upon the root of a tree, as if she meant to prostrate herself on the ground; and the two hind legs remained erect, which gave the male an opportunity of embracing her as other quadrupeds do. I can likewse affirm, that the females go with young about nine months. Moreover, the elephants never copulate unless when in a state of freedom. In the season of love, the males are strongly chained for four or five weeks, during which time they discharge vast quantities of semen, and are so furious, that their cornacks or governors cannot come near them without danger. The approach of the rutting season is easily known; for some days before it happens, an oily liquor flows from a small hole on each side of the head. The domestic female on these occasions sometimes makes her escape, and joins the wild males in the woods. Some days afterward, her cornack goes in quest of her, and calls her by her name till she comes. She submits to him with complacence, and allows herself to be conducted home, and shut up in the stable. It was from cases of this kind that it was discovered that the females bring forth about the end of nine months."—The first remark, with regard to the mode of copulating, M. Buffon thinks unquestionable, since M. Marcel Bles assures us that he has seen the elephants perform the operation. But as to the time

time of gestation, which he limits to nine months, we ought to suspend our judgment, because all travellers affirm that the female elephant is believed to go with young no less than two years.

Elephants, even in a savage state, are peaceable and gentle creatures. They never use their weapons but in defence of themselves or companions. Their social dispositions are so strong, that they are seldom found alone, but march always in large troops: the oldest and most experienced lead the van; the younger, or lame ones, keep in the middle; and those of a second rate, as to age walk in the rear. The females carry their young on their tusks, embracing them at the same time with their trunk. They seldom march in this regular order but when they reckon the journey dangerous, such as an expedition to cultivated lands, where they expect to meet with resistance. On other occasions they are less cautious; some of them falling behind or separating from the rest, but seldom so far as to be without the reach of assistance by alarming and assembling their companions. It is dangerous to offer them the least injury; for they run straight upon the offender; and although the weight of their body be great, their steps are so large, that they easily outrun the swiftest man, whom they either pierce with their tusks, or seize with their trunk, dart him in the air like a stone, and then trample him under their feet. But they never attack any person unless when provoked. However, as they are extremely sensible and delicate with regard to injuries, it is always prudent to keep out of their way. Travellers who frequent these countries kindle large fires, and beat drums during the night, in order to prevent their approach. After being once attacked by men, or falling into any ambush, they are said never to forget the injury, but search for every opportunity of getting revenge. As they are endowed perhaps with a more exquisite sensation of smell than any other animal, owing to the great extent of their nose, they can scent a man at a very great distance, and trace him by his footsteps.

Elephants are peculiarly fond of the banks of rivers, deep valleys, and marshy grounds, especially when well shaded with trees. They delight in drawing up water into their trunks, even when they do not drink it, and amuse themselves in dashing the water around. They cannot endure cold, and are equally averse to an excess of heat: in order to avoid the scorching heat of the sun, they retire to the thickest and most shady parts of the forest. The bulk of their bodies is so enormous, that they do not choose to go into deep waters so frequently as some other quadrupeds; although the length of their trunk, which they raise strait up, and by which they respire, is a great advantage in swimming.

The ordinary food of elephants is roots, herbs, leaves, the tender branches of trees, fruits and grains: but they abhor flesh or fish. When any of them discovers a fine pasture, he immediately calls and invites his companions to come and eat with him. As they devour a large quantity of food in a short time, they are always shifting their pasture; when they meet with cultivated grounds, they make a prodigious desolation, and destroy more plants by their feet than they use for nourishment: which last is very considerable, amounting to 150 pounds of herbage every day: by this means, as they constantly graze in large troops, they lay waste whole fields in an hour. The Indians and negroes employ every art to prevent them from visiting their cultivated lands, making great noises, and burning large fires round their fields. However, these precautions are not always sufficient to prevent the elephants from visiting them. They chase away the domestic animals, put the men to flight, and sometimes even throw down their limber huts. Elephants are hardly susceptible of fear: the only things which can surprise them or stop their course are artificial fires, such as squibs, crackers, &c. the effects of which are so sudden and so quickly repeated, that the elephants frequently turn back; and when one runs, all the rest instantly follow his example.

Although the social disposition in the elephant be exceeding strong; yet whenever the females come in season, it immediately gives place to the stronger and more interesting passion of love. They observe the greatest delicacy in their amours, abhorring nothing so much as to be seen by their companions. The troop divide themselves into couples, steal off into the most secret places in the forest, and then give way to all the impulses of nature, which are lively and lasting in proportion to the long period of abstinence; for, according to all accounts, except that of M. Bles already noticed (A), the female goes with young two years, and it is only once in three years that the season of love returns. They bring forth but one at a time; which, as soon as it comes into the world, is as large as a wild boar, and is furnished with teeth: however, the large tusks do not make their appearance till some time after, and at the age of six months they are several inches long. Elephants of this age are as large as an ox when in a natural state.

The manner of taking and taming elephants, therefore, merits our attention. In forests and such places as are frequented by elephants, the Indians choose a spot and inclose it with strong pallisades, they use the largest trees as the principal stakes, to which are fixed smaller ones in a transverse direction. These cross trees are fixed so as to allow a man to pass easily through. There is likewise a large port left for the elephant, over which is suspended a strong barrier, which is let down as soon as he enters. In order to decoy him into the inclosure, the hunters take along with them a tame female in season, and travel about till they come so near as that the cry of the female can reach a male, whom they previously observe in the forest; then the guide of the female makes her give the cry peculiar to the season of love: the male instantly replies, and sets out in quest of her. The guide then makes the female proceed towards the artificial inclosure, repeating her cries from time to time as she goes along. She enters into

(A) Mr Bles's information is adopted by Mr Pennant: That they go only nine months with young, he says, is guessed by the casual escape of the tame females, when in rut, into the woods; where they couple with the wild; are soon discovered and brought back, and observed to bring forth in about nine months from that time.

 into the inclosure, the male follows her, and the Indians immediately shut the port behind him. He no sooner discovers the hunters, and that he is inclosed, than his passion for the sex is converted into rage and fury. The hunters entangle him with strong ropes; they fetter his legs and trunk; they bring two or three tame elephants in order to pacify and reconcile him to his condition. In a word they reduce him to obedience in a few days, by a proper application of torture and caresses. There are many other methods of catching elephants. Instead of making large inclosures with pallisades, like the kings of Siam, and other monarchs, the poor Indians content themselves with a very simple apparatus; they dig deep pits in the roads frequented by elephants, covering them over with branches of trees, turf, &c. When an elephant falls into one of these pits, he is unable to get out again.

The elephant, when tamed, is the most friendly and obedient of all animals: he is entirely attached to the person who feeds and takes care of him. In a short time he understands signs, and the sound of his master's voice. He distinguishes the language of passion, of command, of satisfaction; and acts accordingly. He receives his orders with attention, and executes them with prudence and alacrity, but without precipitation. He easily learns to bow his knees and lower his body, for the convenience of those who mount him. He caresses his friends with his trunk. He lifts burdens with his trunk, and assists those who are loading him in laying them on his back. He delights in shining harness and trappings. When yoked in a cart or waggon, he pulls equally and cheerfully, unless he be abused by injudicious chastisements. His guide is generally mounted on his neck, with a small rod of iron sharp at the point in his hand; he directs his motion by pricking him on the ears and head; but, for the most part, a word is sufficient.

A tame elephant will do more labour than six horses; but then he requires a proportional quantity of food. They are the principal beasts of burden in many parts of Africa and the East Indies. They carry sacks and bundles of all kind on their neck, back, and tusks. They never lose or damage any thing committed to their care: they will stand on the edge of a river, take bundles off their neck and tusks, lay them carefully in a boat wherever they are desired, and try with their trunk, whether they are properly situated: if they be loaded with casks, they go in quest of stones to prop them and prevent them from rolling.

The elephant is not only the most tractable, but the most intelligent of animals; sensible of benefits, resentful of injuries, and endowed even with a sense of glory.—In India, they were once employed in the launching of ships; one was directed to force a very large ship into the water; the work proved superior to his strength: his master, with a sarcastic tone, bid the keeper take away this lazy beast and bring another: the poor animal instantly repeated his efforts, fractured his skull, and died on the spot. In Delhi, an elephant passing along the streets, put his trunk into a taylor's shop, where several people were at work: one of them pricked the end of it with a needle: the beast passed on; but in the next dirty puddle filled his trunk with water, returned to the shop, and spurting every drop among the people who had offended him, spoilt their work.

Ludolph. com in hist. Æthiop. p. 147.

Ibid. An elephant in Adsmeer, which often passed thro' the bazar or market, as he went by a certain herb-woman, always received from her a mouthful of greens: at length he was seized with one of his periodical fits of rage, broke his fetters, and, running through the market, put the crowd to flight; among others, this woman, who in haste forgot a little child she had brought with her. The animal recollecting the spot where his benefactress was wont to sit, took up the infant gently in his trunk, and placed it in safety on a stall before a neighbouring house. Another, in his madness, killed his *cornac* or governor: the wife seeing the misfortune, took her two children and flung them before the elephant, saying, "Now you have destroyed their father, you may as well put an end to their lives and mine." It instantly stopped, relented, took the greatest of the children, placed it on its neck, adopted him for his *cornac*, and never afterwards would permit any body else to mount it.

A soldier at Pondicherry, who was accustomed, whenever he received the portion that came to his share, to carry a certain quantity of it to one of these animals, having one day drank rather too freely, and finding himself pursued by the guards, who were going to take him to prison, took refuge under the elephant's body and fell asleep. In vain did the guard try to force him from this asylum, as the elephant protected him with his trunk. The next morning the soldier, recovering from his drunken fit, shuddered with horror to find himself stretched under the belly of this huge animal. The elephant, which without doubt perceived the man's embarrassment, caressed him with his trunk, in order to inspire him with courage and make him understand that he might now depart in safety. *Buffon, p. 78.*

A painter was desirous of drawing the elephant which was kept in the menagerie at Versailles in an uncommon attitude, which was that of holding his trunk raised up in the air with his mouth open. The painter's boy, in order to keep the ainmal in this posture, threw fruit into his mouth; but as the lad frequently deceived him, and made an offer only of throwing him the fruit, he grew angry; and, as if he had known that the painter's intention of drawing him was the cause of the affront that was offered him, instead of revenging himself on the lad, he turned his resentment on the master, and taking up a quantity of water in his trunk, threw it on the paper on which the painter was drawing, and spoiled it. *Mem. pour servir a l'Hist. des Animaux, par Messieurs de l'Acad. des Sciences, Part III.*

At the Cape of Good Hope, it is customary to kill those animals, for the sake of their teeth, by the chase. Three horsemen, well mounted and armed with lances, attack the elephant alternately, each relieving the other as they see their companion pressed, till the beast is subdued. Three Dutchmen (brothers), who had made large fortunes by this business, determined to retire to Europe, and enjoy the fruits of their labours; but resolved, before they went, to have a last chase by way of amusement: they met with their game, and began the attack in the usual manner; but unfortunately one of their horses fell down and flung its rider: the enraged animal instantly seized the unhappy man with its trunk, flung him up to a vast height in the air, and received *Voyage de la Caille, p. 160.*

Elephas.

ceived him on one of its tusks; then turning towards the two other brethren, as if it were with an aspect of revenge and insult, held out to them the impaled wretch writhing on the bloody tooth.

From the earliest accounts in history, the eastern nations have employed elephats in war; Alexander the Great was the first European who ever mounted an elephant. He carried a number of them into Greece, which Pyrrhus employed some years after against the Romans at the battle of Tarentum. Both the Greeks and Romans soon learnt to get the better of those monstrous animals: they opened their ranks and allowed them to pass through; neither did they attempt to hurt them, but threw darts, &c. at their guides. Now that fire-arms are the principal instruments of war, elephants, who are terrified at the noise and flame, instead of being useful, would only tend to embarrass and confuse an army. However, in Cochin and other parts of Malabar, as also in Tonquin, Siam, and Pegu, where fire-arms are little understood, they are still used in battle. The guide sits astride upon the neck, and the combatants sit or stand upon the other parts of the body. They are also extremely serviceable in fording of rivers, and carrying over the baggage on their backs. After the keepers have loaded them with several hundred weight, they fasten ropes to them; of which the soldiers taking hold, either swim or are drawn across the river. In time of action, they now and then fix an heavy iron chain to the end of their trunks, which they whirl round with such agility, as to make it impossible for an enemy to approach them at that time. Another use they still have for this creature in war, is to force open the gates of a city or garrison which is closely besieged. This he does by setting his backside against them, riggling backwards and forwards with his whole weight, till he has burst the bars, and forced an entrance: to prevent which, most of the garrisons in this country have large spikes stuck in their gates, that project to a considerable distance. However, after all, those prodigious animals are kept more for show and grandeur than for use, and their keeping is attended with a very great expence, for they devour vast quantities of provision; and you must sometimes regale them with a plentiful repast of cinnamon, of which they are excessively fond. It is said to be no uncommon thing with a Nabob, if he has a mind to ruin a private gentleman, to make him a present of an elephant, which he is ever afterwards obliged to maintain at a greater expence than he can afford: by parting with it, he would certainly fall under the displeasure of the grandee, besides forfeiting all the honour which his countrymen think is conferred upon him by so respectable a present.

When the elephant is properly managed, he lives very long even in a state of slavery and labour. That some have lived in this state 130 years, is pretty well authenticated. In a natural state, they often exceed 200 years, and propagate their species till they are 120: It is 30 years before they come to their full growth.

The elephant inhabits India, and some of its greater islands, Cochin China, and some of the provinces of China. It abounds in the southern parts of Africa, from the river Senegal to the Cape; and from thence as high as Ethiopia on the other side. They are found in the greatest numbers in the interior parts, where there are vast forests, near the sides of rivers. The wild elephants of Ceylon live in troops or families distinct and separate from all others, and seem to avoid the strange herds with particular care. When a family removes from place to place, the largest-tusked males put themselves at the head; and if they meet with a large river, are the first to pass it. On arriving on the opposite bank, they try whether the landing-place is safe: in case it is, they give a signal of a note from the trunk, as if it were the sound of a trumpet, on which the remaining part of the old elephants swim over; the little elephants follow, holding one another by locking their trunks together; and the rest of the old ones bring up the rear. In the woods are often seen a solitary male elephant, wandering like an outlaw banished from the herd and all the race. These are as if in a state of desperation, and very dangerous. A single man will put to flight whole herds of social elephants: this alone fears not his presence, but will stand firm, putting his power to defiance. Elephants are not at present domesticated in Africa, but only in the more civilized parts of Asia. They are much more numerous in Africa. In some parts they swarm so, that the negroes are obliged to make their habitations under ground for fear of them. They are killed and eaten by the natives, and the trunk is said to be a delicious morsel. All the teeth are brought from Africa: they are frequently picked up in the woods; so that it is uncertain whether they are shed teeth, or those of dead animals. The African teeth which come from Mosambique are ten feet long; those of Malabar only three or four; the largest in Asia are those of Cochin China, which even exceed the size of the elephants of Mosambique. The skin is thick, and, when dressed, proof against a musket ball. The flesh, the gall, the skin, and the bones, are said to be used medicinally by the Chinese. See Plate CLXXX.

Elephas | Eleve.

ELEVATION, the same with ALTITUDE or height.

ELEVATION of the Host, in the church of Rome, that part of the mass where the priest raises the host above his head for the people to adore.

ELEVATOR, in anatomy, the name of several muscles, so called from their serving to raise the parts of the body to which they belong.

ELEVATORY, in surgery, an instrument for raising depressed or fractured parts of the skull, to be applied after the integuments and periosteum are removed. See SURGERY.

ELEVE, a term purely French, though of late used also in our language. Literally it signifies a disciple or scholar bred up under any one, being formed from the Italian *allievo*, an "apprentice" or "novice."

It was first used by the French writers in speaking of painters; such a painter was an eleve of Da Vinci, of Raphael, &c. From painting it came to be applied to such as studied or learned any other art under a master. In the Royal Academy of Sciences, there were 20 eleves: and in that of inscriptions, 10 eleves. The eleves are to act in concert with the pensionaries. See ACADEMY.

The denomination *eleve*, however, has been since suppressed, and that of *adjoint* substituted in its room; because every body did not know the sense affixed to it by the academy: and now the pensionary academists have not, as formerly, each of them an eleve; but the eleves are become adjoints, or associates of the academy.

ELEVENTH, or chord of the eleventh. See INTERVAL.

ELEUSINIA, in Grecian antiquity, a festival kept in honour of Ceres, every fourth year by some states, but by others every fifth. The Athenians celebrated it at Eleusis, a town of Attica; whence the name.

Ceres, says an Athenian orator (Isocrates), wandering in quest of her daughter Proserpine, came into Attica, where some good offices were done her, which it is unlawful for those who are not initiated to hear. In return she conferred two unparalleled benefits; to wit, the knowledge of agriculture, by which the human race is raised above the brute creation; and the mysteries, from which the partakers derive sweeter hopes than other men enjoy, both as to the present life and to eternity. It was the popular opinion, that the Eleusinian goddesses suggested prudent counsel to their votaries, and influenced their conduct; that these were respected in the infernal regions, and had precedence in the assemblies of the blessed; while the unhallowed were in utter darkness, wallowing in mire, or labouring to fill a leaky vessel. The Athenians were solicitous to secure these advantages to their children, by having them initiated as soon as was allowed.

Ceres was supposed to be particularly partial to Eleusis and its vicinity. *There* were the memorials of her presence and of her bounty; the well named *Callichorus*, by which she had rested, in the reign of Erectheus; the stone on which she sat, named *the sorrowful;* the Rharian plain, where barley was first sown; and the threshing-floor and altar of Triptolemus, a herdsman whom she instructed in the culture of that grain, the use of which succeeded to acorns. Her mysteries continued to possess a pre-eminence in holiness, and to be accounted as much superior to all other religious festivals as the gods were to the heroes. Even the garments worn at the solemnity were supposed to partake of their efficacy, and to be endued with signal virtues. It was usual to retain them until they were perishing; and then to dedicate them in the temple, or to reserve them for the purpose of enwrapping new-born children.

The mystic temple, as it was called, provided by Pericles for the solemnity, created such awe by its sanctity as could be equalled only by the effect of its beauty and magnitude, which excited astonishment in every beholder. The profane or uninitiated were forbidden to enter it on any pretence. Two young Acarnanians happened inadvertently to mix with the croud at the season of the mysteries, and to go in; but the question suggested by their ignorance presently betrayed them, and their intrusion was punished with death. The chief priest, hierophant, or mystagogue, was taken from the Eumolpidæ, a holy family flourishing at Athens, and descended from Eumolpus, a shepherd and favourite of Ceres. He was enjoined celibacy, and wore a stole or long garment, his hair, and a wreath of myrtle. The grand requisites in his character were strength and melody of voice, solemnity of deportment, magnificence, and great decorum. Under him, besides many of inferior station, was the daduchus or torch-bearer, who had likewise his hair, with a fillet; the priest, who officiated at the altar; and the hiero-ceryx or sacred herald; all very important personages. The latter was of a family which claimed the god Mercury and Aglauros the daughter of Cecrops for its ancestors.

The secrecy in which the mysteries were enveloped, served to enhance the idea of their consequence, and to increase the desire of participation. It was so particular, that no person was allowed even to name the hierophant by whom he had been initiated. Public abhorrence and detestation awaited the babbler, and the law directed he should die.

The Athenians suffered none to be initiated into these mysteries but such as were members of their city. This regulation, which compelled Hercules, Castor, and Pollux, to become citizens of Athens, was strictly observed in the first ages of the institution, but afterwards all persons, barbarians excepted, were freely initiated.

The festivals were divided into great and less mysteries. The less were instituted from the following circumstance. Hercules passed near Eleusis while the Athenians were celebrating the mysteries, and desired to be initiated. As this could not be done, because he was a stranger, and as Eumolpus was unwilling to displease him on account of his great power, and the services which he had done to the Athenians, another festival was instituted without violating the laws. It was called μικρα, and Hercules was solemnly admitted to the celebration and initiated. These less mysteries were observed at Agræ near the Ilissus. The greater were celebrated at Eleusis, from which place Ceres has been called *Eleusinia*. In later times the smaller festivals were preparatory to the greater, and no person could be initiated at Eleusis without a previous purification at Agræ. This purification they performed by keeping themselves pure, chaste, and unpolluted, during nine days; after which they came and offered sacrifices and prayers, wearing garlands of flowers, called ισμερα or ιμηρα, and having under their feet Διος κωδιον, *Jupiter's skin*, which was the skin of a victim offered to that god. The person who assisted was called υδρανος from υδωρ *water*, which was used at the purification, and they themselves were called μυσται, *the initiated*.

A year after the initiation at the less mysteries they sacrificed a sow to Ceres, and were admitted in the greater, and the secrets of the festivals were solemnly revealed to them, from which they were called εφοροι and εποπται, *inspectators*.

This festival was observed in the month Boedromion or September, and continued nine days from the 15th till the 23d. During that time it was unlawful to arrest any man or present any petition, on pain of forfeiting a thousand drachmas, or according to others on pain of death. It was also unlawful for those who were initiated to sit upon the cover of a well, to eat beans, mullets, or weazles. If any woman rode to Eleusis in a chariot, she was obliged by an edict of Lycurgus to pay 6,000 drachmas. The design of this law was to destroy all distinction between the richer and poorer sort of citizens. When the season approached, the mystæ or persons who had been initiated only in the lesser mysteries, repaired to Eleusis to be instructed in the ceremonial. The service for the opening of the temple, with morning sacrifice, was performed.

Eleusinia. formed. The ritual was then produced from the sanctuary. It was enveloped in symbolical figures of animals, which suggested words compendiously, in letters with ligatures, implicated, the tops huddled together, or disposed circularly like a wheel; the whole utterly inexplicable to the prophane. The case, which was called *Petroma*, consisted of two stones exactly fitted. The mysterious record was replaced after the reading, and closed up until a future festival. The principal rite was nocturnal, and confined to the temple and its environs. The mystæ waited without, with impatience and apprehension. Lamentations and strange noises were heard. It thundered. Flashes of light and of fire rendered the deep succeeding darkness more terrible. They were beaten and perceived not the hand. They beheld frightful apparitions, monsters, and phantoms of a canine form. They were filled with terror, became perplexed and unable to stir. The scene then suddenly changed to brilliant and agreeable. The propylæa or vestibules of the temple were opened, the curtains withdrawn, the hidden things displayed. They were introduced by the hierophant and daduchus, and the former showed them the mysteries. The splendor of illumination, the glory of the temple and of the images, the singing and dancing which accompanied the exhibition, all contributed to sooth the mind after its late agitation, and to render the wondering devotee tranquil and self-satisfied. After this inspection, or, as it was called, the *autopsia*, they retired, and others advanced. The succeeding days were employed in purification, in sacrifice, in pompous processions, and spectacles, at which they assisted, wearing myrtle-crowns. The second day was called αλαδε μυςαι, *to the sea, you that are initiated*: because they were commanded to purify themselves by bathing in the sea. On the third day sacrifices, and chiefly a mullet were offered; as also barley from a field of Eleusis. These oblations were called Θυα, and held so sacred that the priests themselves were not, as in other sacrifices, permitted to partake of them. On the fourth day they made a solemn procession, in which the καλαθιον, *holy basket of Ceres* was carried about in a consecrated cart, while on every side the people shouted χαιρε Δημητερ, *Hail, Ceres!* After these followed women, called κιςοφοροι, who *carried baskets*, in which was sesamin, carded wool, grains of salt, a serpent, pomegranates, reeds, ivy boughs, certain cakes, &c. The fifth was called Ἡ των λαμπαδων ημερα, *the torch day*; because on the following night the people ran about with torches in their hands. It was usual to dedicate torches to Ceres, and contend which should offer the biggest, in commemoration of the travels of the goddess, and of her lighting a torch in the flames of mount Ætna. The sixth day was called Ιακχος, from Iacchus, the son of Jupiter and Ceres, who accompanied his mother in her search after Proserpine with a torch in his hand. From that circumstance his statue had a torch in his hand, and was carried in solemn procession from the Ceramicus to Eleusis. The statue with those that accompanied it, called Ιακχαγωγοι, was crowned with myrtle. In the way nothing was heard but singing and the noise of brazen kettles as the votaries danced along. The way through which they issued from the city was called Ιερα οδος *the sacred way*, the resting place Ιερα συκη, from a *fig-tree* which grew in the neighbourhood. They also stopped on a bridge over the Cephisus, where they derided those that passed by. After they had passed this bridge, they entered Eleusis by a place called μυςικη εισοδος, *the mystical entrance*. On the seventh day were sports, in which the victors were rewarded with a measure of barley, as that grain had been first sown in Eleusis. The eighth day was called Επιδαυριων ημερα, because once Æsculapius at his return from Epidaurus to Athens was initiated by the repetition of the less mysteries. It became customary, therefore, to celebrate them a second time upon this, that such as had not hitherto been initiated might be lawfully admitted. The ninth and last day of the festival was called Πλημοχοαι, *earthen vessels*, because it was usual to fill two such vessels with wine; one of which being placed towards the east, and the other towards the west; which, after the repetition of some mystical words, were both thrown down, and the wine being spilt on the ground was offered as a libation.

The story of Ceres and Proserpine, the foundation of the Eleusinian mysteries, was partly local. It was both verbally delivered, and represented in allegorical show. Proserpine was gathering flowers when she was stolen by Pluto. Hence the procession of the holy basket, which was placed on a car dragged along by oxen, and followed by a train of females, some carrying the mystic chests, shouting, *Hail, Ceres!* At night a procession was made with lighted torches, to commemorate the goddess searching for her daughter. A measure of barley, the grain which, it was believed, she had given, was the reward of the victors in the gymnic exercises; and the transaction at the temple had a reference to the legend. A knowledge of these things and places, from which the profane were excluded, was the amount of initiation; and the mode of it, which had been devised by craft, was skilfully adapted to the reigning superstitions. The operation was forcible, and the effect in proportion. The priesthood flourished as piety increased. The dispensation was corrupt, but its tendency not malignant. It produced sanctity of manners and an attention to the social duties; desire to be as distinguished by what was deemed virtue as by silence.

Some have supposed the principal rites at this festival to have been obscene and abominable, and that from thence proceeded all the mysterious secrecy. They were carried from Eleusis to Rome in the reign of Adrian, where they were observed with the same ceremonies as before, though perhaps with more freedom and licentiousness. They lasted about 1800 years, and were at last abolished by Theodosius the Great.

ELEUSIS, (anc. geog.) a town in Attica between Megara and the Piræus, celebrated for the festivals of Ceres. See the preceding article.—Those rites were finally extinguished in Greece upon the invasion of Alaric the Goth. Eleusis, on the overthrow of its goddess and the cessation of its gainful traffic, probably became soon an obscure place, without character or riches. For some ages, however, it was not entirely forsaken, as is evident from the vast consumption of the ancient materials, and from the present remains, of which the following account is given by Dr Chandler †. "The port was small and of a circular form. The stones

† *Travels in Greece*, p. 189.

ftones of one pier are feen above water, and the correfponding fide may be traced. About half a mile from the fhore is a long hill, which divides the plain. In the fide next the fea are traces of a theatre, and on the top are cifterns cut in the rock. In the way to it, fome maffes of wall and rubbifh, partly ancient, are ftanding; with ruined churches; and beyond, a long broken aqueduct croffes to the mountains. The Chriftian pirates had infefted the place fo much, that in 1676 it was abandoned. It is now a fmall village at the eaftern extremity of the rocky brow, on which was once a caftle; and is inhabited by a few Albanian families, employed in the culture of the plain, and fuperintended by a Turk, who refides in an old fquare tower. The proprietor was Achmet Aga, the primate or principal perfon of Athens.

"The myftic temple at Eleufis was planned by Ictinus, the architect of the Parthenon. Pericles was overfeer of the building. It was of the Doric order; the cell fo large as to admit the company of a theatre. The columns on the pavement within, and their capitals, were raifed by Coræbus. Metagenes of Xypete added the architraves and the pillars above them, which fuftained the roof. Another completed the edifice. This was a temple *in antis*, or without exterior columns, which would have occupied the room required for the victims. The afpect was changed to *Proftylos* under Demetrius the Phalerean; Philo a famous artichect erecting a portico, which gave dignity to the fabric, and rendered the entrance more commodious. The fite was beneath the brow, at the eaft end, and encompaffed by the fortrefs. Some marbles, which are uncommonly maffive, and fome pieces of the columns, remain on the fpot. The breadth of the cell is about 150 feet; the length, including the pronaos and portico, is 216 feet; the diameter of the columns, which are fluted 6 inches from the bottom of the fhafts, is 6 feet and more than 6 inches. The temple was a decaftyle or had 10 columns in the front, which was to the eaft. The peribolus or inclofure, which furrounded it on the north-eaft and on the fouth-fide, meafures 387 feet in length from north to fouth, and 328 feet in breadth from eaft to weft. On the weft fide it joined the angles of the weft end of the temple in a ftraight line. Between the weft wall of the inclofure and temple and the wall of the citadel was a paffage of 42 feet 6 inches wide, which led to the fummit of a high rock at the north-weft angle of the inclofure, on which are vifible the traces of a temple *in antis*, in length 74 feet 6 inches from north to fouth, and in breadth from the eaft to the wall of the citadel, to which it joined on the weft, 54 feet. It was perhaps that facred to Triptolemus. This fpot commands a very extenfive view of the plain and bay. About three-fourths of the cottages are within the precincts of the myftic temple, and the fquare tower ftands on the ruined wall of the inclofure.

"At a fmall diftance from the north end of the inclofure is a heap of marble, confifting of fragments of the Doric and Ionic orders; remains, it is likely, of the temples of Diana Propylea and of Neptune, and of the Propyleum or gateway. Wheler faw fome large ftones carved with wheat-ears and bundles of poppy. Near it is the buft of a coloffal ftatue of excellent workmanfhip, maimed, and the face disfigured; the breadth at the fhoulders, as meafured by Pococke, 5 feet and an half; and the bafket on the head above 2 feet deep. It probably reprefented Proferpine. In the heap are two or three infcribed pedeftals; and on one are a couple of torches, croffed. We faw another fixed in the ftone ftairs, which lead up the fquare tower on the outfide. It belonged to the ftatue of a lady, who was hierophant or prieftefs of Proferpine, and had covered the altar of the goddefs with filver. A well in the village was perhaps that called Callichorus, where the women of Eleufis were accuftomed to dance in honour of Ceres. A tradition prevails, that if the broken ftatue be removed, the fertility of the land will ceafe. Achmet Aga was fully poffeffed with this fuperftition, and declined permitting us to dig or meafure there, until I had overcome his fcruples by a prefent of a handfome fnuff-box containing feveral zechins or pieces of gold."

ELEUTHERIA, a feftival celebrated at Platæa in honour of Jupiter *Eleutherius*, or "the affertor of liberty," by delegates from almoft all the cities of Greece. Its inftitution originated in this: after the victory obtained by the Grecians under Paufanias over Mardonius the Perfian general in the country of Platæa, an altar and ftatue were erected to Jupiter Eleutherius, who had freed the Greeks from the tyranny of the barbarians. It was further agreed upon in a general affembly, by the advice of Ariftides the Athenian, that deputies fhould be fent every fifth year, from the different cities of Greece, to celebrate Eleutheria, feftivals of liberty. The Platæans celebrated alfo an anniverfary feftival in memory of thofe who had loft their lives in that famous battle. The celebration was thus: At break of day a proceffion was made with a trumpeter at the head, founding a fignal for battle. After him followed chariots loaded with myrrh, garlands, and a black bull, and certain free young men, as no figns of fervility were to appear during the folemnity, becaufe they in whofe honour the feftival was inftituted had died in the defence of their country. They carried libations of wine and milk in large-eared veffels, with jars of oil, and precious ointments. Laft of all appeared the chief magiftrate, who, though not permitted at other times to touch iron, or wear garments of any colour but white, yet appeared clad in purple, and taking a water-pot out of the city chamber, proceeded through the middle of the town, with a fword in his hand, towards the fepulchres. There he drew water from a neighbouring fpring, and wafhed and anointed the monuments, after which he facrificed a bull upon a pile of wood, invoking Jupiter and infernal Mercury, and inviting to the entertainment the fouls of thofe happy heroes who had perifhed in the defence of their country. After this he filled a bowl with wine, faying, I drink to thofe who loft their lives in the defence of the liberties of Greece. There was alfo a feftival of the fame name obferved by the Samians in honour of the god of love. Slaves alfo, when they obtained their liberty, kept a holiday, which they called *Eleutheria*.

ELF, a term now almoft obfolete, formerly ufed to denote a fairy or hobgoblin; an imaginary being, the creature of ignorance, fuperftition, and craft. See Fairy.

Elf-Arrows, in natural hiftory, a name give to the flints

flints anciently fashioned into arrow-heads, and still found fossile in Scotland, America, and several other parts of the world: they are believed by the vulgar to be shot by fairies, and that cattle are sometimes killed by them.

ELGIN, the capital of the county of Moray, in Scotland, and formerly a bishop's see, is situated on the river Losey, about six miles north from the Spey, in W. Long. 2. 25. N. Lat. 57. 40. Mr. Pennant says, it is a good town, and has many of the houses built over piazzas; but excepting its great cattle-fairs has little trade. It is principally remarkable for its ecclesiastical antiquities. The cathedral, now in ruins, has been formerly a very magnificent pile. The west door is very elegant and richly ornamented. The choir is very beautiful, and has a fine and light gallery running round it; and at the east end are two rows of narrow windows in an excellent Gothic taste. The chapter-house is an octagon; the roof supported by a fine single column with neat carvings of coats of arms round the capital. There is still a great tower on each side of this cathedral; but that in the centre, with the spire and whole roof, are fallen in; and form most awful fragments, mixed with the battered monuments of knights and prelates. Boethius says, that Duncan, who was killed by Macbeth at Inverness, lies buried here. The place is also crowded with a number of modern tomb-stones.—The cathedral was founded by Andrew de Moray, in 1224, on a piece of land granted by Alexander II.; and his remains were deposited in the choir, under a tomb of blue marble, in 1244. The great tower was built principally by John Innes bishop of this see, as appears by the inscription cut on one of the great pillars: "Hic Jacet in Xto, pater et dominus, Dominus *Johannes de Innes* hujus ecclesiæ Episcopus;—qui hoc notabile opus incepit et per septennium ædificavit." Elgin is a royal borough; and gives title of earl to the family of Bruce.

ELIAS, the prophet, memorable for having escaped the common catastrophe of mankind; being taken up alive into heaven, in a fiery chariot, about 895 B. C. See *the Bible*.

ELICHMAN (John), a native of Silesia in the 17th century, who practised physic at Leyden, and was remarkable for understanding 16 languages. He supported an opinion, that the German and Persian languages were derived from the same origin. His Latin translation of the Tablet of Cebes, with the Arabic version and the Greek, was printed at Leyden in 1640, under the care of Salmasius, who prefixed thereto a very ample preface.

ELIQUATION, in chemistry, an operation by which a more fusible substance is separated from one that is less so, by means of a heat sufficiently intense to melt the former, but not the latter. Thus an allay of copper and lead may be separated by a heat capable of melting the latter, but not the former.

ELIS. See ELEA.

ELIS, (anc. geog.), the capital of the district of that name in Peloponnesus, situate on the Peneus, which ran through it. It was the country of Phædo the philosopher, scholar of Socrates, and friend of Plato; who inscribes with his name the dialogue on the immortality of the soul. Pyrrho also was of this city, at the head of the sect called after him *Pyrrhonists*.

The city of Elis owed its origin to an union of small towns after the Persian war. It was not encompassed immediately with a wall; for it had the care of the temple at Olympia, and its territory was solemnly consecrated to Jupiter. To invade or not protect it was deemed impiety; and armies, if marching through, delivered up their weapons, which, on their quitting it, were restored. Amid warring states the city enjoyed repose, was resorted to by strangers, and flourished. The region round about it was called *cœle* or *hollow*, from the inequalities. The country was reckoned fertile, and particularly fit for the raising of flax. This, which grew no where else in Greece, equalled the produce of Judæa in fineness, but was not so yellow. Elis was a school, as it were, for Olympia, which was distant 37 miles. The athletic exercises were performed there, before the more solemn trial, in a gymnasium, by which the Peneus ran. The hellanodics or præfects of the games paired the rival combatants by lot, in an area called *Plethrium* or *The Acre*. Within the wall grew lofty plane-trees; and in the court, which was called the *Xystus*, were separate courses marked for the foot-races. A smaller court was called the *Quadrangle*. The præfects, when chosen, resided for 10 months in a building erected for their use, to be instructed in the duties of their office. They attended before sun-rise to preside at the races; and again at noon, the time appointed for the pentathlum or five sports. The horses were trained in the agora or market-place, which was called the *hippodrome*. In the gymnasium were altars and a cenotaph of Achilles. The women, besides other rites, beat their bosoms in honour of this hero, on a fixed day towards sunset. There also was the town-hall, in which extemporary harangues were spoken and compositions recited. It was hung round with bucklers for ornaments. A way led from it to the baths through the Street of Silence; and another to the market-place, which was planned with streets between porticoes of the Doric order adorned with altars and images. Among the temples one had a circular perystle or colonnade; but the image had been removed and the roof was fallen in the time of Pausanias. The theatre was ancient, as was also a temple of Bacchus, one of the deities principally adored at Elis. Minerva had a temple in the citadel, with an image of ivory and gold made (it was said) by Phidias. At the gate leading to Olympia was the monument of a person, who was buried, as an oracle had commanded, neither within nor without the city. The structures of Elis, Dr Chandler observes, seem to have been raised with materials far less elegant and durable than the produce of the Ionian and Attic quarries. The ruins are of brick, and not considerable, consisting of pieces of ordinary wall, and an octagon building with niches, which, it is supposed, was the temple with a circular peristyle. These stand detached from each other, ranging in a vale southward from the wide bed of the river Peneus; which, by the margin has several large stones, perhaps reliques of the gymnasium. The citadel was on a hill, which has on the top some remnants of wall.

ELISHA the prophet, famous for the miracles he performed, died about 830 B. C. See *the Bible*.

Elision || Elizabeth.

ELISION, in grammar, the cutting off or suppressing a vowel at the end of a word, for the sake of sound or measure, the next word beginning with a vowel.

Elisions are pretty frequently met with in English poetry, but more frequently in the Latin, French, &c. They chiefly consist in suppressions of the *a*, *e*, and *i*, though an elision suppresses any of the other vowels.

ELIXATION, in pharmacy, the extracting the virtues of ingredients by boiling or stewing.

ELIXIR, in medicine, a compound tincture extracted from many efficacious ingredients. Hence the difference between a tincture and an elixir seems to be this, that a tincture is drawn from one ingredient, sometimes with an addition of another to open it and to dispose it to yield to the menstruum: whereas an elixir is a tincture extracted from several ingredients at the same time.

ELIZABETH, queen of England, daughter of Henry VIII. and Anna Boleyn, was born at Greenwich, September 7th, 1533. According to the humour of the times, she was early instructed in the learned languages, first by Grindal, who died when she was about 17, and afterwards by the celebrated Roger Ascham. She acquired likewise considerable knowledge of the Italian, Spanish, and French languages. Dr Grindal was also her preceptor in divinity, which she is said to have studied with uncommon application and industry. That Elizabeth became a Protestant, and her sister Mary a Papist, was the effect of that cause which determines the religion of all mankind; namely the opinion of those by whom they were educated: and this difference of opinion, in their tutors, is not at all surprising, when we recollect, that their father Harry was of both religions, or of neither.

But the studies of Elizabeth were not confined merely to languages and theology: she was also instructed in the political history of the ancients; and was so well skilled in music, as to sing and play "artfully and sweetly."

After the short reign of her brother Edward, our heroine being then about 20 years of age, her *firebrand* sister acceded to the crown, Elizabeth experienced a considerable degree of persecution, so as to be not a little apprehensive of a violent death. She was accused of nobody knows what; imprisoned; and, we are told inhumanely treated. At last, by the intercession of king Philip of Spain, she was set at liberty; which she continued to enjoy till, on the death of her *pious* sister, she, on the 17th of November 1558, ascended the throne of England. Her political history as a queen, is universally known and admired*: but her attention to the government of her kingdom did not totally suspend her pursuit of learning. Ascham, in his *Schoolmaster*, tells us, that, about the year 1563, five years after her accession, she being then at Windsor, besides her perfect readiness in Latin, Italian, French, and Spanish, she read more Greek in one day than some prebendaries of that church did read Latin in a whole week, (p. 21.)—She employed Sir John Fortescue to read to her, Thucydides, Xenophon, Polybius, Euripides, Æschines, and Sophocles. (*Ballard*, p. 219.)—That the Latin language was familiar to her, is evident from her speech to the university of Oxford, when she was near sixty; also from her spirited answer to the Polish ambassador in the year 1598. And that she was also skilled in the art of poetry appears, not only from the several scraps that have been preserved, but likewise from the testimony of a cotemporary writer, Puttenham, in his *Art of Engl. Poetry* (a very scarce book). These are his words:—"But, last in recital, "and first in degree, is the queen, whose learned, de"licate, noble muse, easily surmounted all the rest, "for sense, sweetness, or subtilty, be it in ode, elegy, "epigram, or in any other kind of poem," &c. In this author are to be found only a specimen of 16 verses of her English poetry. "But," says Mr Walpole, "a greater instance of her genius, and that too in "Latin, was her extempore reply to an insolent pro"hibition, delivered to her from Philip II. by his am"bassador, in this tetrastic.

* See (History of) *England*.

Te veto ne pergas bello defendere Belgas:
Quæ Dracus eripuit, nunc restituantur oportet;
Quas pater evertit, jubeo te condere cellas.
Religio papæ fac restituatur ad unguem.

"She instantly answered him, with as much spirit "as she used to return his invasions."

Ad Græcas, bone rex, fient mandata kalendas.

Being earnestly pressed by a Roman priest, during his persecution, to declare her opinion concerning the real presence of Christ's body in the wafer, she answered,

Christ was the word that spake it;
He took the bread and brake it;
And what that word did make it,
That I believe and take it. *Fuller's Holy State.*

She gave the characters of four knights of Nottinghamshire in the following distich:

Gervaise the gentle, Stanhope the stout,
Markham the lion, and Sutton the lout. *Walp. Cat.*

Coming into a grammar-school, she characterised three classic authors in this hexameter:

Persius a crab-staff; bawdy Martial; Ovid a fine wag.
Full. Worth. of Warw. 126.

Sir Walter Raleigh having wrote on a window,

Fain would I climb, yet fear I to fall;

She immediately wrote under it,

If thy heart fail thee, climb not at all.
Worth. of Devonsh. 261.

Doubtless, she was a woman of singular capacity and extraordinary acquirements: and, if we could forget the story of the Scottish Mary, and of her favourite Essex, together with the burning of a few Anabaptists; in short, could we forbear to contemplate her character through the medium of religion and morality, we might pronounce her the most illustrious of illustrious women. See further, the articles England, Mary, and Scotland. She died in her palace at Richmond, the 24th of March 1602, aged 70, having reigned 44 years; and was interred in the chapel of Henry VII. in Westminster Abbey. Her successor James erected a magnificent monument to her memory. —She wrote, 1. The Mirrour, or Glass of the Sinful Soul. This was translated out of French verse into English

English prose, when she was eleven years old. It was dedicated to queen Catharine Parr. Probably it was never printed; but the dedication and preface are preserved in the *Sylloge epistolarum*, in Hearne's edition of *Livii Foro Juliensis*, p. 161. 2. Prayers and Meditations, &c. Dedicated to her father, dated at Hatfield, 1545. Manuscript, in the royal library. 3. A Dialogue out of Xenophon, in Greek, between Hiero a king, yet some time a private person, and Simonides a poet, as touching the life of the Prince and Private Man. First printed from a manuscript in her majesty's own hand-writing, in the Gentleman's Magazine for 1743. 4. Two orations of Isocrates, translated into Latin. 5. Latin oration at Cambridge. Preserved in the king's library: also in Hollinshed's Chron. p. 1206; and in Fuller's Hist. of Cambr. p. 138. 6. Latin Oration at Oxford. See Wood's Hist. and Antiq. of Oxf. lib. i. p. 289. also in Dr Jebb's Append. to his Life of Mary Queen of Scots. 7. A Comment on Plato. 8. *Boethius de consolatione philosophiæ*, translated into English anno 1593. 9. *Sallust de bello Jugurthino*, translated into English anno 1590. 10. A play of Euripides, translated into Latin, (Cat. of Royal Auth.) 11. A Prayer for the use of her fleet in the great expedition in 1596. 12. Part of Horace's Art of Poetry, translated into English anno 1598. 13. *Plutarch de Curiositate*, translated into English. 14. Letters on various occasions to different persons: several speeches to her parliament; and a number of other pieces.

Elizabeth Petrowna, (daughter of Peter the Great) the last empress of Russia, distinguished herself by her signal clemency. She made a vow, that no person should be put to death in her reign, and she strictly observed it. The example has been followed, and confirmed by law, under the present august sovereign of Russia, Catharine II. Elizabeth died in 1762, in the 21st year of her reign and 52d of her age.

ELK, in zoology. See Cervus.

ELL, *(ulna)* a measure, which obtains, under different denominations, in most countries, whereby cloths, stuffs, linens, silks, &c. are usually measured; answering nearly to the yard of England, the canna of Italy, the vara of Spain, the palm of Sicily, &c.

Servius will have the ell to be the space contained between the two hands when stretched forth; but Suetonius makes it only the cubit.

The ells most frequently used with us are the English and Flemish; the former containing three feet nine inches, or one yard and a quarter; the latter only 27 inches, or three quarters of a yard; so that the ell English is to the Flemish ell as five to three. In Scotland, the ell contains $37\frac{2}{10}$ English inches.

M. Ricard, in his Treatise of Commerce, reduces the ells thus: 100 ells of Amsterdam are equal to $98\frac{3}{4}$ of Brabant, Antwerp, and Brussels; to $58\frac{1}{7}$ of England and France; to 120 of Hamburgh, Francfort, Leipsic, and Cologne; 125 of Breslaw; 110 of Bergen and Drontheim; and 117 of Stockholm.

ELLIOT, (the Right Honourable George Augustus, Lord Heathfield), was the youngest son of the late Sir Gilbert Elliot, Baronet, of Stobbs (A) in Roxburghshire; and was born about the year 1718. He received the first rudiments of his education under a private tutor; and at an early time of life was sent to the university of Leyden, where he made considerable progress in classical learning, and spoke with fluency and elegance the German and French languages. Being designed for a military life, he was sent from thence to the celebrated *Ecole Royale du Genie Militaire*, conducted by the great Vauban, at La Fere in Picardy; where he laid the foundation of what he so conspicuously exhibited at the defence of Gibraltar. He completed his military course on the continent by a tour, for the purpose of seeing in practice what he had studied in theory. Prussia was the model for discipline, and he continued some time as a volunteer in that service.

Mr Elliot returned in the 17th year of his age to his native country, Scotland; and was the same year, 1735, introduced by his father Sir Gilbert to Lieutenant-Colonel Peers of the 23d regiment of foot, then lying in Edinburgh, as a youth anxious to bear arms for his king and country. He was accordingly entered as a volunteer in that regiment, where he continued for a year or more. From the 23d regiment he went into the engineer corps at Woolwich, and made great progress in that study, until his uncle Colonel Elliot brought him in his adjutant of the second troop of horse grenadiers. With these troops he went upon service to Germany, and with them in a variety of actions. At the battle of Dettingen he was wounded. In this regiment he bought the rank of captain and major, and afterwards purchased the lieutenant-colonelcy from Colonel Brewerton, who succeeded to his uncle. On arriving at this rank, he resigned his commission as an engineer, which he had enjoyed along with his other rank, and in which service he had been actively employed very much to the advantage of his country. He received the instructions of the famous engineer Bellidor, and made himself completely master of the science of gunnery. Had he not so disinterestedly resigned his rank in the engineer department, he would long before his death, by regular progression, have been at the head of that corps. Soon after this he was appointed aid-de-camp to George II. and was distinguished for his military skill and discipline. In the year 1759, he quitted the second troop of horse grenadier guards, being selected to raise, form, and discipline,

(A) The ancient and honourable family of Elliot of Stobbs, as well as the collateral branch of Elliot of Minto in the same county, and of Elliot of Port Elliot in Cornwall, are originally from Normandy. Their ancestor, Mr Aliott, came over with William the conqueror, and held a distinguished rank in his army. There is a traditionary anecdote in the family relating to an honourable distinction in their coat, which, as it corresponds with history, bears the probability of truth. When William set foot on English land, he slipped and fell on the earth. He sprung up, and exclaimed that it was a happpy omen—he had embraced the country of which he was to become the lord. Upon this Aliott drew his sword, and swore by the honour of a soldier, that he would maintain, at the hazard of his blood, the right of his lord to the sovereignty of the earth which he had embraced. On the event of conquest, King William added to the arms of Aliott, which was a baton *or*, on a field *azure*, an arm and sword as a crest, with the motto, *Per saxa, per ignes, fortiter et recte.*

discipline, the first regiment of light horse, called after him *Elliot's*. As soon as they were raised and formed, he was appointed to the command of the cavalry in the expedition on the coasts of France, with the rank of brigadier general. After this he passed into Germany, where he was employed on the staff, and greatly distinguished himself in a variety of movements; where his regiment displayed a strictness of discipline, an activity and enterprise, which gained them signal honour: and indeed they have been the pattern regiment, both in regard to discipline and appointment, to the many light dragoon troops that have been since raised in the service. From Germany he was recalled for the purpose of being employed as second in command in the memorable expedition against the Havannah; the circumstances of which conquest are well known.

On the peace his gallant regiment was reviewed by the king, when they presented to his majesty the standards which they had taken from the enemy. Gratified with their fine discipline and high character, the king asked General Elliot what mark of his favour he could bestow on his regiment equal to their merit? He answered, that his regiment would be proud if his majesty should think, that, by their services, they were intitled to the distinction of *Royals*. It was accordingly made a royal regiment, with this flattering title, "The 15th, or *King*'s Royal Regiment of Light Dragoons." At the same time the king expressed a desire to confer some honour on the general himself; but the latter declared that the honour and satisfaction of his Majesty's approbation of his services was his best reward.

During the peace he was not idle. His great talents in the various branches of the military art gave him ample employment. In the year 1775, he was appointed to succeed General A'Court as commander in chief of the forces in Ireland; but did not continue long in this station, not even long enough to unpack all his trunks: for finding that interferences were made by petty authority derogatory of his own, he resisted the practice with becoming spirit; and not choosing to disturb the government of the sister kingdom on a matter personal to himself, he solicited to be recalled. He accordingly was so, and appointed to the command of Gibraltar in a fortunate hour for the safety of that important fortress. The system of his life, as well as his education, peculiarly qualified him for this trust. He was perhaps the most abstemious man of the age; neither indulging himself in animal food nor wine. He never slept more than four hours at a time; so that he was up later and earlier than most other men. He so inured himself to habits of hardiness, that the things which are difficult and painful to other men, were to him his daily practice, and rendered pleasant by use. It could not be easy to starve such a man into a surrender, nor possible to surprise him. The example of the commander in chief in a besieged garrison had a most persuasive efficacy in forming the manners of the soldiery. Like him his brave followers came to regulate their lives by the most strict rules of discipline before there arose a necessity for so doing; and severe exercise, with short diet, became habitual to them by their own choice. The military system of discipline which he introduced, and the preparations which he made for his defence, were contrived with so much judgment, and executed with so much address, that he was able with a handful of men to preserve his post against an attack, the constancy of which, even without the vigour, had been sufficient to exhaust any common set of men. Collected within himself, he in no instance destroyed, by premature attacks, the labours which would cost the enemy time, patience, and expence to complete; he deliberately observed their approaches, and seized on the proper moment, with the keenest perspection, in which to make his attack with success. He never spent his ammunition in useless parade or in unimportant attacks. He never relaxed from his discipline by the appearance of security, nor hazarded the lives of his garrison by wild experiments. By a cool and temperate demeanour, he maintained his station for three years of constant investment, in which all the powers of Spain were employed. All the eyes of Europe were on this garrison; and his conduct has justly exalted him to the most elevated rank in the military annals of the day. On his return to England, the gratitude of the British senate was as forward as the public voice in giving him that distinguished mark his merit deserved. Both houses of parliament voted an unanimous address of thanks to the general. The king conferred on him the honour of Knight of the Bath, with a pension during his own and a second life of his own appointment; and on June 14, 1787, his majesty advanced him to the peerage by the title of *Lord Heathfield Baron Gibraltar*, permitting him to take, in addition to his family arms, the arms of the fortress he had so bravely defended, to perpetuate to futurity his noble conduct.

His lordship died on the 6th of July 1790, at his chateau at Aix-la-Chapelle, of a second stroke of the palsy, after having for some weeks preceding enjoyed tolerable good health and an unusual flow of spirits. His death happened two days before he was to have set out for Leghorn in his way to Gibraltar; of which place he was once more appointed to the defence, in the view of an approaching war.——He married Ann, daughter of Sir Francis Drake of Devonshire; and had by her (who died in 1769) Francis Augustus, now Lord Heathfield, lieutenant-colonel of the 6th regiment of horse.

ELLIPOMACROSTYLA, in natural history, the name of a genus of crystals. The word is derived from the Greek, ελλιπης *imperfect*, μακρος *long*, and ςυλος *a column*; and expresses an imperfect crystal with a long column. The perfect figure of crystal being a column terminated by a pyramid at each end, those which want this character are esteemed imperfect: and accordingly the bodies of this genus are defined to be imperfect crystals with single pyramids; one end of their column being affixed to some solid body, and composed of thin and slender hexangular columns, terminated by hexangular pyramids.

ELLIPOPACHYSTYLA, in natural history, the name of a genus of crystals. The word is derived from the Greek, ελλιπης *imperfect*, παχυς *thick*, and ςυλος *a column*, and expresses a crystal of the imperfect kind with a thick column. The bodies of this genus are crystals composed of an hexangular column, considerably thick and short, affixed irregularly at one end to some solid body, and terminated at the other by an hexangular pyramid.

ELLIPSIS, in geometry, a curve line returning into itself, and produced from the section of a cone by a plane cutting both its sides, but not parallel to the base. See *Conic Sections*.

Ellipsis, in grammar, a figure of syntax, wherein one or more words are not expressed; and from this deficiency it has got the name of *ellipsis*.

ELLIPTIC, or Elliptical, something belonging to an ellipsis.

ELLIPOMACHROSTYLA, in natural history, a genus of imperfect crystals, with single pyramids; one end of their column being affixed to some solid body. They are dodecahedral, with hexangular columns and hexangular pyramids.

Of these crystals authors enumerate a great many species; among which are the whitish pellucid sprig crystal, a bright brown kind, a dull brown kind, and a bright yellow kind; all which are farther distinguished according to the different lengths of their pyramids.

ELLIPOPACRYSTYLA, in natural history, a genus of imperfect crystals, composed of 12 planes in an hexangular column, terminated by an hexangular pyramid at one end, and irregularly affixed to some other body at the other, with the shorter columns.

There are two species of these crystals; one short, bright, and colourless, found in great plenty in New-Spain and other parts of America; the other, a short, dull, and dusky brown one, found in Germany, and sometimes in England.

ELLISIA, in botany: a genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 28th order, *Luridæ*. The corolla is monopetalous and funnel-shaped; the berry carnous and bilocular; there are two seeds muricated or set with small raised points, the one higher than the other.

ELM, in botany. See Ulmus.

ELMACINUS (George), author of the *History of the Saracens*, was born in Egypt towards the middle of the 13th century. His history comes down from Mahomet to the year of the Hegira 512, answering to the year of our Lord 1134; in which he sets down year by year, in a very concise manner, whatever regards the Saracen empire, intermixed with some passages relating to the eastern Christians. His abilities must have been considerable; since, though he professed Christianity, he held an office of trust near the persons of the Mahometan princes. He was son to Yafer Al Amid, secretary to the council of war under the sultans of Egypt for 45 years; and in 1238, when his father died, succeeded him in his place. His history of the Saracens was translated from Arabic into Latin by Erpinius; and printed in these two languages in folio, at Leyden, in 1625. Erpinius died before the publication; but Golius took care of it, and added a preface. It was dedicated by Erpinius's widow to Dr. Andrews, bishop of Winchester.

ELOCUTION. See Oratory, Part III.

ELOGY, a praise or panegyric bestowed on any person or thing, in consideration of its merit. The beauty of elogy consists in an expressive brevity. Eulogiums should not have so much as one epithet, properly so called, nor two words synonymous: they should strictly adhere to truth; for extravagant and improbable elogies rather lessen the character of the person or thing they would extol.

ELOHI, Eloi, or *Elohim*, in scripture, one of the names of God. But it is to be observed, that angels, princes, great men, judges, and even false gods, are sometimes called by this name. The sequel of the discourse is what assists us in judging rightly concerning the true meaning of this word. It is the same as *Eloha*. One is the singular, the other the plural. Nevertheless *Elohim* is often construed in the singular number, particularly when the true God is spoken of; but when false gods are spoken of, it is construed rather in the plural.

ELOINED, in law, signifies restrained or hindered from doing something: thus it is said, that if those within age be eloined, so that they cannot sue personally, their next friend shall sue for them.

ELONGATION, in astronomy, the digression or recess of a planet from the sun, with respect to an eye placed on our earth. The term is chiefly used in speaking of Venus and Mercury, the arch of a great circle intercepted between either of these planets and the sun being called the *elongation* of that planet from the sun.

Elongation, in surgery, is an imperfect luxation, occasioned by the stretching or lengthening of the ligaments of any part.

ELOPEMENT, in law, is where a married woman departs from her husband, and cohabits with an adulterer; in which case the husband is not obliged to allow her any alimony out of his estate, nor is he chargeable for necessaries for her of any kind. However, the bare advertising a wife in the gazette, or other public paper, is not a legal notice to persons in general not to trust her; though a personal notice given by the husband to particular persons is said to be good.—An action lies, and large damages may be recovered, against a person for carrying away and detaining another man's wife.

ELOQUENCE, the art of speaking well, so as to affect and persuade. See Oratory.

ELSHEIMER (Adam), a celebrated painter, born at Francfort on the Maine, 1574. He was first a disciple of Philip Uffenbach a German; but his desire of improvement carrying him to Rome, he soon became a most excellent artist in landscapes, history, and night pieces, with small figures. His works are but few; and the great pains he bestowed in finishing them raised their prices so high, that they are hardly any where to be found but in the cabinet of princes. He was of a melancholy turn, and sunk under the embarrassments of his circumstances in 1610. James Ernest Thomas of Landau was his disciple; and imitated his style so nicely, that their performances are not easily distinguished.

ELSIMBURG, a port-town of Sweden, in the province of Gothland, and territory of Schonen, seated on the side of the Sound, over against Elsinore. It was formerly a fortress belonging to the Danes; but all the fortifications were demolished in 1679, and there is only one tower of a castle which remains undemolished. It now belongs to Sweden. E. Long. 13. 20. N. Lat. 56. 2.

Elsinore. Elvas.

ELSINORE, or ELSINOOR, a port-town of Denmark, seated on the Sound, in the isle of Zealand. E. Long. 13. 23. N. Lat. 56. 0.—It was a small village, containing a few fishermens huts, until 1445, when it was made a staple town by Eric of Pomerania; who conferred upon the new settlers considerable immunities, and built a castle for their defence. From that period it gradually increased in size and wealth, and is now the most considerable place in Denmark next to Copenhagen. It contains about 5000 inhabitants, amongst whom are a considerable number of foreign merchants, and the consuls of the principal nations trading to the Baltic. The passage of the Sound is guarded by the fortress of Cronborg, which is situated upon the edge of a peninsular promontory, the nearest point of land from the opposite coast of Sweden. It is strongly fortified towards the shore by ditches, bastions, and regular entrenchments; and towards the sea by several batteries, mounted with 60 cannon, the largest whereof are 48 pounders. Every vessel, as it passes, lowers her top-sails, and pays a toll at Elsinore.

It is generally asserted, that this fortress guards the Sound; and that all the ships must, on account of the shoal waters and currents, steer so near the batteries as to be exposed to their fire in case of a refusal. This, however, is a mistaken notion. On account indeed of the numerous and opposite currents in the Sound, the safest passage lies near the fortress; but the water in any part is of sufficient depth for vessels to keep at a distance from the batteries, and the largest ships can even sail close to the coast of Sweden. The constant discharge, however, of the toll, is not so much owing to the strength of the fortress as to a compliance with the public law of Europe. Many disputes have arisen concerning the right by which the crown of Denmark imposes such a duty. The kings of Sweden, in particular, claiming an equal title to the free passage of the Strait, were for some time exempted by treaty from paying it; but in 1720, Frederic I. agreed that all Swedish vessels should for the future be subject to the usual imposts. All vessels, beside a small duty, are rated at $1\frac{1}{4}$ *per cent.* of their cargoes, except the English, French, Dutch, and Swedish, which pay only one *per cent.* and in return, the crown takes the charge of constructing light-houses, and erecting signals to mark the shoals and rocks, from the Categate to the entrance into the Baltic. The tolls of the Sound, and of the two Belts, supply an annual revenue of above L.100,000 Sterling.

ELVAS, a large town, and one of the best and most important in Portugal, seated in the province of Alentejo, a few miles from the frontiers of Estramadura in Spain. It is built on a mountain, and is strongly fortified with works of free-stone. The streets of the town are handsome, and the houses neat; and there is a cistern so large, that it will hold water enough to supply the whole town six months. The water is conveyed to it by a magnificent aqueduct, three miles in length, sustained in some places by four or five high arches, one upon another. It was bombarded by the French and Spaniards in 1706, but without effect. It has generally a garrison of 1000 men. The king founded an accademy here, in 1733, for young gentlemen. W. Long. 7. 28. N. Lat. 38. 39.

Eluding || Ely.

ELUDING, the act of evading or rendering a thing vain and of no effect; a dexterous getting clear, or escaping out of an affair, difficulty, embarrassment, or the like. We say, to *elude* a proposition, &c. The design of chicanery is, to *elude* the force of the laws: this doctor has not resolved the difficulty, but *eluded* it. Alexander, says the historian, in cutting the Gordian knot, either *eluded* the oracle or fulfilled it: *Ille nequicquam luctatus cum latentibus nodis, Nihil, inquit, interest, quomodo solvatur; gladioque ruptis omnibus loris, oraculi sortem vel* eludit, *vel implevit.*

ELVELA, in botany: A genus of the natural order of fungi, belonging to the cryptogamia class of plants. The fungus is turbinated, or like an inverted cone.

ELUL, in ancient chronology, the 12th month of the Jewish civil year, and the sixth of the ecclesiastical: it consisted of only 29 days, and answered pretty nearly to our August.

ELUTRIATION, in chemistry, an operation performed by washing solid substances with water, stirring them well together, and hastily pouring off the liquid, while the lighter part remains suspended in it, that it may thereby be separated from the heavier part. By this operation metallic ores are separated from earth, stones, and other unmetallic particles adhering to them.

ELY, a city and bishop's see of Cambridgeshire, situated about 12 miles north of Cambridge. E. Long. 15. 0. N. Lat. 52. 24. It is a county of itself, including the territory around; and has a judge who determines all causes civil and criminal within its limits. The church hath undergone various alterations since it was first established by Etheldra, the wife of Egfride, king of Northumberland, who founded a religious house here, and planted it with virgins, and became the first abbess of it herself. The Danes entirely ruined this establishment; then Ethelwald, the 27th bishop of Winchester, rebuilt the monastery, and filled it with monks; to whom king Edgar, and many succeeding monarchs, bestowed many privileges, and great grants of land; so that this abbey became in process of time the best of any in England. Richard, the 11th abbot, wishing to free himself of the bishop of Lincoln, within whose diocese his monastery was situated, and not liking so powerful a superior, he made great interest with king Henry I. to get Ely erected into a bishoprick; and spared neither purse nor prayers to bring this about. He even brought the bishop of Lincoln to consent to it, by giving him and his successors the manors of Bugden, Biggleswade, and Spalding, which belonged to the abbey, in lieu of his jurisdiction; but he lived not to taste the sweets of his industry and ambition, he dying before his abbey was erected into a see. His successor was the first bishop of Ely: but the great privileges the bishop enjoyed were almost wholly taken away, or much restricted, by the act of parliament, 27th Henry VIII. regarding the restoring to the crown the ancient royalties: So, instead of being palatine of the isle of Ely, the bishop and his temporal steward were by that act declared to be from thenceforth justices of the peace in the said island. This diocese contains all Cambridgeshire, and the isle of Ely, excepting Iselham, which belongs to the see of Rochester, and 15 other parishes, that are in the diocese of Norwich; but it has a parish in Norfolk,

folk, viz. Emneth. The number of parishes in this diocese are 141, whereof 75 are impropriate. It hath but one archdeacon, viz. of Ely. It is valued in the king's books at L.2134 : 18 : 5. The clergy's tenth, amounting to the sum of L.384 : 14 : 9¼. The bishopric is computed to be worth annually L.4000. The church is dedicated to St. Ethelred. The building, as it now appears, has been the work of several of its bishops. The west parts were rebuilt by bishop Ridal; the choir and lanthern were begun by bishop Norwold, and finished by bishop Frodsham. This see hath given two saints and two cardinals to the church of Rome; and to the English nation nine lord chancellors, seven lord treasurers, one lord privy-seal, one chancellor of the exchequer, one chancellor to the university of Oxford, two masters of the rolls, and three almoners. To this cathedral belong a bishop, a dean, an archdeacon, eight prebendaries, with vicars, lay-clerks, choristers, a schoolmaster, usher, and 28 king's scholars.

ELYMAIS, the capital city of the land of Elam, or the ancient Persia. We are told (1 Mac. vi. 1.) that Antiochus Epiphanes, having understood that there were very great treasures lodged in a temple at Elymais, determined to go and plunder it: but the citizens getting intelligence of his design, made an insurrection, forced him out of the city, and obliged him to fly. The author of the second book of Maccabees (ix. 2.) calls this city *Persepolis*, in all probability because formerly it was the capital of Persia; for it is known from other accounts, that Persepolis and Elymais were two very different cities, the latter situated upon the Eulæus, the former upon the Araxis.

ELYMUS, in botany: A genus of the digynia order, belonging to the triandria class of plants; and in the natural method ranking under the fourth order, *Gramina*. The calyx is lateral, bivalved, aggregate, and multiflorous.

ELYOT (Sir Thomas), a gentleman of eminent learning in the 16th century, was educated at Oxford, travelled into foreign countries, and upon his return was introduced to court. His learning recommended him to Henry VIII. who conferred the honour of knighthood on him, and employed him in several embassies; particularly in 1532, to Rome, about the divorce of queen Catharine, and afterwards to Charles V. about 1536. He wrote, *The Castle of Health*, *The Governor*, *Banquet of Sapience*, *Of the Education of Children*, *De Rebus memorabilibus Angliæ*, and other books; and was highly esteemed by all his learned cotemporaries.

ELYSIUM, (Ελυσιος,) in the ancient theology, or rather mythology, a place in the *inferi* or lower world, furnished with fields, meads, agreeable woods, groves, shades, rivers, &c. whither the souls of good people were supposed to go after this life.

Orpheus, Hercules, and Æneas, are supposed to have descended into Elysium in their life-time, and to have returned again; (Virg. lib. vi. ver. 638, &c.) Tibullus (lib. i. eleg. 3.) gives us fine descriptions of the Elysian fields.

Virgil opposes Elysium to Tartarus; which was the place where the wicked underwent their punishment.

Hic locus est, partes ubi se via findit in ambas:
Dextera, quæ Ditis magni sub mœnia tendit:
Hac iter Elysium nobis: at læva malorum
Exercet pœnas, & ad impia Tartara mittit.

He assigns Elysium to those who died for their country, to those of pure lives, to truly inspired poets, to the inventors of arts, and to all who have done good to mankind.

Some authors take the fable of Elysium to have been borrowed from the Phœnicians; as imagining the name *Elysium* formed from the Phœnician עלך *alaz*, or עלץ *alats*, or עלם *alas*, "to rejoice," or "to be in joy;" the later *a* being only changed into *e*, as we find done in many other names: as in *Enakim* for *Anakim*, &c. On which footing, Elysian fields should signify the same thing as a place of pleasure; or

——*Locus lætos, & amœna vireta*
Fortunatorum nemorum, sedesque beatas. VIRG.

Others derive the word from the Greek λυω *solvo*, "I deliver, I let loose or disengage;" because here mens souls are freed or disencumbered from the fetters of the body. Beroaldus, and Hornius (Hist. Philosoph. lib. iii. cap. 2.) take the place to have derived its name from Eliza, one of the first persons who came into Greece after the deluge, and the author and father of the Ætolians.

The Elysian fields were, according to some, in the Fortunate Islands on the coast of Africa; in the Atlantic. Others place them in the island of Leuce; and according to the authority of Virgil, they were situated in Italy. According to Lucian, they were near the moon; or in the centre of the earth, if we believe Plutarch. Olaus Wormius contends that it was in Sweden the Elysian fields were placed.

ELZEVIRS, celebrated printers at Amsterdam and Leyden, who greatly adorned the republic of letters by many beautiful editions of the best authors of antiquity. They fell somewhat below the Stephenses in point of learning, as well as in their editions of Greek and Hebrew authors; but as to the choice of good books, they seem to have equalled, and in the neatness and elegance of their small characters, greatly to have exceeded them. Their Virgil, Terence, and Greek Testament, have been reckoned their masterpieces; and are indeed so very fine, that they justly gained them the reputation of being the best printers in Europe. There were five of these Elzevirs, namely, Lewis, Bonaventure, Abraham, Lewis, and Daniel. Lewis began to be famous at Leyden in 1595, and was remarkable for being the first who observed the distinction between the *v* consonant and *u* vowel, which had been recommended by Ramus and other writers long before, but never regarded. Daniel died in 1680 or 1681; and though he left children who carried on the business, passes nevertheless for the last of his family who excelled in it. The Elzevirs have printed several catalogues of their editions; but the last, published by Daniel, is considerably enlarged, and abounds with new books. It was printed at Amsterdam, 1674, in 12mo, and divided into seven volumes.

EMANATION, the act of flowing or proceeding from some source or origin. Such is the emanation of light

light from the sun; or that of effluvia from odorous, &c. bodies; of wisdom from God, &c.—The word is formed of the Latin *e* "out of," and *manare* "to flow or stream."

Emanation is also used for the thing that proceeds, as well as the act of proceeding. The power given a judge is an emanation from the regal power; the reasonable soul is an emanation from the Divinity.

EMANCIPATION, in the Roman law, the setting free a son from the subjection of his father, so that whatever moveables he acquires belong in property to him, and not to his father, as before emancipation.

Emancipation puts the son in a capacity of managing his own affairs, and of marrying without his father's consent, though a minor. Emancipation differs from manumission, as the latter was the act of the master in favour of a slave, whereas the former was that of a father in favour of his son.

There were two kinds of emancipation: the one tacit, which was by the son's being promoted to some dignity, by his coming of age, or by his marrying, in all which cases he became his own master of course. The other, express; where the father declared before a judge, that he emancipated his son. In performing this, the father was first to sell his son imaginarily to another, whom they called *pater fiduciarius*, father in trust; of whom being bought back again by the natural father, he manumitted him before the judge by a verbal declaration.

Emancipation still obtains in France, with regard to minors or pupils, who are hereby set at liberty to manage their own effects, without the advice or direction of their parents or tutors.

EMARGINATED, among botanists. See Botany, p. 444, nº 181.

EMASCULATION, the act of castrating or depriving a male of those parts which characterise his sex. See Castration, and Eunuch.

EMAUS, Emmaus, or *Ammaus*, (anc. geog.), a village, 60 stadia to the north-west of Jerusalem, or about seven miles: it afterwards became a town, and a Roman colony, *Nicopolis*, (Jerome). Reland has another *Ammaus* towards Lydda, 22 miles from Jerusalem, (Itinerary); a third, near Tiberias.

EMBALMING, is the opening a dead body, taking out the intestines, and filling the place with odoriferous and desiccative drugs and spices, to prevent its putrifying. The Egyptians excelled all other nations in the art of preserving bodies from corruption; for some that they embalmed upward of 2000 years ago, remain whole to this day, and are often brought into other countries as great curiosities. Their manner of embalming was thus: they scooped the brains with an iron scoop out at the nostrils, and threw in medicaments to fill up the vacuum: they also took out the entrails, and having filled the body with myrrh, cassia, and other spices, except frankincense, proper to dry up the humours, they pickled it in nitre, where it lay soaking for 70 days. The body was then wrapped up in bandages of fine linen and gums, to make it stick like glue; and so was delivered to the kindred of the deceased, entire in all its features, the very hairs of the eye-lids being preserved. They used to keep the bodies of their ancestors, thus embalmed, in little houses magnificently adorned, and took great pleasure in beholding them, alive as it were, without any change in their size, features, or complexion. The Egyptians also embalmed birds, &c. The prices for embalming were different; the highest was a talent, the next 29 minæ, and so decreasing to a very small matter: but they who had not wherewithal to answer this expence, contented themselves with infusing, by means of a syringe, through the fundament, a certain liquor extracted from the cedar; and leaving it there, wrapped up the body in salt of nitre: the oil thus preyed upon the intestines, so that when they took it out, the intestines came away with it, dried and not in the least putrified: the body being enclosed in nitre, grew dry, and nothing remained besides the skin glued upon the bones.

The method of embalming used by the modern Egyptians, according to Maillet, is to wash the body several times with rose-water, which he elsewhere observes, is more fragrant in that country than with us; they afterwards perfume it with incense, aloes, and a quantity of other odours, of which they are by no means sparing; and then they bury the body in a winding sheet, made partly of silk and partly of cotton, and moistened, as is supposed, with some sweet-scented water or liquid perfume, though Maillet uses only the term *moistened;* this they cover with another cloth of unmixed cotton, to which they add one of the richest suits of clothes of the deceased. The expence, he says, on these occasions, is very great, though nothing like what the genuine embalming cost in former times.

EMBARCADERO, in commerce, a Spanish term, much used along the coasts of America, particularly those on the side of the South Sea. It signifies a place which serves some other considerable city farther within land, for a port or place of shipping, *i. e.* of embarking or disembarking commodities. Thus Calao is the embarcadero of Lima, the capital of Peru; and Arica the embarcadero of Potosi. There are some embarcaderos 40, 50, and even 60 leagues off the city, which they serve in that capacity.

EMBARGO, in commercee, an arrest on ships or merchandise, by public authority; or a prohibition of state, commonly on foreign ships, in time of war, to prevent their going out of port, sometimes to prevent their coming in, and sometimes both, for a limited time.

Government may lay embargoes on ships, or employ those of their subjects, in time of danger, for the service and defence of the nation: but they must not be for the private advantage of a particular trader or company; and therefore a warrant to stay a single ship is no legal embargo. No inference can be made from embargoes which are only in war-time; and are a prohibition by advice of council, and not at prosecution of parties. If goods be laden on board, and after an embargo or restraint from the prince or state comes forth, and then the master of the ship breaks ground, or endeavours to sail, if any damage accrues, he must be responsible for the same; the reason is, because his freight is due, and must be paid, even though the goods be seized as contraband.

EMBARRASS

EMBARRASS, (*Embarrassment*), a French term, though now naturalized; denoting a difficulty or obstacle which perplexes or confounds a person, &c.

EMBASSADOR. See AMBASSADOR.

EMBASSY, the office or function of an AMBASSADOR.

EMBDEN, a port-town and city of Germany, capital of a county of the same name, now in possession of the king of Prussia; it is situated at the mouth of the river Ens. E. Long. 6. 45. N. Lat. 53. 50.

EMBER-WEEKS, are those wherein the *ember* or *embring days* fall.

In the laws of king Alfred, and those of Canute, those days are called *ymbren*, that is, circular days, from whence the word was probably corrupted into *ember-days*: by the canonists they are called *quatuor anni tempora*, the four cardinal seasons, on which the circle of the year turns: and hence Henshaw takes the word to have been formed, viz. by corruption from *temper* or *tempora*.

The ember-days are, the Wednesday, Friday, and Saturday, after Quadragesima Sunday, after Whitsunday, after Holy-rood day in September, and after St Lucia's day in December: which four times answer well enough to the four quarters of the year, Spring, Summer, Autumn, and Winter.

Mr Somner thinks they were originally fasts, instituted to beg God's blessing on the fruits of the earth. Agreeably to which, Skinner supposes the word *ember* taken from the ashes, *embers*, then strewed on the head.

These ember-weeks are now chiefly taken notice of, on account of the ordination of priests and deacons; because the canon appoints the Sundays next succeedings the ember-weeks, for the solemn times of ordination: Though the bishops, if they please, may ordain on any Sunday or holiday.

EMBERIZA, in ornithology, a genus of birds belonging to the order of passeres. The bill is conical, and the mandibles recede from each other towards the base; the inferior mandible has the sides narrowed inwards, but the upper one is still narrower. The most remarkable species are,

1. The nivalis, or great pyed mountain-finch of Ray, and the snow-bird of Edwards, has white wings, but the outer edge of the prime-feathers are black; the tail is black, with three white feathers on each side. These birds are called in Scotland *snow-flakes*, from their appearance in hard weather and in deep snows. They arrive in that season among the Cheviot-hills and in the Highlands in amazing flocks. A few breed in the Highlands, on the summit of the highest hills, in the same places with the *ptarmigans*; but the greatest numbers migrate from the extreme north. They appear in the Shetland islands; then in the Orkneys; and multitudes of them often fall, wearied with their flight, on vessels in the Pentland Frith. Their appearance is a certain fore-runner of hard weather, and storms of snow, being driven by the cold from their common retreats. Their progress southward is probably thus; Spitzbergen and Greenland, Hudson's Bay, the Lapland Alps, Scandinavia, Iceland, the Ferroe Isles, Shetland, Orkneys, Scotland, and the Chivot-hills. They visit at that season all parts of the northern hemisphere, Prussia, Austria, and Siberia. They arrive lean, and return fat. In Austria, they are caught and fed with millet, and, like the ortolan, grow excessively fat. In their flights, they keep very close to each other, mingle most confusedly together, and fling themselves collectively into the form of a ball; at which instant the fowler makes great havock amongst them.

2. The miliaris, or grey emberiza, is of a greyish colour, spotted with black in the belly, and the orbits are reddish. It is the bunting of English authors, and a bird of Europe.

3. The hortulana, or ortolan, has black wings; the first three feathers on the tail are white on the edges, only the two lateral are black outwardly. The orbits of the eyes are naked and yellow; the head is greenish, and yellow towards the inferior mandible. It feeds principally upon the panic-grass; grows very fat; and is reckoned a delicate morsel by certain epicures, especially when fattened artificially. These birds are found in several parts of Europe, but are not met with in Britain; are common in France and Italy, and some parts of Germany and Sweden, migrating from one to the other in spring and autumn; and in their passage are caught in numbers, in order to fatten for the table. This species will sometimes sing very prettily, and has been kept for that purpose. The song is not unlike that of the yellow-hammer, but finer and sweeter. In some parts it makes the nest in a low hedge; in others, on the ground. It is carelessly constructed, not unlike that of the lark. The female lays four or five greyish eggs, and in general has two broods in a year.

The manner of fattening these birds for the table is as follows. They are taken and placed in a chamber lightened by lanthorns; so that, not knowing the vicissitudes of day and night, they are not agitated by the change. Are fed with oats and millet; and grow so fat, that they would certainly die if not killed in a critical minute. They are a mere lump of fat; of a most exquisite taste, but apt soon to satiate. These birds receive both their Greek and Latin name from their food, the millet. Aristotle calls them *cynchromi*; and the Latins, *miliariæ*. The latter kept and fattened them in their *orinthones*, or fowl-yards, as the Italians do at present; which the ancients constructed with the utmost magnificence, as well as conveniency.

4. The citrinella, or yellow-hammer, has a blackish tail, only the two outward side-feathers are marked on the inner edge with a sharp white spot. It is a bird of Europe, and comes about houses in winter: it builds its nest on the ground in meadows.

5. The schœniclas, or reed-sparrow, has a black head, a black-grey body, and a white spot on the quill feathers. It inhabits marshy places, most commonly among reeds, from which it takes its name. Its nest is worthy of notice for the artful contrivance of it, being fastened to four reeds, and suspended by them like a hammock, about three feet above the water; the cavity of the nest is deep, but narrow; and the materials are bushes, fine bents, and hairs. It lays four or five eggs of a bluish white, marked with irregular purplish veins, especially on the larger end. It is a bird much admired for its song; and, like the nightingale, it sings in the night.

6. The oryzivora, or rice-bunting, with the head and whole under side of the body black; hind part of the neck

neck in some pale yellow, and others white; coverts of the wings, and primaries, black, the last edged with white; part of the scapulars, lesser coverts of the wings, and rump, white; back black, edged with dull yellow; tail of the same colours, and each feather sharply pointed; the legs are red. The head, upper part of the neck, and back, of the female, is yellowish brown, spotted with black; the under part, of a dull yellow; the sides thinly streaked with black.

These birds inhabit in vast numbers the island of Cuba, where they commit great ravages among the early crops of rice, which precede those of Carolina. As soon as the crops of that state are to their palate, they quit Cuba, and pass over the sea, in numerous flights, directly north; and are very often heard in their passage by sailors frequenting that course. Their appearance is in September, while the rice is yet milky; and commit such devastions, that 40 acres of that grain have been totally ruined by them in a small time. They arrive very lean: but soon grow so fat, as to fly with difficulty; and, when shot, often burst with the fall. They continue in Carolina not much above three weeks, and retire by the time the rice begins to harden; going on to other parts, and staying in each only so long as the rice continues green. They come into Rhode Island and New York at the end of April, or the second week in May, frequenting the borders of fields, and live on insects, &c. till the maize is fit for their palate; when they begin by picking holes in the sides of the husks, and after satiating themselves go on to another; which leaves room for the rain to get in, and effectually spoils the plants. They continue there during the summer, and breed; returning, as autumn approaches, to the southward. The males and females do not arrive together; the females come first.—They are esteemed to be the most delicate birds of those parts; and the male is said to have a fine note. This species is known in the country by the names of *bob lincoln* and *conquedle*; likewise called by some the *white-backed maize thief*.

There are above 50 other species; two of which, *viz.* the black-throated bunting a native of America, and the cinereous bunting an inhabitant of Canada, are figured on Plate CLXXXII. as specimens of the genus.

EMBLEM, a kind of painted ænigma, which, representing some obvious history, with reflections underneath, instructs us in some moral truth or other matter of knowledge. See DEVISE, ÆNIGMA, &c.

Such is that very significant image of Scævola holding his hand in the fire; with the words, *Agere et pati fortiter Romanum est*, "To do and suffer courageously is Roman."

The word is pure Greek, formed of the verb εμϐαλλειν, "to cast in, to insert." Suetonius relates, that Tiberius made the word be erased out of the decree of the Roman senate, because borrowed from another language.

The emblem is somewhat plainer and more obvious than the ænigma.—Gale defines emblem an ingenious picture, representing one thing to the eye, and another to the understanding.

The Greeks also give the name EMBLEMS εμϐληματα, to inlayed or Mosaic works, and even to all kinds of ornaments of vases, moveables, garments, &c. And the Latins used *emblema* in the same sense. Accordingly, Cicero reproaching Verres with the statues and fine wrought works he had plundered from the Sicilians, calls the ornaments fixed thereto (and which on occasion might be separated from them) *emblemata*. Add, that Latin authors frequently compare the figures and ornaments of discourse to these *emblemata*. Thus, an ancient Latin poet praising an orator, says, that all his words were ranged like the pieces in Mosaic:

Quam lepipe λεξεις *compostæ, ut tesserulæ omnes,*
Arte pavimenti, atque emblemate *vermiculato.*

With us, emblem ordinarily signifies no more than a painting, basso-relievo, or other representation, intended to hold forth some moral or political instruction.

What distinguishes an emblem from a devise is, that the words of an emblem have a full complete sense of themselves; nay, all the sense and signification which they have together with the figure. But there is a yet further difference between emblem and devise; for a devise is a symbol appropriated to some person, or that expresses something which concerns him particularly; whereas an emblem is a symbol that regards all the world alike.

These differences will be more apparent, from comparing the emblem above quoted, with the devise of a candle lighted, and the words *Juvando consumor*, "I waste myself in doing good." See DEVISE.

EMBOLISMUS, Εμϐολισμος, in chronology, signifies "intercalation." The word is formed of εμϐαλλειν, "to insert."

As the Greeks made use of the lunar year, which is only 354 days, in order to bring it to the solar, which is 365 days, they had every two or three years an embolism, i. e. they added a 13th lunar month every two or three years, which additional month they called *embolimæus*, εμϐολιμαιος, because inserted, or intercalated.

EMBOSSING, or IMBOSSING, in architecture and sculpture, the forming or fashioning works in relievo, whether cut with a chisel or otherwise.

Embossing is a kind of sculpture, wherein the figures stick out from the plane wherein it is cut: and according as the figures are more or less prominent, they are said to be in alto, mezzo, or basso, relievo; or high, mean, or low, relief. See ENCHASING.

EMBOTHRIUM, in botany: A genus of the monogynia order, belonging to the tetrandria class of plants. There is no calyx; the corolla consists of four linear oblique petals; the stamina are four very short filaments; the antheræ are pretty large, oblong, and seated within the cavity of the petal. The pericarpium is a round unilocular follicle, sharpened at both ends; the seeds are four or five in number, egg-shaped, and compressed.

EMBRASURE, in architecture, the enlargement made of the aperture of a door or window, on the inside of the wall; its use being to give the greater play for the opening of the door or casement, or to admit the more light.

EMBROCATION, in surgery and pharmacy, an external kind of remedy, which consists in an irrigation of the part affected, with some proper liquor, as oils, spirits, &c. by means of a woollen or linen cloth, or a spunge, dipped in the same.

EMBROIDERY, a work in gold, or silver, or silk thread, wrought by the needle upon cloth, stuffs, or muslin,

muslin, into various figures. In embroidering stuffs the work is performed in a kind of loom; because the more the piece is stretched, the easier it is worked. As to muslin, they spread it upon a pattern ready designed; and sometimes before it is stretched upon the pattern, it is starched, to make it more easy to handle. Embroidery on the loom is less tedious than the other, in which, while they work flowers, all the threads of the muslin, both lengthways and breadthwise, must be continually counted; but, on the other hand, this last is much richer in points, and susceptible of greater variety. Cloths too much milled are scarce susceptible of this ornament, and in effect we seldom see them embroidered. The thinnest muslins are left for this purpose; and they are embroidered to the greatest perfection in Saxony: in other parts of Europe, however, they embroider very prettily, and especially in France.

There are several kinds of embroidery: as, 1. Embroidery on the stamp; where the figures are raised and rounded, having cotton or parchment put under them to support them. 2. Low embroidery; where the gold and silver lie low upon the sketch, and are stitched with silk of the same colour. 3. Guimped embroidery: this is performed either in gold or silver; they first make a sketch upon the cloth, then put on cut vellum, and afterwards sew on the gold and silver with silk thread: in this kind of embroidery they often put gold and silver cord, tinsel, and spangles. 4. Embroidery on both sides; that which appears on both sides of the stuff. 5. Plain embroidery; where the figures are flat and even, without cords, spangles, or other ornaments.

By stat. 22. Geo. II. c. 36. no foreign imbroidery, or gold and silver brocade, shall be imported, upon pain of being forfeited and burnt, and penalty of 100 l. for each piece. No person shall sell, or expose to sale, any foreign embroidery, gold or silver thread, lace, fringe, brocade, or make up the same into any garment, on pain of having it forfeited and burnt, and penalty of 100l. All such embroidery, &c. may be seized and burnt; and the mercer, &c. in whose custody it was found, shall forfeit 100 l.

EMBRUN, or AMBRUN, a city of Dauphiny, in France, near the confines of Piedmont. E. Long. 6. 6. N. Lat. 44. 35.

EMBRYO, in physiology, the first rudiments of an animal in the womb, before the several members are distinctly formed; after which period it is denominated a *fetus*. See GENERATION, and FETUS.

EMERALD, a genus of precious stones belonging to the order of the siliceous earths. The word is derived according to some, from the French *esmeraude*, and that from the Latin *smaragdus*, signifying the same thing; by others it is said to be derived from the Italian *smeraldo*, or the Arabian *zomorrad*. According to Cronstedt the emerald is the softest of all the precious stones, though other naturalists place it the next after the diamond in this respect. It is perhaps the most beautiful of all the gems, and, according to Wallerius, when heated in the fire, changes its colour to a deep blue, and becomes phosporescent; but recovers its green colour when cold. When pulverised it has a white appearance, and, with borax, melts to a very thin and colourless glass. It becomes electric by being rubbed, and some have the property of the tourmalin, viz. of being electrified by heat, and in that instance attracting ashes or other light substances; though the emeralds are less powerful than the tourmalin, and after having attracted the ashes, they retain them without any signs of repulsion.

Pliny mentions twelve different kinds of these precious stones; though it appears, from the vast size of some of them, that they must have been only certain kinds of green spar, or other green stone, which at that time went under the name of *emerald* among the ancients. The true emerald is found only in very small crystals, from the size $\frac{1}{16}$th of an inch in diameter to that of a walnut. Theophrastus, however, mentions one four cubits long and three broad; likewise an obelisk composed only of four emeralds, the whole length being 40 cubits, and the breadth from four to two.

Engestroom informs us, that the emeralds in their rough or native state, consist of hexagonal columns mostly truncated at both ends; and that he had some in his possession, which in a gentle heat became colourless; but in a strong heat white and opaque, without any mark of fusion. Brunick distinguishes them into two classes. 1. The pale green emerald, which comes from the east and from Peru, the figure being that of a hexagonal truncated prism, and the basis a vein of white quarz. 2. The dark green emerald, which is also columnar but very dark-coloured, striped longitudinally, and has little transparency. The points are generally broken off longitudinally, though Davila mentions one resembling a blunt triangular pyramid; and in the Imperial cabinet at Vienna, there is one with a five-sided pyramid. These are the emeralds which become electrical by heat; though all of them do not; and those which do so cannot be known but by actual experiment. The finest specimen of the former kind of emeralds is to be seen in the treasure of the holy chapel of Loretto, containing upwards of 100 of these precious stones great and small. A fellow to this was made by art, and both were presents to the king of Sicily, designed to represent two mount Calvaries.

Emeralds are distinguished by the jewellers into two kinds, the oriental and occidental. The true oriental emerald is very scarce, and at present only found in the kingdom of Cambay. So great indeed is the scarcity of them, that an opinion prevailed that there are no oriental emeralds. This opinion is adopted, among others, by Mr Bruce; who informs us, that he made an excursion to the island of emeralds in the Red Sea, and endeavours to show that there never were any emeralds but what came from America, and that those said to have been found in the East-Indies were imported from that continent. It is probable indeed, that in former times any kind of crystal tinged of a green colour might be called an *emerald*, and hence the green cochle spar brought from Egypt may have obtained the name of *mother of emeralds*; but of late some emeralds have been brought from Cambay into Italy which greatly excelled those of America. The best emeralds of the western continent come from Peru, and are called *oriental* by the jewellers: some are found in Europe, principally in the ducy of Silesia in Germany.

Rough EMERALDS.—Those of the first and coarsest sort, called *plasmes*, for grinding, are worth 27 shillings sterling the marc, or 8 ounces. The demi-morillons, 8l. sterl. per marc. Good morillons, which are only little pieces,

pieces, but of fine colour, from 13l. to 15l. per marc. Emeralds, larger than morillons, and called *of the third colour* or *sort*, are valued at from 50l. to 60l. the marc. Emeralds called *of the second sort*, which are in larger and finer pieces than the preceding, are worth from 65l. to 75l. per marc. Lastly, those of the first colour, otherwise called *negres cartes*, are worth from 110l. to 115l.

EMERALDS ready cut, or polished and not cut, being of good stone, and a fine colour, are worth,

	L.	s.
Those weighing one caract, or four grains	0	10
Those of two caracts —— ——	1	7
Those of three caracts —— ——	2	5
Those of four caracts —— ——	3	10
Those of five caracts —— ——	4	10
Those of six caracts —— ——	7	10
Those of seven caracts —— ——	15	0
Those of eight caracts —— ——	19	0
Those of nine caracts —— ——	23	0
Those of ten caracts —— ——	33	0

To counterfeit EMERALDS: Take of natural crystal, four ounces; of red-lead, four ounces; verdegris, forty-eight grains; crocus martis, prepared with vinegar, eight grains: let the whole be finely pulverized and sifted: put this into a crucible, leaving one inch empty: lute it well, and put it into a potter's furnace, and let it stand there as long as they do their pots. When cold, break the crucible; and you will find a matter of a fine emerald colour, which, after it is cut and set in gold, will surpass in beauty an oriental emerald.

EMERSION, in physics, the rising of any solid above the surface of a fluid specifically heavier than itself, into which it had been violently immerged or thrust.

It is one of the known laws of hydrostatics, that a lighter solid being forced down into a heavier fluid, immediately endeavours to emerge; and that with a force or moment equal to the excess of weight of a quantity of the fluid above that of an equal bulk of the solid. Thus, if a solid be immerged in a fluid of double its specific gravity, it will emerge again till half its bulk or body be above the surface of the fluid.

EMERSION, in astronomy, is when the sun, moon, or other planet, begins to re-appear, after its having been eclipsed, or hid by the interposition of the moon, earth, or other body.

The difference of longitude is sometimes found by observing the immersions and emersions of the first of Jupiter's satellites. The immersions are observed from the time of Jupiter's being in conjunction with the sun to his opposition; and the emersion, from the opposition to the conjunction; which two intervals are usually six months a-piece, and divide the year between them. But when Jupiter is in conjunction with the sun, and 15 days before and afterwards, there is nothing to be observed; the planet, with his satellites, being then lost in the light of the sun.

EMERSION is also used when a star, before hid by the sun, as being too near him, begins to re-appear, and get out of his rays.

EMERSON (William), a late eminent mathematician, was born in June 1701, at Hurworth, a village about three miles south of Darlington; at least it is certain that he resided here from his childhood. His father Dudley Emerson was a tolerable proficient in mathematics; and without his books and instructions, perhaps his own genius (most eminently fitted for mathematical disquisitions) would have never been unfolded. He was instructed in the learned languages by a young clergyman, then curate of Hurworth, who was boarded at his father's house. In the earlier part of his life he attempted to teach a few scholars: but whether from his concise method (for he was not happy in explaining his ideas), or the warmth of his natural temper, he made no progress in his school: he therefore soon left it off; and satisfied with a moderate competence left him by his parents, he devoted himself to a studious retirement. Towards the close of the year 1781 (being sensible of his approaching dissolution), he disposed of the whole of his mathematical library to a bookseller at York; and on May 20th 1782, he died of a lingering and painful disorder at his native village, aged near 81 years.

Mr Emerson in his person was rather short, but strong and well-made, with an open countenance and ruddy complexion. He was exceedingly singular in his dress. He had but one coat, which he always wore open before, except the lower button: no waistcoat; his shirt quite the reverse of one in common use, no opening before, but buttoned close at the collar behind: a kind of flaxen wig, which had not a crooked hair in it, and probably had never been tortured with a comb from the time of its being made. He always walked up to London when he had any thing to publish, revising sheet by sheet himself:—Trusting no eyes but his own, was always a favourite maxim with him. He never advanced any mathematical proposition that he had not first tried in practice, constantly making all the different parts himself on a small scale, so that his house was filled with all kinds of mechanical instruments together or disjointed. He would frequently stand up to his middle in water while fishing, a diversion he was remarkably fond of. He used to study incessantly for some time, and then for relaxation take a ramble to any pot ale-house where he could get any body to drink with and talk to. The duke of Manchester was highly pleased with his company, and used often to come to him in the fields and accompany him home, but could never persuade him to get into a carriage. On these occasions he would sometimes exclaim, "Damn your whim-wham! I had rather walk." He was a married man; and his wife used to spin on an old-fashioned wheel, whereof a very accurate drawing is given in his mechanics. He was deeply skilled in the science of music, the theory of sounds, and the various scales both ancient and modern, but was a very poor performer.

The following is a list of Mr Emerson's works. 1. The doctrine of Fluxions. 2. The Projection of the Sphere, orthographic, stereographic, and gnomonical. 3. The Elements of Trigonometry. 4. The Principles of Mechanics. 5. A Treatise of Navigation on the Sea. 6. A Treatise of Algebra, in two books. 7. The Arithmetic of Infinites, and the differential method, illustrated by Examples. 8. Mechanics; or the Doctrine of Motion. 9. The Elements of Optics, in four books. 10. A System of Astronomy. 11. The

Emery. 11. The Laws of Centripetal and Centrifugal Force. 12. The mathematical principles of Geography. 13. Tracts, 8vo. 14. Cyclomathesis; or an easy Introduction to the several branches of the Mathematics. 15. A short Comment on Sir Isaac Newton's Principia; to which is added, A Defence of Sir Isaac against the Objections that have been made to several Parts of his works. 16. A Miscellaneous Treatise, containing several Mathematical Subjects, 8vo. 1776.

EMERY, in natural history, a rich iron-ore found in large masses of no determinate shape or size, extremely hard, and very heavy. It is usually of a dusky brownish red on the surface; but when broken, is of a fine bright iron-grey, but not without some tinge of redness; and is spangled all over with shining specks, which are small flakes of a foliaceous talc, highly impregnated with iron. It is also sometimes very red, and then usually contains veins of gold. It makes no effervescence with any of the acid menstruums; and is found in the island of Guernsey, in Tuscany, and many parts of Germany.

Phil. Com. p. 607. Dr. Lewis is of opinion, that some kinds of emery may contain the metal called *platina*, and on this subject has the following curious observations: Alonso Barba mentions a substance called *chumpi*; which is a hard stone of the emery kind, participating of iron, of a grey colour shining a little, very hard to work, because it resists the fire much, found in Potosi, Chocaya, and other places, along with blackish and reddish ores that yield gold. If Platina is really found in large masses, either generally or only now and then, one might reasonably expect those masses to be such as are here described.

"Of the same kind perhaps also is the mineral mentioned by several authors under the name of Spanish emery, *smiris Hispanica*, which should seem, from the accounts given of it, to be no other than platina or its matrix. The *smiris* is said to be found in the gold mines, and its exportation prohibited; to contain films or veins of native gold; to be in great request among the alchemists; to have been sometimes used for the adulteration of gold; to stand, equally with the noble metal, cupellation, quartation, antimony, and the regal cement; and to be separable from it by amalgamation with mercury, which throws out the *smiris* and retains the gold; properties strongly characteristic of platina, and which do not belong to any known substance besides. This debasement of gold *per extractum smiridis Hispanici* is mentioned by Becher in his *Minera arenaria*, and several times hinted at in his *Physica subterranea*. Both Becher and Stahl indeed call the substance which the gold receives from the emery an earth, whereas platina is undoubtedly a metal; but this does not at all invalidate our supposition, for they give the name of earth also to the substance which copper receives from calamine in being made into brass, which is now known to be metallic.

"From these observations I have been led to suspect, that the European emeries likewise might possibly participate of platina. If this was certain, it would account satisfactorily for the use which some of the alchemists are said to have made of emeries and other ferruginous ores; and we should no longer doubt, or wonder, that by treating gold with these kinds of minerals, they obtained a permanent augmentation; that this augmentation, though it resisted lead, antimony, aquafortis, and the regal cement, was separable, as Becher owns it was, by quicksilver; and that, when it exceeded certain limits, it rendered the gold pale and brittle.

Emery ‖ Eminence.

"If emery contains platina, I imagined it might be discoverable by boiling the powdered mineral in melted lead, and afterwards working off the lead upon a test or cupel. The experiment was made with eight ounces of the finest powder of common emery, and the same quantity of lead; which were covered with black flux to prevent the scorification of the lead, and urged with a strong fire for two or three hours. The lead became hard, rigid, of a dark colour, and a granulated texture, as if it had really imbibed some platina from the emery; but in cupellation it worked almost entirely off, leaving only a bead about the size of a small pin's head, which was probably no other than silver contained in the lead.

"I repeated the experiment with some variation, thinking to obtain a more perfect resolution of the emery by vitrifying it with lead. Two ounces of fine emery and six ounces of minium were well mixed together, and urged with a strong fire, in a close crucible, for an hour: they melted into an uniform dark brownish glass. The glass was powdered, mixed with four ounces of fixt alkaline salt and some powdered charcoal, and put into a fresh crucible, with some common salt on the surface: The fire was pretty strongly excited; but the fusion was not so perfect as could be wished, and only about two ounces of lead were found revived. This lead had suffered nearly the same change as that in the foregoing experiment; and, like it, gave no appearance of platina on being cupelled.

"It seems to follow from these experiments, that the emery employed in them contained no platina; but as it is not to be supposed that all emeries are of one composition, other sorts may deserve to be submitted to the same trials. As gold is contained in some parcels of common minerals, and by no means in all the individuals of any one species; platina may possibly in like manner be found in some European ores, though there is not the least footstep of it in other parcels of the same kind of ore."

EMETICS, medicines that induce vomiting.

EMIMS, ancient inhabitants of the land of Canaan beyond Jordan, who were defeated by Chederlaomer and his allies, Gen. xiv. 5. Moses tells us, that they were beaten in Shaveh Kirjathaim, which was in the country of Sihon conquered from the Moabites, Josh. xiii. 19—21. The Emims were a warlike people, of a gigantic stature, great and many, and tall as the Anakims.

EMINENCE, in geography, a little hillock or ascent above the level of the adjoining champaign.

Eminence is also a title of honour given to cardinals. The decree of the pope, whereby it was appointed that the cardinals should be addressed under the quality of *eminence*, bears date the 10th of January 1630. They then laid aside the titles of *illustrissimi*, and *reverendissimi*, which they had borne before.

The grand master of Malta is likewise addressed under the quality of *eminence*. The popes John VIII. and Gregory VII. gave the same titles to the kings of France. The emperors have likewise borne it.

Eminentissimus, the superlative of *eminent*, has of late been attributed to the cardinals.

EMIR, a title of dignity among the Turks, signifying a prince.

This title was first given to the caliphs; but when they assumed the title of Sultans, that of emir remained to their children; as that of Cæsar among the Romans. At length the title came to be attributed to all who were judged to descend from Mahomet by his daughter Fatimah, and who wear the green turban instead of the white. The Turks make an observation, that the emirs, before their fortieth year, are men of the greatest gravity, learning, and wisdom; but after this, if they are not great fools, they discover some signs of levity and stupidity. This is interpreted by the Turks a sort of divine impulse in token of their birth and sanctity. The Turks also call the vizirs, bashaws, or governors of provinces, by this name.

EMISSARY, in a political sense, a person employed by another to sound the opinions of people, spread certain reports, or act as a spy over other people's actions.

EMISSARY-*Vessels*, in anatomy, the same with those more commonly called EXCRETORY.

EMISSION, in medicine, a term used chiefly to denote the ejaculation of the semen or seed in the act of coition. See COITION, and GENERATION.

EMMANUEL, or IMMANUEL, a Hebrew word which signifies, 'God with us.' Isaiah (viii. 14.), in that celebrated prophecy, wherein he declares to Ahaz the birth of the Messiah, who was to be born of a virgin, says, This child shall be called, and really be, Emmanuel, that is, *God with us*. The same prophet (viii. 8.) repeats the same thing, while he is speaking of the enemy's army, which, like a torrent, was to overflow Judea. 'The stretching out of his wings shall fill the breadth of thy land, O Emmanuel.' The evangelist Matthew (i. 23.) informs us, that this prophecy was accomplished in the birth of Jesus Christ, who was born in Bethlehem of Judah, of the virgin Mary, and who was properly Emmanuel, or 'God with us.'

EMMERICK, a rich fortified town of Germany, in the circle of Westphalia, and duchy of Cleves. It carries on a good trade with the Dutch, and both Protestants and Catholics have the free exercise of their religion. The streets are neat and regular, and the houses tolerably built. It was taken by the French in 1672, and delivered to the elector of Brandenburgh, in 1673, under whose jurisdiction it now is. It is seated near the Rhine. E. Long. 5. 29. N. Lat. 52. 5.

EMMIUS (Ubbo), born at Gretha in East-Friesland in 1547, was a very learned professor, and chosen rector of the college of Norden in 1579. This seminary flourished exceedingly under his care; and declined as visibly after he was ejected, in 1587, for refusing to subscribe the Confession of Augsburg. The year after, he was made rector of the college of Leer; and when the city of Groningen confederated with the United Provinces, the magistrates appointed him rector of that college: which employment he filled with the highest repute near 20 years; until, the college being erected into an university, he was the first rector, and one of the chief ornaments of it by his lectures, till his infirmities prevented his public appearance. His wisdom was equal to his learning; so that the governor of Friesland and Groningen often consulted him, and seldom failed to follow his advice. He wrote *Vetus Græcia illustrata*, 3 vols; *Decades Rerum Fresicarum*; and many other valuable works. He died in 1625.

EMMENAGOGUES, εμμηναγωγα, in medicine, such remedies as promote the menstrual discharge. They are thus called from εν "in," μην "month," αγω *duco*, "I lead," because their natural periods of flowing are once a-month.

EMOLLIENTS, in medicine and pharmacy, are such remedies as sheath and soften the asperity of the humours, and relax and supply the solids at the same time.

EMOLUMENT, is properly applied to the profits arising daily from an office or employ. The word is formed of the Latin *emolumentum*, which according to some, primarily signifies the profits redounding to the miller from his mill; of *molo*, *molere*, "to grind."—The patent, or other instrument, whereby a person is preferred to an office, gives him a right to enjoy all the dues, honours, profits, and emoluments belonging thereto.—*emolument* is also used, in a somewhat greater latitude, for profit or advantage in the general.

EMOTION and PASSION, in the human mind, are thus distinguished by a celebrated writer *. An internal motion or agitation in the mind, when it passeth away without desire, is denominated *an emotion*: when desire follows, the motion or agitation is denominated *a passion*. A fine face, for example, raiseth in me a pleasant feeling: if that feeling vanish without producing any effect, it is in proper language an *emotion*; but if the feeling, by reiterated views of the object, becomes sufficiently strong to occasion desire, it loses its name of emotion, and acquires that of *passion*. The same holds in all the other passions. The painful feeling raised in a spectator by a slight injury done to a stranger, being accompanied with no desire of revenge, is termed an emotion; but that injury raiseth in the stranger a stronger emotion, which being accompanied with desire of revenge, is a passion. External expressions of distress produce in the spectator a painful feeling, which being sometimes so slight as to pass away without any effect, is an emotion; but if the feeling be so strong as to prompt desire of affording relief, it is a passion, and is termed *pity*. Envy is emulation in excess: if the exaltation of a competitor be barely disagreeable, the painful feeling is an emotion; if it produce desire to depress him, it is a passion. See PASSION.

* *Elem. of Criticism*, vol. i. p. 41.

EMOUY, or HIA-MEN, an island and port of China, under the jurisdiction of the province of FO-KIEN.

The port is properly but an anchoring-place for ships, inclosed on one side by the island from which it takes its name, and on the other by the main land: but it is so extensive, that it can contain several thousands of vessels; and the depth of its water is so great, that the largest ships may lie close to the shore without danger.

In the beginning of the present century it was much frequented by European vessels; but few visit it at present, as all the trade is carried on at Canton. The emperor keeps here a garrison of 6 or 7000 men, commanded by a Chinese general. In entering this

Emouy. road, a large rock muſt be doubled which ſtands at the mouth of it, and divides it almoſt as the Mingant divides the harbour of Breſt. This rock is viſible, and riſes ſeveral feet above the ſurface of the water.

The iſland of Emouy is particularly celebrated on account of the magnificence of its principal pagod, conſecrated to the deity Fo. This temple is ſituated in a plain, terminated on one ſide by the ſea, and on the other by a lofty mountain. Before it the ſea, flowing through different channels, forms a large ſheet of water which is bordered with turf of the moſt beautiful verdure. The front of this edifice is 180 feet in length, and its gate is adorned with figures in relief, which are the uſual ornaments of the Chineſe architecture. On entering, you find a vaſt portico, with an altar in the middle, on which is placed a gigantic ſtatue of gilt braſs, repreſenting the god Fo, ſitting croſs-legged. Four other ſtatues are placed at the corners of this portico, which are 18 feet high, although they repreſent people ſitting. Each of theſe ſtatues is formed from a ſingle block of ſtone. They bear in their hands different ſymbols which mark their attributes, as formerly in Athens and Rome the trident and caduceus diſtinguiſhed Neptune and Mercury. One holds a ſerpent in its arms, which is twiſted round its body in ſeveral folds; the ſecond has a bent bow and a quiver; the two others preſent, one a kind of battle-axe, and the other a guitar, or ſome inſtrument of the ſame kind.

After croſſing this portico, you enter a ſquare outer court, paved with large gray ſtones, the leaſt of which is ten feet in length and four in breadth. At the four ſides of this court ariſe four pavilions, which terminate in domes, and have a communication with one another by means of a gallery which runs quite round it. One of theſe contains a bell ten feet in diameter; the wooden-work which ſupports this heavy maſs cannot be ſufficiently admired. In the other is kept a drum of an enormous ſize, which the bonzes uſe to proclaim the days of new and full moon. It muſt be obſerved, that the clappers of the Chineſe bells are on the outſide, and made of wood in the form of a mallet. The two other pavilions contain the ornaments of the temple, and often ſerve to lodge travellers, whom the bonzes are obliged to receive. In the middle of this court is a large tower, which ſtands by itſelf, and terminates alſo in a dome, to which you aſcend by a beautiful ſtone ſtair-caſe that winds round it. This dome contains a temple remarkably neat; the cieling is ornamented with moſaic work, and the walls are covered with ſtone figures in relief, repreſenting animals and monſters. The pillars which ſupport the roof of this edifice are of wood varniſhed; and on feſtivals are ornamented with ſmall flags of different colours. The pavement of the temple is formed of little ſhells, and its different compartments preſent birds, butterflies, flowers, &c.

The bonzes continually burn incenſe upon the altar, and keep the lamps lighted, which hang from the ceiling of the temple. At one extremity of the altar ſtands a brazen urn, which when ſtruck ſends forth a mournful ſound: on the oppoſite ſide is a hollow machine of wood, of an oval form, uſed for the ſame purpoſe, which is to accompany with its ſound their voices when they ſing in praiſe of the tutelary idol of the pagod. The god Pouſſa is placed on the middle of this altar, on a flower of gilt braſs, which ſerves as a baſe, and holds a young child in his arms; ſeveral idols, which are no doubt ſubaltern deities, are ranged around him, and ſhow by their attitudes their reſpect and veneration.

Emouy, Empalement.

The bonzes have traced out on the walls of this temple ſeveral hierogliphical characters in praiſe of Pouſſa; there is alſo to be ſeen an hiſtorical or allegorical painting in freſco, which repreſents a burning lake, in which ſeveral men appear to be ſwimming, ſome carried by monſters, others ſurrounded by dragons and winged ſerpents. In the middle of the gulph riſes a ſteep rock, on the top of which the god is ſeated, holding in his arms a child, who ſeems to call out to thoſe who are in the flames of the lake; but an old man, with hanging ears and horns on his head, prevents them from climbing to the ſummit of the rock, and threatens to drive them back with a large club. The bonzes are at a loſs what anſwer to give, when any queſtions are aſked them concerning this painting. Behind the altar is a kind of library, containing books which treat of the worſhip of idols.

On deſcending from this dome you croſs the court, and enter a kind of gallery, the walls of which are lined with boards; it contains 24 ſtatues of gilt braſs, repreſenting the ſame number of philoſophers, ancient diſciples of Confucius. At the end of this gallery you find a large hall, which is the refectory of the bonzes; and after having traverſed a ſpacious apartment, you at length enter the temple of Fo, to which there is an aſcent by a large ſtone ſtair-caſe. It is ornamented with vaſes full of artificial flowers (a work in which the Chineſe excel); and here alſo are found the ſame kind of muſical inſtruments as thoſe mentioned before. The ſtatue of the god is not to be ſeen but through a piece of black gauze, which forms a kind of veil or curtain before the altar. The reſt of the pagod conſiſts of ſeveral large chambers, exceedingly neat, but badly diſpoſed; the gardens and pleaſure grounds are on the declivity of the mountain; and a number of delightful grottos are cut out in the rock, which afford an agreeable ſhelter from the exceſſive heat of the ſun.

There are ſeveral other pagods in the iſle of Emouy; among which is one called *The Pagod of the Ten Thouſand Stones*, becauſe it is built on the brow of a mountain where there is a like number of little rocks, under which the bonzes have formed grottos and very pleaſant covered ſeats. A certain rural ſimplicity reigns here, which captivates and delights.

Strangers are received by theſe bonzes with great politeneſs, and may freely enter their temples; but they muſt not attempt to gratify their curioſity fully, nor to enter thoſe apartments into which they are not introduced, eſpecially if they are accompanied by ſuſpicious perſons; for the bonzes, who are forbid under pain of ſevere puniſhment to have any intercourſe with women, and who often keep them in private, might, from fear of being diſcovered, revenge themſelves for too impertinent a curioſity.

EMPALEMENT, an ancient kind of puniſhment, which conſiſted in thruſting a ſtake up the fundament. The word comes from the French *empaler*, or the Italian *impalare*; or rather, they are all alike derived from

from the Latin *palus* "a stake," and the proposition *in*, "in or into." We find mention of empaling in Juvenal. It was frequently practised in the time of Nero, and continues to be so in Turkey.

Empalement of a Flower, the same with Calyx.

EMPANNELLING. See Impannelling.

EMPARLANCE. See Imparlance.

EMPEDOCLES, a celebrated philosopher and poet, was born at Agrigentum, a city in Sicily. He followed the Pythagorean philosophy, and admitted the metemsychosis. He constantly appeared with a crown of gold on his head; to maintain, by this outward pomp, the reputation he had acquired of being a very extraordinary man. Yet Aristotle says, that he was a great lover of liberty, extremely averse to state and command, and that he even refused a kingdom that was offered him. His principal work was a Treatise in verse on the Nature and Principles of Things. Aristotle, Lucretius, and all the ancients, make the most magnificent elogiums on his poetry and eloquence.

He taught rhetoric; and often alleviated the anxieties of his mind, as well as the pains of his body, with music. It is reported, that his curiosity to visit the flames of the crater of Ætna proved fatal to him. Some maintain that he wished it to believed that he was a god; and that his death might be unknown, he threw himself into the crater and perished in the flames. His expectations, however, were frustrated; and the volcano by throwing up one of his sandals discovered to the world that Empedocles had perished by fire. Others report that he lived to an extreme old age; and that he was drowned in the sea about 440 years before the Christian era.

EMPEROR *(imperator)*, among the ancient Romans, signified a general of an army, who, for some extraordinary success, had been complimented with this appellation. Thus Augustus, having obtained no less than twenty famous victories, was as often saluted with the title *emperor*; and Titus was denominated *emperor* by his army after the reduction of Jerusalem.

Afterwards, it came to denominate an absolute monarch or supreme commander of an empire. In this sense Julius Cæsar was called *emperor*: the same title descended with the dignity to Octavius, Augustus, Tiberius, and Caligula; and afterwards it became elective.

In strictness, the title *emperor* does not, and cannot, add any thing to the rights of sovereignty: its effect is only to give precedence and pre-eminence above other sovereigns; and as such, it raises those invested with it to the summit of all human greatness.

It is disputed, whether or not emperors have the power of disposing of the regal title. It is true, they have sometimes taken upon them to erect kingdoms; and thus it is that Bohemia and Poland are said to have been raised to the dignity: thus, also, the emperor Charles the Bald, in the year 877, gave Provence to Boson, putting the diadem on his head, and decreeing him to be called "king," *ut more priscorum imperatorum regibus videretur dominari*. Add, that the emperor Leopold erected the ducal Prussia into a kingdom in favour of the elector of Brandenburg; and though several of the kings of Europe refused for some time to acknowledge him in that capacity, yet by the treaty of Utrecht in 1712 they all came in.

In the East, the title and quality of emperor are more frequent than in Europe; thus, the sovereign princes of China, Japan, Mogul, Persia, &c. are all emperors of China, Japan, &c. In the year 1723, the czar of Muscovy assumed the title of *emperor of all Russia*, and procured himself to be recognized as such by most of the princes and states of Europe.

In the West, the title has been a long time restrained to the emperors of Germany. The first who bore it was Charlemagne, who had the title of emperor conferred on him by Pope Leo III. though he had all the power before. The imperial prerogatives were formerly much more extensive than they are at present. At the close of the Saxon race, A. D. 1024, they exercised the right of conferring all the ecclesiastical benefices in Germany; of receiving the revenues of them during a vacancy; of succeeding to the effects of intestate ecclesiastics; of confirming or annulling the elections of the popes; of assembling councils, and of appointing them to decide concerning the affairs of the church; of conferring the title of king on their vassals; of granting vacant fiefs; of receiving the revenues of the empire; of governing Italy as its proper sovereigns; of erecting free cities, and establishing fairs in them; of assembling the diets of the empire, and fixing the time of their duration; of coining money, and conferring the same privilege on the states of the empire; and of administering both high and low justice within the territories of the different states: but in the year 1437, they were reduced to the right of conferring all dignities and titles, except the privilege of being a state of the empire; of *preces primariæ*, or of appointing once during their reign a dignitary in each chapter or religious house; of granting dispensations with respect to the age of majority; of erecting cities, and conferring the privilege of coining money; of calling the meetings of the diet, and presiding in them.

To which some have added, 1. That all the princes and states of Germany are obliged to do them homage, and swear fidelity to them. 2. That they, or their generals, have a right to command the forces of all the princes of the empire, when united together. 3. That they receive a kind of tribute from all the princes and states of the empire, for carrying on a war which concerns the whole empire, which is called the *Roman month*. For the rest, there is not a foot of land or territory annexed to his title; but ever since the reign of Charles IV. the emperors have depended entirely on their hereditary dominions as the only source of their power, and even of their subsistence. See Diet and Electors.

The kings of France were anciently also called emperors, at the time when they reigned with their sons, whom they associated to the crown. Thus Hugh Capet, having associated his son Robert, took the title of emperor, and Robert that of king; under which titles they are mentioned in the History of the Council of Rheims, by Gerbert, &c. King Robert is also called emperor of the French by Helgau of Fleury. Louis le Gros, upon associating his son, did the same. In the First Register of the King's Charters, fol. 166, are found letters of Louis le Gros, dated in 1116, in favour of Raymond bishop of Maguelonne, wherein he styles himself, *Ludovicus, Dei ordinante providentia,*

Fran-

Francorum imperator augustus. The kings of England had likewise anciently the title of emperors, as appears from a charter of king Edgar: *Ego Edgarus Anglorem basileus, omnique regum iusularum oceani quæ Britanniam circumjacent, &c. imperator & dominus.*

EMPETRUM, BERRY-BEARING HEATH: A genus of the triandria order, belonging to the monœcia class of plants. In the natural method this genus is ranked by Linnæus under the 54th order, *Miscellaneæ*; and likewise among those of which the order is doubtful. The male calyx is tripartite; the corolla tripetalous; the stamina long; the female calyx is tripartite; the corolla tripetalous; the styles nine; the berry nine-seeded. There are two species; one of which, viz. the nigrum, which bears the crow-crake berries, is a native of Britain. It grows wild on boggy heaths and mountains. Children sometimes eat the berries; but, when taken in too great quantity, they are apt to occasion a head-ach. Grouse feed upon them. When boiled with allum, they afford a dark purple dye. Goats are not fond of it. Cows, sheep, and horses refuse it.

EMPHASIS, in rhetoric, a particular stress of the voice and action, laid on such parts or words of the oration as the orator wants to inforce upon his audience. See DECLAMATION: ORATORY, Part IV.; and READING.

EMPHYSEMA, in surgery, a windy tumor, generally occasioned by a fracture of the ribs, and formed by the air insinuating itself, by a small wound, between the skin and muscles, into the substance of the cellular or adipose membrane, spreading itself afterwards up to the neck, head, belly, and other parts, much after the manner in which butchers blow up their veal.

EMPIRE *(imperium)*, in political geography, a large extent of land, under the jurisdiction or government of an emperor. See EMPEROR.

In ancient history we read of four great monarchies or empires, viz. that of the Babylonians, Chaldeans, and Assyrians; that of the Medes and Persians; that of the Greeks; and that of the Romans. The first subsisted from the time of Nimrod, who founded it in the year of the world 1800, according to the computation of Usher, to Sardanapalus their last king in 3257, and consequently lasted above 1450 years. The empire of the Medes commenced under Arbace, in the year of the world 3257, and was united to that of the Babylonians and Persians under Cyrus, in 3468, and it closed with the death of Darius Codomannus in 3674. The Grecian empire lasted only during the reign of Alexander the Great, beginning in the year of the world 3674, and terminating with the death of this conqueror in 3681, his conquests being divided among his captains. The Roman empire commenced with Julius Cæsar, when he was made perpetual dictator, in the year of the city 708, and of the world 3956, 48 years before Christ. The seat of the empire was removed to Byzantium by Constantine, in the year of our Lord 334; the east and west were then united under the title of the Roman empire, till the Romans proclaimed Charlemagne emperor, A. D. 800. From this epocha the east and west formed two separate empires; that of the east, governed by Greek emperors, commenced A. D. 802: and being gradually weakened, terminated under Constantine Palæologus in 1453. The western empire was afterwards known by the appellation of the empire, or German empire.

Antiquaries distinguish between the medals of the *upper*, and *lower* or *bas, empire*.—The curious only value those of the upper empire, which commences with Cæsar or Augustus, and ends in the year of Christ 260. The lower empire comprehends near 1200 years reckoning down to the destruction of Constantinople in 1453.——They usually distinguish two ages, or periods, of the lower empire: the first beginning where the upper ends, viz. with Aurelian, and ending with Anastasius, including 200 years; the second beginning with Anastasius, and ending with the Palæologi, which includes 1000 years.

EMPIRE, or *The empire*, used absolutely and without any addition, signifies the empire of Germany; called also, in juridical acts and laws, The holy Roman empire. It had its beginning with the ninth century; Charlemagne being created first emperor by Pope Leo III. who put the crown on his head in St. Peter's church on Christmas-day in the year 800.

Authors are at a loss under what form of government to range the empire. Some of them maintain it to be a monarchial state, because all the members thereof are obliged to ask the investiture of their states of the emperor, and to take an oath of fidelity to him. Others consider it as a republic, or aristocratic state, because the emperor cannot resolve or determine any thing without the concurring suffrages of the princes. It is added, that if they require investiture from, and swear fealty to him, it is only as head of the republic, and in the name of the republic, and not in his own; just as at Venice every thing is transacted in the name of the doge. Others will have the empire to be a monarcho-aristocratic state, *i. e.* a mixture of monarchy and aristocracy; because, though the emperor in many cases seems to act sovereignly, yet his decrees and resolves have no force, in case the state refuse to confirm them. Lastly, it has been called an aristo-democratic state, because the diet, wherein the sovereignty is lodged, is composed of princes and the deputies of the cities; and is divided into three orders or bodies, called *colleges*, viz. the college of electors, the college of princes, and the college of cities.

We say, diet of the empire, circles of the empire, fiefs of the empire, princes of the empire, estates of the empire, members of the empire, capitulations of the empire. See DIET, CIRCLE, PRINCE, CAPITULATION, &c.

The states or estates of the empire are of two kinds, mediate and immediate. The immediate states are those who hold immediately of the empire: Whereof, again, there are two kinds; the first, such as have seats and voices in the imperial diet; the second, such as have none. The mediate states are those who hold of the immediate.

The states which now compose the empire are, The princes of the empire, the counts of the empire, the free barons of the empire, the prelates of the empire, the princesses or abbesses of the empire, the nobles of the empire, and the imperial cities.

EMPIRIC, an appellation given to those physicians who conduct themselves wholly by their own experience, without studying physic in a regular way.

Some even use the term, in a still worse sense, for a quack who prescribes at random, without being at all acquainted with the principles of the art.

EMPIS, in zoology, a genus of insects belonging to the order Diptera; of which the characters are these: The proboscis is of an horny substance, bivalve, reflexed under the head and breast, and longer than the thorax. See a specimen on Plate CLXXXII.

EMPLASTER. See PLASTER.

EMPORIÆ, a double city of the Hither Spain, near the Pyrenees; separated by a wall: one part occupied by the Greeks of Phocæa, whence originally are the Massilienses; the other, by native Spaniards, to whom was added by Augustus a Roman colony. Now Ampurias, in Catalonia. E. Long. 2. 50. N. Lat. 42. 15.

EMPORIUM, in medicine, is often used for the common sensory in the brain. See BRAIN.

EMPORIUM, (anc. geog.), two cities near Placentia; one well fortified, and guarded by a strong garrison, at which Hannibal met a repulse; the other Hannibal took and plundered. Now thought to be Ponte Nura, in the duchy of Placentia.

EMPRESS, the spouse of an emperor, or a woman who governs an empire. See EMPEROR.

EMPROSTHOTONOS, a species of convulsion, wherein the head bends forward.

EMPYÆMA, in medicine, a disorder wherein purulent matter is contained in the thorax or breast, after an inflammation and suppration of the lungs and pleura. See MEDICINE-*Index*.

EMPYREAL AIR. So Dr Higgins denominates that which Dr Priestley calls *dephlogisticated* air, and other philosophers *vital* or *pure* air.

EMPYREUM, a term used by divines for the highest heaven, where the blessed enjoy the the beatific vision. The word is formed of εν and πυρ *fire*, because of its splendor.

EMPYREUMA, in chemistry, signifies a very disagreeable smell produced from burnt oils. It is often perceived in distillations of animal as well as vegetable substances, when they are exposed to a quick fire.

EMRODS. See HEMORRHOIDS.

EMULATION, a generous ardor kindled by the praise-worthy examples of others, which impels us to imitate, to rival, and, if possible, to excel them. This passion involves in it esteem of the person whose attainments or conduct we emulate, of the qualities and actions in which we emulate him, and a desire of resemblance, together with a joy springing from the hope of success. The word comes originally from the Greek αμιλλα, *dispute, contest*; whence the Latin, *æmulus*, and thence our *emulation*.

Plato observes of emulation, that it is the daughter of envy; if so, there is a great difference between the mother and the offspring; the one is a virtue and the other a vice. Emulation admires great actions, and strives to imitate them; envy refuses them the praises that are their due; emulation is generous, and only thinks of surpassing a rival; envy is low, and only seeks to lessen him. Perhaps, therefore, it would be more just to suppose emulation the daughter of admiration: admiration, however, is a principal ingredient in the composition of it.

EMULGENT, or RENAL, ARTERIES, those which supply the kidneys with blood; being sometimes single, sometimes double, on each side. See ANATOMY, n°23.

EMULSION, a soft liquid remedy, of a colour and consistence resembling milk. See PHARMACY.

EMUNCTORY, in anatomy, a general term for all those parts which serve to carry off the excrementitious parts of the blood and other humours of the body. Such more especially are the kidneys, bladder, and most of the glands.

ENALLAGE, in grammar, is when one word is substituted for another of the same part of speech: A substantive for an adjective; as *exercitus victor*, for *victoriosus; scelus*, for *scelestus*: A primitive for a derivative; as *Dardana armo*, for *Dardania*: An active for a passive; as *nox humida cœlo præcipitat*, for *præcipitatur*, &c.

ENAMEL, in general, is a vitrified matter betwixt the parts of which is dispersed some unvitrified matter: hence enamel ought to have all the properties of glass except transparency.

Enamels have for their basis a pure crystal glass or frit, ground up with a fine calx of lead and tin prepared for the purpose, with the addition usually of white salt of tartar. These ingredients baked together are the matter of all enamels, which are made by adding colours of this or that kind in powder to this matter, and melting or incorporating them together in a furnace.

For white enamel, Neri (*De Arte Vitriar.*) directs only manganese to be added to the matter which constitutes the basis. For azure, zaffer mixed with calx of brass. For green, calx of brass with scales of iron, or with crocus martis. For black, zaffer with manganese or with crocus martis; or manganese with tartar. For red, manganese, or calx of copper and red tartar. For purple, manganese with calx of brass. For yellow, tartar and manganese. And for violet-coloured enamel, manganese with thrice-calcined brass.

In making these enamels, the following general cautions are necessary to be observed. 1. That the pots must be glazed with white glass, and must be such as will bear the fire. 2. That the matter of enamels must be very nicely mixed with the colours. 3. When the enamel is good, and the colour well incorporated, it must be taken from the fire with a pair of tongs. 4. The general way of making the coloured enamel is this: Powder, sift, and grind, all the colours very nicely, and first mix them with one another, and then with the common matter of enamels: then set them in pots in a furnace; and when they are well mixed and incorporated, cast them into water; and when dry, set them in a furnace again to melt; and when melted, take a proof of it. If too deep coloured, add more of the common matter of enamels; and if too pale, add more of the colours.

Enamels are used either in counterfeiting or imitating precious stones, in painting in enamel; or by enamellers, jewellers, and goldsmiths, in gold, silver, and other metals. The two first kinds are usually prepared by the workmen themselves, who are employed in these arts. That used by jewellers, &c. is brought to us chiefly from Venice or Holland, in little cakes of different sizes, commonly about four inches diameter, having the mark of the maker struck upon it with a puncheon. In Britain it pays 1s. $7\frac{4}{100}$d. the pound on importation,

tation, and draws back 1 s. 5 $\frac{1}{100}$d. at the rate of 4 s. per pound.

ENAMELLING, the art of laying enamel upon metals, as gold, silver, copper, &c. and of melting it at the fire, or of making divers curious works in it at a lamp. It signifies also to paint in enamel.

The method of painting in ENAMEL. This is performed on plates of gold or silver, and most commonly of copper, enamelled with the white enamel; whereon they paint with colours which are melted in the fire, where they take a brightness and lustre like that of glass. This painting is the most prized of all for its peculiar brightness and vivacity, which is very permanent, the force of its colours not being effaced or sullied with time as in other painting, and continuing always as fresh as when it came out of the workmens hands. It is usual in miniature: It being more difficult the larger it is, by reason of certain accidents it is liable to in the operation. Enamelling should only be practised on plates of gold, the other metals being less pure: copper, for instance, scales with the application, and yields fumes; and silver turns the yellow white. Nor must the plate be made flat; for in such case, the enamel cracks: to avoid which, they usually forge them a little round or oval, and not too thick. The plate being well and evenly forged, they usually begin the operation by laying on a couch of white enamel (as we observed above) on both sides, which prevents the metal from swelling and blistering; and this first layer serves for the ground of all the other colours. The plate being thus prepared, they begin at first by drawing out exactly the subject to be painted with red vitriol, mixed with the oil of spike, marking all parts of the design very lightly with a small pencil. After this, the colours (which are to be before ground with water in a mortar of agate extremely fine, and mixed with oil of spike somewhat thick) are to be laid on, observing the mixtures and colours that agree to the different parts of the subject; for which it is necessary to understand painting in miniature. But here the workman must be very cautious of the good or bad qualities of the oil of spike he employs to mix his colours with, for it is very subject to adulterations.

Great care must likewise be taken, that the least dust imaginable come not to your colours while you are either painting or grinding them; for the least speck, when it is worked up with it, and when the work comes to be put into the reverberatory to be red hot, will leave a hole, and so deface the work.

When the colours are all laid, the painting must be gently dried over a slow fire to evaporate the oil, and the colours afterwards melted to incorporate them with the enamel, making the plate red-hot in a fire like what the enamellers use. Afterwards that part of the painting must be passed over again which the fire hath any thing effaced, strengthening the shades and colours, and committing it again to the fire, observing the same method as before, which is to be repeated till the work be finished.

Method of ENAMELLING *by the Lamp*. Most enamelled works are wrought at the fire of a lamp, in which, instead of oil, they put melted horse-grease, which they call *caballine oil*. The lamp, which is of copper, or white iron, consists of two pieces; in one of which is a kind of oval plate, six inches long, and two high, in which they put the oil and the cotton. The other part, called the *box*, in which the lamp is inclosed, serves only to receive the oil which boils over by the force of the fire. This lamp, or, where several artists work together, two or three more lamps are placed on a table of proper height. Under the table, about the middle of its height, is a double pair of organ-bellows, which one of the workmen moves up and down with his foot to quicken the flame of the lamps, which are by this means excited to an incredible degree of vehemence. Grooves made with a guage in the upper part of the table, and covered with parchment, convey the wind of the bellows to a pipe of glass before each lamp; and that the enamellers may not be incommoded with the heat of the lamp, every pipe is covered at six inches distance with a little tin plate, fixed into the table by a wooden handle. When the works do not require a long blast, they only use a glass-pipe, into which they blow with their mouth.

It is incredible to what a degree of fineness and delicacy the threads of enamel may be drawn at the lamp. Those which are used in making false tufts of feathers are so fine, that they may be wound on the reel like silk or thread. The fictitious jets of all colours, used in embroideries, are also made of enamel; and that with so much art, that every small piece hath its hole to pass the thread through wherewith it is sewed. These holes are made by blowing them into long pieces; which they afterwards cut with a proper tool.

It is seldom that the Venetian or Dutch enamels are used alone; they commonly melt them in an iron-ladle, with an equal part of glass or crystal; and when the two matters are in perfect fusion, they draw it out into threads of different sizes, according to the nature of the work. They take it out of the ladle while liquid, with two pieces of broken tobacco-pipes, which they extend from each other arm's length. If the thread is required still longer, then another workman holds one end, and continues to draw it out, while the first holds the enamel to the flame. Those threads, when cold, are cut into what lengths the workman thinks fit, but commonly from 10 to 12 inches; and as they are all round, if they are required to be flat, they must be drawn through a pair of pinchers while yet hot. They have also another iron instrument in form of pinchers, to draw out the enamel by the lamp when it is to be worked and disposed in figures. Lastly, they have glass-tubes of various sizes, serving to blow the enamel into various figures, and preserve the necessary vacancies therein; as also to spare the stuff, and form the contours. When the enameller is at work, he sits before the lamp with his foot on the step that moves on the bellows; and holding in his left hand the work to be enamelled, or the brass or iron-wires the figures are to be formed on, he directs with his right the enamel thread, which he holds to the flame with a management and patience equally surprising. There are few things they cannot make or represent with enamel; and some figures are as well finished, as if done by the most skilful carvers.

ENARTHROSIS, in anatomy, a species of DIARTHROSIS.

ENCÆNIA, the name of three several feasts celebrated by the Jews in memory of the dedication, or

rather

rather purification, of the temple, by Judas Maccabæus, Solomon, and Zorobabel. This term is likewise used in church history for the dedication of the Christian churches.

ENCAMPMENT, the pitching of a Camp.

ENCANTHIS, in surgery, a tubercle arising either from the caruncula lachrymalis, or from the adjacent red skin; sometimes so large, as to obstruct not only the puncta lacrymalia, but also part of the sight or pupil itself. See Surgery.

ENCAUSTIC and Encaustum, the same with enamelling and enamel. See Enamelling and Enamel.

Encaustic Painting, a method of painting made use of by the ancients, in which wax was employed to give a gloss to their colours, and to preserve them from the injuries of the air.

This ancient art, after having been long lost, was restored by Count Caylus, a member of the Academy of Inscriptions in France; and the method of painting in wax was announced to the Academy of Painting and Belles Lettres in the year 1753; though M. Bachelier, the author of a treatise *De l'Histoire & du Secret de la Peinture en Cire*, had actually painted a picture in wax in 1749; and he was the first who communicated to the public the method of performing the operation of inustion, which is the principal characteristic of the encaustic painting. The Count kept his method a secret for some time, contenting himself with exhibiting a picture at the Louvre in 1754, representing the head of Minerva, painted in the manner of the ancients, which excited the curiosity of the public, and was very much admired. In the interval of suspence, several attempts were made to recover the ancient method of painting. The first scheme adopted was that of melting wax and oil of turpentine together, and using this composition as a vehicle for mixing and laying on the colours. But this method did not explain Pliny's meaning, as the wax is not burnt in this way of managing it. In another attempt, which was much more agreeable to the historian's description of encaustic painting, the wax was melted with strong lixivium of salt of tartar, and with this the colours were ground. When the picture was finished, it was gradually presented to the fire, so as to melt the wax; which was thus diffused through all the particles of the colours, so that they were fixed to the ground, and secured from the access of air or moisture. But the method of Count Caylus is much more simple: the cloth or wood, which he designed for the basis of his picture, is waxed over, by only rubbing it simply with a piece of bees-wax; the wood or cloth, stretched on a frame, being held horizontally over, or perpendicularly before a fire, at such a distance, that the wax might gradually melt, whilst it is rubbed on, diffuse itself, penetrate the body, and fill the interstices of the texture of the cloth, which, when cool, is fit to paint upon; but, as water colours, or those that are mixed up with common water, will not adhere to the wax, the whole picture is to be first rubbed over with Spanish chalk or white, and then the colours are applied to it; when the picture is dry, it is put near the fire, whereby the wax melts, and absorbs all the colours.

Mr. J. H. Muntz, in a treatise on this subject, has proposed several improvements in the art of encaustic painting. When the painting is on cloth, he directs it to be prepared by stretching it on a frame, and rubbing one side several times over with a piece of bees-wax, or virgin wax, till it is covered with a coat of wax of considerable thickness. In fine linen, this is the only operation necessary previous to painting; but coarse cloth must be rubbed gently on the unwaxen side with a pumice stone, to take of all those knots which would prevent the free and accurate working of the pencil. Then the subject is to be painted on the unwaxed side with colours prepared and tempered with water; and when the picture is finished, it must be brought near the fire, that the wax may melt and fix the colours. This method, however, can only be applied to cloth or paper, through the substance of which the wax may pass; but in wood, stone, metals, or plaster, the former method of Count Caylus must be observed.

Mr. Muntz has also discovered a method of forming grounds for painting with crayons, and fixing these, as well as water colours, employed with the pencil. On the unwaxed side of a linen cloth, stretched and waxed as before, lay an even and thick coat of the colour proper for the ground; having prepared this colour by mixing some proper pigment with an equal quantity of chalk, and tempering them with water. When the colour is dry, bring the picture to the fire that the wax may melt, pass through the cloth, and fix the ground. An additional quantity of wax may be applied to the back of the picture, if that which was first rubbed on should not be sufficient for the body of colour; but as this must be laid on without heat, the wax should be dissolved in oil of turpentine, and applied with a brush, and the canvas be again exposed to the fire, that the fresh supply of wax may pass through the cloth, and be absorbed by the colour: and thus a firm and good body will be formed for working on with the crayons. If cloth and paper are joind together, the cloth must be first fixed to the straining frame, and then the paper must be pasted to it with a composition of paste made with wheaten flour, or starch and water, and about a twelfth part of its weight of common turpentine. The turpentine must be added to the paste when it is almost sufficiently boiled, and the composition well stirred, and left to simmer over the fire for five or six minutes; let wax be dissolved in oil of turpentine to the consistence of a thin paste; and when the cloth and paper are dry, let them be held near a fire; and with a brush lay a coat of the wax and turpentine on both sides the joined cloth and paper, in such a degree of thickness, that both surfaces may shine throughout without any appearance of dull spots. Then expose the cloth to the fire or to the sun; by which means the oil will evaporate, and the wax become solid, and be fit to receive any composition of colour for a ground, which is to be laid on as above directed in the case of cloth without paper.

Almost all the colours that are used in oil-painting may be also applied in the encaustic method. Mr. Muntz objects, indeed, to brown, light pink, and unburnt *terra di Sienna*; because these, on account of their gummy or stony texture, will not admit such a cohesion with the wax as will properly fix them; but

 other

Encaustic. other colours which cannot be admitted in oil-painting, as red lead, red orpiment, crystals of verdegris, and red precipitate of mercury, may be used here. The crayons used in encaustic painting are the same with those used in the common way of crayon-painting, excepting those that in their composition are too tenacious; and the method of using them is the same in both cases.

The encaustic painting has many peculiar advantages: though the colours have not the natural varnish or shining which they acquire with oil, they have all the strength of paintings in oil, and all the airiness of water-colours, without partaking of the apparent character or defects of either; they may be looked at in any light and in any situation, without any false glare: the colours are firm, and will bear washing; and a picture, after having been smoaked, and then exposed to the dew, becomes as clean as if it had been but just painted. It may also be retouched at pleasure without any detriment to the colours; for the new colours will unite with the old ones, without spots, as is the case in common size painting; nor is it necessary to rub the places to be retouched with oil as in oil pictures; it is not liable to crack, and easily repaired, if it should chance to suffer any injury. The duration of this painting is also a very material advantage; the colours are not liable to fade and change; no damp can affect them, nor any corrosive substance injure them; nor can the colour fall off in shivers from the canvas. However, notwithstanding all these and other advantages enumerated by the abbe Mazeas and Mr Muntz, this art has not yet been much practised. Many of these properties belong to a much higher species of encaustic painting afterwards discovered in England, the colours of which are fixed by a very intense heat; nor are the colours or grounds on which they are laid liable to be dissolved or corroded by any chemical menstruum, nor, like the glassy colours of enamel, to run out of the drawing on the fire. What this method consists in will appear from the following account communicated in a letter from Mr Josiah Colebrooke to the earl of Macclesfield president of the Royal Society in 1759.

"The art of painting with burnt wax (says he) has long been lost to the world. The use of it to painters in the infancy of the art of painting, was of the utmost consequence. Drying oil being unknown, they had nothing to preserve their colours entire from the injury of damps and the heat of the sun: a varnish of some sort was therefore necessary; but they being unacquainted with distilled spirits, could not, as we now do, dissolve gums to make a transparent coat for their pictures: this invention therefore of burnt wax supplied that defect to them; and with this manner of painting, the chambers and other rooms in their houses were furnished: this Pliny calls *encaustum*, and we *encaustic painting*.

"The following experiments which I have the honour to lay before your Lordship and the Society, were occasioned by the extract of a letter from the abbe Mazeas, translated by Dr Parsons, and published in the second part of the XLIXth volume of the Philosophical Transactions, n° 100. concerning the ancient method of painting with burnt wax, revived by count Caylus.

"The count's method was, 1. To rub the cloth or board designed for the picture simply over with bees-wax. 2. To lay on the colours mixed with common water; but as the colours will not adhere to the wax, the whole picture was first rubbed over with (A) Spanish chalk, and then the colours are used. 3. When the picture is dry, it is put near the fire, whereby the wax melts, and absorbs all the colours.

"Exp. I. A piece of oak-board was rubbed over with bees-wax, first against the grain of the wood, and then with the grain, to fill up all the pores that remained after it had been planed, and afterwards was rubbed over with as much dry Spanish white as could be made to stick on it. This, on being painted (the colours mixed with water only), so clogged the pencil, and mixed so unequally with the ground, that it was impossible to make even an outline, but what was so much thicker in one part than another, that it would not bear so much as the name of painting; neither had it any appearance of a picture. However, to pursue the experiment, this was put at a distance from the fire, on the hearth, and the wax melted by slow degrees: but the Spanish white (though laid as smooth as so soft a body would admit, before the colour was laid on), on melting the wax into it, was not sufficient to hide the grain of the wood, nor show the colours by a proper whiteness of the ground; the wax, in rubbing on the board, was unavoidably thicker in some parts than in others, and the Spanish white the same: on this I suspected there must be some mistake in the Spanish white, and made the inquiry mentioned (in the note A).

"To obviate the inequality of the ground in the first experiment:

"Exp. 2. A piece of old wainscot (oak board) $\frac{1}{4}$th of an inch thick; which, having been part of an old drawer, was not likely to shrink on being brought near the fire: this was smoothed with a fish-skin, made quite warm before the fire; and then, with a brush dipped in white wax, melted in an earthen pipkin, smeared all over, and applied to the fire again, that the wax might be equally thick on all parts of the board, a ground was laid (on the waxed board), with levigated chalk mixed with gum-water, (*viz.* gum Arabic dissolved in water): when it was dry, I painted it with a kind of landscape; and pursuing the method laid down by count Caylus, brought it gradually to the fire. I fixed the picture on a fire-screen, which would preserve the heat, and communicate it to the back part of the board. This was placed first at the distance of three feet from the fire, and brought forwards by slow degrees, till it came within

(A) "Spanish chalk is called by Dr Parsons, in a note, *Spanish white*. This is a better kind of whitening than the common, and was the only white that had the name of *Spanish* annexed to it that I could procure, tho' I inquired for it at most if not all the colour-shops in town.

"My friend M. da Costa showed me a piece of Spanish chalk in his collection, which seemed more like a CIMOLIA (tobacco-pipe clay), and was the reason of my using that in one of the experiments.

Encaustic. within one foot of the fire, which made the wax swell and bloat up the picture; but as the chalk did not absorb the wax, the picture fell from the board and left it quite bare.

" Exp. 3. I mixed three parts white wax, and one part white resin, hoping the tenacity of the resin might preserve the picture. This was laid on a board heated with a brush; as in the former; and the ground was chalk, prepared as before. This was placed horizontally on an iron box, charged with an hot heater, shifting it from time to time, that the wax and resin might penetrate the chalk; and hoping from this position, that the ground, bloated by melting the wax, would subside into its proper place; but this, like the other, came from the board, and would not at all adhere.

" Exp. 4. Prepared chalk four drams, white wax, white resin, of each a dram, burnt alabaster half a dram, were all powdered together and sifted, mixed with spirit of molasses instead of water, and put for a ground on a board smeared with wax and resin, as in Exp. 3. This was also placed horizontally on a box-iron as the former: the picture blistered, and was cracked all over; and though removed from the box-iron to an oven moderately heated (in the same horizontal position), it would not subside, nor become smooth. When it was cold, I took an iron spatula made warm, and moved it gently over the surface of the picture, as if I were to spread a plaster. (This thought occurred, from the board being prepared with wax and resin, and the ground having the same materials in its composition, the force of the spatula might make them unite). This succeeded so well, as to reduce the surface to a tolerable degree of smoothness; but as the ground was broke off in many places, I repaired it with flake white, mixed up with the yolk of an egg and milk, and repainted it with molasses spirit (instead of water), and then put it into an oven with a moderate degree of heat. In this I found the colours fixed, but darker than when it was at first painted: and it would bear being washed with water, not rubbed with a wet cloth.

" Exp. 5. A board (that had been used in a former experiment) was smeared with wax and resin, of each equal parts; was wetted with molasses spirit, to make whitening (or Spanish white) mixed with gum-water adhere. This, when dry, was scraped with a knife, to make it equally thick in all places. It was put into a warm oven, to make the varnish incorporate partly with the whitening before it was painted; and it had only a small degree of heat: water only was used to mix the colours. This was again put into an oven with a greater degree of heat; but it flaked off from the board: whether it might be owing to the board's having had a second coat of varnish (the first having been scraped and melted off), and that the unctuous parts of the wax had so entered its pores, that it would not retain a second varnish, I cannot tell.

" Exp 6. Having miscarried in these trials, I took a new board, planed smooth, but not polished either with a fish-skin or rushes: I warmed it, and smeared it with wax only; then took *cimolia* (tobacco pipe clay) divested of its sand, by being dissolved in water and poured off, leaving the coarse heavy parts behind. After this was dried and powdered, I mixed it with a small quantity of the yolk of an egg and cow's milk, and made a ground with this on the waxed board: this I was induced to try, by knowing that the yolk of an egg will dissolve almost all unctuous substances, and make them incorporate with water; and I apprehended that a ground, thus prepared, would adhere so much the more firmly to the board than the former had done, as to prevent its flaking off. The milk, I thought, might answer two purposes; first, by uniting the ground with the wax; and secondly, by answering the end of size or gum-water, and prevent the colours from sinking too deep into the ground, or running one into another. When the ground was near dry, I smoothed it with a pallet knife, and washed with milk and egg where I had occasion to make it smooth and even: when dry I painted it, mixing the colours with common water; this, on being placed horizontally in an oven only warm enough to melt the wax, flaked from the board; but held so much better together than any of the former, that I pasted part of it on paper. Encaustic.

" Exp. 7. Flake-white (or purest sort of white-lead) mixed with egg and milk, crumbled to pieces in the oven, put on the waxed board, as in the last experiment.

" The bad success which had attended all the former experiments, led me to consider of what use the wax was in this kind of painting: and it occurred to me, that it was only as a varnish to preserve the colours from fading,

" In order to try this:

" Exp. 8. I took what the brick-layers call *fine stuff*, or *putty* (B): to this I added a small quantity of burnt alabaster, to make it dry: this it soon did in the open air; but before I put on any colours, I dried it gently by the fire, lest the colours should run. When it was painted, I warmed it gradually by the fire (to prevent the ground from cracking) till it was very hot. I then took white wax three parts, white resin one part, melted them in an earthen pipkin, and with a brush spread them all over the painted board, and kept it close to the fire in a perpendicular situation, that what wax and resin the plaster would not absorb might drop off. When it was cold, I found the colours were not altered, either from the heat of the fire, or passing the brush over them. I then rubbed it with a soft linen cloth, and thereby procured a kind of gloss, which I afterwards increased by rubbing it with an hard brush; which was so far from scratching or leaving any marks on the picture, that it became more smooth and polished by it.

" After I had made all the foregoing experiments, in conversation with my honoured and learned friend Dr Kidby, a fellow of this society, I said I had been trying to find out what the encaustic painting of the ancients was. Upon which he told me, that there was a passage in Vitruvius *de Architectura*, relative to that kind of painting; and was so good as to transcribe it for me from the 7th book, chap. 9. *De minii temperatura*. Vitruvius's words are: *At si quis subtilior fuerit, & voluerit expolitionem miniaceam suum colorem retinere*,

(B) Putty is lime slaked, and, while warm, dissolved in water, and strained through a sieve.

Encaustic. *retinere, cum paries expolitus & aridus fuerit, tunc ceram Punicam liquefactam igni, paulo oleo temperatam, seta inducat, deinde postea carbonibus in ferreo vase compositis, eam ceram apprime cum pariete, calefaciendo sudore cogat, fiatque ut peraequetur, deinde cum candela linteisque puris subigat, uti signa marmorea nuda curantur. Haec autem καυσις Graece dicitur. Ita obstans cerae Punicae lorica non patitur, nec lunae splendorem, nec solis radios lambendo eripere ex his politionibus colorem.*

"Which I thus translate: 'But if any one is more wary, and would have the polishing [painting] with vermilion hold its colour, when the wall is painted and dry, let him take Carthaginian [Barbary] wax, melted with a little oil, and rub it on the wall with an hair-pencil; and afterwards let him put live coals in an iron vessel [chaffing-dish], and hold it close to the wax, when the wall, by being heated, begins to sweat; then let it be made smooth: afterwards let him rub it with a (C) candle and (D) clean linen rags, in the same manner as they do the naked marble statues. This the Greeks call καυσις. The coat of Carthaginian wax (thus put on) is so strong, that it neither suffers the moon by night, nor the sun-beams by day, to destroy the colour.'

"Being satisfied, from this passage in Vitruvius, that the manner of using wax in Exp. 8. was right, I was now to find if the wax-varnish, thus burnt into the picture, would bear washing. But here I was a little disappointed; for rubbing one corner with a wet linen cloth, some of the colour came off; but washing it with a soft-hair pencil dipped in water, and letting it dry without wiping, the colour stood very well.

"A board painted, as in Exp. 8. was hung in the most smoky part of a chimney for a day, and exposed to the open air in a very foggy night. In the morning the board was seemingly wet through, and the water ran off the picture. This was suffered to dry without wiping; and the picture had not suffered at all from the smoke or the dew, either in the ground or the colours; but when dry, by rubbing it, first with a soft cloth, and afterwards with a brush, it recovered its former gloss.

"Suspecting that some tallow might have been mixed with the white wax I had used, which might cause the colours to come off on being rubbed with a wet cloth, I took yellow wax which had been melted from the honeycomb in a private family, and consequently not at all adulterated: to three parts of this I added one part resin, and melted them together.

"Exp. 9. Spanish white, mixed with fish-glue, was put for a ground on a board, and painted with water-colours only. The board was made warm; and then the wax and resin were put on with a brush, and kept close to the fire till the picture had imbibed all the varnish, and looked dry. When it was cold, I rubbed it first with a linen cloth, and then polished it with an hard brush.

"In these experiments I found great difficulties with regard to colours. Many water-colours being made from the juices of plants, have some degree of an acid in them; and these, when painted on an alkaline ground, as chalk, whitening, *cimolia*, and plaster, are totally changed in their colours, and from green become brown; which contributes much to make the experiment tedious. I would therefore advise the use of mineral or metallic colours for this sort of painting, as most likely to preserve their colour: for although I neutralized Spanish white, by fermenting it with vinegar, and afterwards washed it very well with water, it did not succeed to my wish.

"These experiments, and this passage from Vitruvius, will in some measure explain the obscurity of part of that passage in Pliny which Dr Parsons, in his learned comment on the encaustic painting with wax, seems to despair of.

"*Ceris pingere*, was one species of encaustic painting. Εγκαυστον, *inustum*, may be translated, "forced in by means of fire, burnt in:" for whatever is forced in by the help of fire can be rendered into Latin by no other significant word that I know of but *inustum*. If this is allowed me, and I think I have the authority of Vitruvius (a writer in the Augustan age) for it, who seems to have wrote from his own knowledge, and not like Pliny, who copied from others much more than he knew himself, the difficulty with regard to this kind of painting is solved, and the encaustic with burnt wax recovered to the public.

"What he means by the next kind he mentions, *in ebore cestro id est viriculo*, I will not attempt to explain at present.

"The ship-painting is more easily accounted for: the practice being in part continued to this time: and is what is corruptly called *breaming*, for brenning or burning.

"This is done by reeds set on fire, and held under the side of a ship till it is quite hot; then resin, tallow, tar, and brimstone, melted together, and put on with an hair brush while the planks remain hot, make such a kind of paint as Pliny describes: which, he says, *nec sole, nec sale, ventisque corrumpitur*. As they were ignorant of the use of oil-painting, they mixed that colour with the wax, &c. which they intended for each particular part of the ship, and put it on in the manner above described.

"In the pictures painted for these experiments, and now laid before your lordship and the society, I hope neither the design of the landscape, nor the execution of it, will be so much taken into consideration as the varnish (which was the thing wanted in this inquiry): and I think that will evince, that the encaustic painting

(C) The account of the method of polishing [painting] walls covered with vermilion, gave me great satisfaction, as it proved the method I had taken in experiment 8. (which I had tried before I saw or knew of this passage in Vitruvius) was right. The use of the candle, as I apprehend, was to melt the wax on the walls where by accident the brush had put on too much, or afford wax where the brush had not put on enough, or had left any part bare.

(D) The rubbing the wall with a linen cloth, while warm, will do very well, where there is only one colour to be preserved; but where there are many, as in a landscape, it will be apt to take off some, or render the colouring rather faint; which I found by wiping the wax off from a painting while it was hot.

ing with burnt wax is fully restored by these experiments; and though not a new invention, yet having been lost for so many ages, and now applied further, and to other purposes, than it was by Vitruvius (who confined it to vermilion only), may also amount to a new discovery, the use of which may be a means of preserving many curious drawings to posterity: for this kind of painting may be on paper, cloth, or any other substance that will admit a ground to be laid on it. The process is very simple, and is not attended with the disagreeable smell unavoidable in oil-painting, nor with some inconveniences inseparable from that art; and as there is no substance we know more durable than wax, it hath the greatest probability of being lasting."

Still, however, there seem to have been some defects or inconveniences attending these and other subsequent attempts: for we find the ancient or some similar method of painting in wax remaining a desideratum upwards of 25 years after the publication of the preceding experiments; when in 1787 a method was communicated to the Society of Arts by Miss Greenland, for which she was rewarded with a prize. The ground of her information she received in Florence, through the acquaintance of an amateur of painting, who procured her the satisfaction of seeing some paintings in the ancient Grecian style, executed by Signora Parenti, a professor at that place, who had been instructed by a Jesuit at Pavia, the person who made the farthest discoveries in that art. Miss Greenland's friend knowing she was fond of painting, informed her what were the materials the paintress used, but could not tell her the proportions of the composition; however, from her anxiety to succeed in such an acquisition, she made various experiments, and at last obtained such a sufficient knowledge of the quantities of the different ingredients as to begin and finish a picture, which she afterwards presented to the Society for their inspection.

Her method is as follows: "Take an ounce of white wax, and the same weight of gum mastich powdered. Put the wax in a glazed earthen vessel over a very slow fire; and when it is quite dissolved strew in the mastich, a little at a time, stirring the wax continually until the whole quantity of gum is perfectly melted and incorporated: then throw the paste into cold water; and when it is hard, take it out of the water, wipe it dry, and beat it in one of Mr Wedgwood's mortars, observing to pound it at first in a linen cloth to absorb some drops of water that will remain in the paste, and would prevent the possibility of reducing it to a powder, which must be so fine as to pass through a thick gauze. It should be pounded in a cold place and but a little while at a time, as after long beating the friction will in a degree soften the wax and gum, and instead of their becoming a powder they will return to a paste.

"Make some strong gum-arabic water; and when you paint, take a little of the powder, some colour, and mix them together with the gum-water. Light colours require but a small quantity of the powder, but more of it must be put in proportion to the body and darkness of the colours; and to black there should be almost as much of the powder as colour.

"Having mixed the colours, and no more than can be used before they grow dry, paint with fair water, as is practised in painting with water-colours, a ground on the wood being first painted of some proper colour prepared in the same manner as is described for the picture; walnut-tree and oak are the sorts of wood commonly made use of in Italy for this purpose. The painting should be very highly finished; otherwise, when varnished, the tints will not appear united.

"When the painting is quite dry, with rather a hard brush, passing it one way, varnish it with white wax, which is put into an earthen vessel, and kept melted over a very slow fire till the picture is varnished, taking great care the wax does not boil. Afterwards hold the picture before a fire, near enough to melt the wax, but not make it run; and when the varnish is entirely cold and hard, rub it gently with a linen cloth. Should the varnish blister, warm the picture again very slowly, and the bubbles will subside. When the picture is dirty, it need only be washed with cold water."

The opinion given by the Society upon the above is: The method made use of by Miss Greenland provides against all inconveniences; and the brilliancy of the colours in the picture painted by her, and exhibited to the Society, fully justifies the opinion, that the art of painting in wax, as above described, highly merited the reward of a gold pallet voted to her on this occasion.

ENCEINTE, in fortification, is the wall or rampart which surrounds a place, sometimes composed of bastions or curtains, either faced or lined with brick or stone, or only made of earth. The enceinte is sometimes only flanked by round or square towers, which is called a *Roman wall.*

ENCEPHALI, in medicine, worms generated in the head, where they cause so great a pain as sometimes to occasion distraction.

The encephali are very rare; but there are some diseases wherein they swarm; from whence we are told pestilential fevers have wholly arisen. Upon the dissection of one who died of this fever, a little, short, red worm was found in the head, which malmsey wine, wherein horse-raddish had been boiled, could alone destroy. This medicine was afterwards tried on the sick, most of whom it cured.

The like worms have also been taken out by trepanning, and the patient cured. Those worms that generate in the nose, ears, and teeth, are also called *encephali.*

ENCHANTER, a person supposed to practise enchantment or fascination. See FASCINATION, WITCHCRAFT, &c.

ENCHANTER's Nightshade, in botany. See CIRCÆA.

ENCHASING, INCHASING, or *Chasing*, the art of enriching and beautifying gold, silver, and other metal work, by some design or figures represented thereon in low relievo.

Enchasing is practised only on hollow thin works, as watch-cases, cane-heads, tweezer-cases, or the like. It is performed by punching or driving out the metal, to form a figure, from withinside, so as to stand out prominent from the plane or surface of the metal. In order to this, they provide a number of fine steel blocks or puncheons of divers sizes; and the design being drawn on the surface of the metal, they apply the inside upon the head or tops of these blocks, directly under the lines or parts of the figures; then, with a fine

fine hammer, striking on the metal, sustained by the block, the metal yields, and the block makes an indenture or cavity on the inside, corresponding to which there is a prominence on the outside, which is to stand for that part of the figure.

Thus the workman proceeds to chase and finish all the parts by the successive application of the block and hammer to the several parts of the design. And it is wonderful to consider with what beauty and justness, by this simple piece of mechanism, the artists in this kind will represent foliages, grotesques, animals, histories, &c.

ENCLITICA, in grammar, particles which are so closely united with other words as to seem part of them, as in *virumque*, &c.—There are three enclitic particles in Latin, viz. *que*, *ne*, *ve*.

ENCRATITES, in church history, heretics who appeared towards the end of the second century: they were called *Encratites*, or *Continentes*, because they gloried in abstaining from marriage and the use of wine and animal-food.

ENCURECK, in natural history, a venomous insect found in Persia, and said to be a kind of tarantula. According to Olearius as quoted by Mr Boyle, it neither stings nor bites; but lets fall its venom like a drop of water, which causes insufferable pain in the part for a time, and afterwards so profound a sleep, that nothing can awake the patient except crushing one of the creatures on the part affected. It is nevertheless said, that the sheep eat these insects without damage.

ENCYCLOPÆDIA, a term nearly synonymous with CYCLOPÆDIA; but adopted in preference to it in denominating the present work, as being more definite and of better authority. According to an observation of the late learned printer Mr Bower, the preposition EN makes the meaning of the word more precise: For *Cyclopædia* may denote "the instruction OF a circle," as *Cyropædia* is "the instruction OF Cyrus," whereas in *Encyclopædia* the preposition determines the word to be from the dative of *cyclus*, "instruction IN a circle." And Vossius in his book *De vitiis sermonis*, has observed, "That *Cyclopædia* is used by some authors, but *Encyclopædia* by the best."

ENDEMIC, or ENDEMICAL, DISEASES, those to which the inhabitants of particular countries are subject more than others, on account of the air, water, situation and manner of living.

ENDIVE, in botany. See CICHORIUM.

ENDLESS, something without an end: thus authors mention endless rolls, the endless screw, &c.

ENDOR, (anc. geog.), a town of Galilee, four miles to the south of mount Tabor; in the tribe of Manasseh, where the Pythoness was consulted by Saul: at this day, says Jerome, a large village.

ENDORSE, in heraldry, an ordinary, containing the eight part of a pale, which Leigh says is only used when a pale is between two of them.

ENDORSED, in heraldry, is said of things borne back to back, more usually called ADOSSE.

ENDORSEMENT, in law and commerce. See INDORSEMENT.

ENDOWMENT, in law, denotes the settling a dower on a woman: though sometimes it is used figuratively, for settling a provision upon a parson, on the building of a church; or the severing a sufficient portion of tithes for a vicar, when the benefice is appropriated.

ENDYMION, (fab. hist.), a shepherd, son of Æthlius and Calyce. It is said that he required of Jupiter to grant to him to be always young, and to sleep as much as he would; whence came the proverb of *Endymionis somnum dormire*, to express a long sleep. Diana saw him naked as he slept on mount Latmos; and was so struck with his beauty, that she came down from heaven every night to enjoy his company. Endymion married Chromia daughter of Itonius; by whom he had three sons Pæon, Epeus, and Æolus, and a daughter called *Eurydice*. The fable of Endymion's amours with Diana, or the moon, arose from his knowledge of astronomy; and as he passed the night on some high mountain to observe the heavenly bodies it came to be reported that he was courted by the moon. Some suppose that there were two of that name; the son of a king of Elis, and the shepherd or astronomer of Caria. The people of Heraclea maintained that Endymion died on mount Latmos, and the Eleans pretended to show his tomb at Olympia in Peloponnesus.

ENEMY, in law, an alien or foreigner, who publicly invades the kingdom.

ENERGUMENTS, in church-history, persons supposed to be possessed by the devil, concerning whom there were many regulations among the primitive Christians. They were denied baptism and the Eucharist: at least, this was the practice of some churches: and though they were under the care of exorcists, yet it was thought a becoming act of charity, to let them have the public prayers of the church, at which they were permitted to be present. See EXORCISM.

ENERGY, a term of Greek origin, signifying the power, virtue, or efficacy of a thing. It is also used, figuratively, to denote emphasis of speech.

ENERVATING, the act of destroying the force, use, or office, of the nerves, either by cutting them, by weakening them with debauchery, or by some other violence.

Excess of wine, and other strong, hot, spirituous liquors, enervate or weaken the nerves. When they would render a horse useless, they enervate him, or cut his nerves.

ENFANS PERDUS, the same with forlorn hope. See FORLORN.

ENFILADE, in the art of war, is used in speaking of trenches, or other places, which may be scoured by the enemy's shot along their whole length. In conducting the approaches at a siege, care must be taken that the trenches be not enfiladed from any work of the place.

ENFINE', formerly ANTINOE; a city of Egypt, built by Adrian in honour of his favourite Antinous. It is situated towards the middle of the Said, or Upper Egypt, and still contains several stately monuments of antiquity. In ancient times this city was very magnificent. It was about half a league in circumference, having two principal streets 45 feet wide, intersecting each other at right angles, and running thro' its whole length. The others were more narrow, but equally straight; the two largest having gates at each end, part of which still remain. According to the Nubian geographer, it was

was called the city of the Magi, becaufe Pharoah is faid to have caufed the magicians come from thence to his court. Near it were the ruins of Abydus, where there was an oracle of the god Befa, one of the moft ancient in Egypt, and which was ftill famous in the time of Conftantius; and hence fome have derived the appellation juft mentioned, the neighbouring people coming in crowds to confult the oracle.

The ruins of the gates are the moft beautiful pieces of architecture to be met with in this place. The handfomeft has three vaulted entries; the middle one being 60 feet in height, 22 wide, and 20 thick; the other two fmaller. Each of the facades of this edifice is ornamented with four pilafters in bas relief, with Corinthian capitals, the acanthus leaves of which have a confiderable projection. It was furrounded by eight Corinthian columns, of which only one now remains, but the pedeftals of the reft are ftill entire. Befides thefe, there are heaps of rubbifh in different parts of the town, apparently the remains of ancient temples or palaces. All thefe feem to have been bordered by a colonnade, forming a portico on each fide, where the inhabitants might walk fecure from the heat of the fun. One of the fquares was ornamented with four large Corinthian pillars, three of which are deftroyed all but the bafes. The fourth is quite entire, about 50 feet high, and the fhaft compofed of feveral ftones. The pedeftal has a Greek infcription, pretty much defaced, dedicating it to the emperor Alexander Severus, to whom the fenate of ALEXANDRIA had already dedicated the famous column mentioned under that article. Thefe four other columns were therefore probably raifed in honour of that emperor after his victories over the Perfians; for the foliage of the oak, with which the firft ftone of the fhaft is decorated, was a fign of victory among the Romans. Towards the end of the fourth century the city was peopled by Chriftians; and Palladius affures us, that there were at that place 12 convents of virgins, and feveral others inhabited by monks. In the environs there are feveral coptic monafteries poffeffed by monks equally miferable and ignorant. The Nubian Geographer informs us, that the city was furrounded by a well cultivated country, abounding in fruits and harvefts; but thefe have now given place to fands and barren defarts. The ruins of Abydus abovementioned are ftill to be feen near this place.

ENFRANCHISEMENT, in law, the incorporating a perfon into any fociety or body politic.

ENGASTRIMYTHI, in Pagan theology, the Pythians, or priefteffes of Apollo, who delivered oracles from within, without any action of the mouth or lips.

The ancient philofophers, &c. are divided upon the fubject of the engaftrimythi. Hippocrates mentions it a difeafe. Others will have it a kind of divination. Others attribute it to the operation or poffeffion of an evil fpirit. And others to art and mechanifm. M. Scottus maintains that the engaftrimythi of the ancients were poets, who, when the priefts could not fpeak, fupplied the defect by explaining in verfe what Apollo dictated in the cavity of the bafon on the facred tripod.

ENGENDERING, a term fometimes ufed for the act of producing or forming any thing: thus meteors are faid to be engendered in the middle region of the atmofphere, and worms in the belly.

ENGINE, in mechanics, is a compound machine, made of one or more mechanical powers, as levers, pullies, fcrews, &c. in order to raife, caft, or fuftain any weight, or produce any effect which could not be eafily effected otherwife. The word is formed of the French *engin*, from the Latin *ingenium* "with;" by reafon of the ingenuity required in the contrivance of engines to augment the effect of moving powers.

ENGINE for extinguifhing Fires. See HYDROSTATICS, n° 33.

Pile-ENGINE, one contrived for driving piles. See *PILE-Engine*.

Steam-ENGINE, a machine to raife water by fire, or rather by the force of water turned into fteam. See *STEAM-Engine*.

ENGINEER, in the military art, an able expert man, who, by a perfect knowledge in the mathematics, delineates upon paper, or marks upon the ground, all forts of forts, and other works proper for offence and defence. He fhould underftand the art of fortification, fo as to be able, not only to difcover the defects of a place, but to find a remedy proper for them; as alfo how to make an attack upon, as well as to defend, the place. Engineers are extremely neceffary for thefe purpofes: wherefore it is requifite, that befides being ingenious, they fhould be brave in proportion. When at a fiege the engineers have narrowly furveyed the place, they are to make their report to the general, by acquainting him which part they judge the weakeft, and where approaches may be made with moft fuccefs. Their bufinefs is alfo to delineate the lines of circumvallation and contravallation, taking all the advantages of the ground; to mark out the trenches, places of arms, batteries, and lodgments, taking care that none of their works be flanked or difcovered from the place. After making a faithful report to the general of what is a-doing, the engineers are to demand a fufficient number of workmen and utenfils, and whatever elfe is neceffary.

ENGLAND, the fouthern divifion of the ifland of Great Britain. Including Wales, it is of a triangular form, and lies between the 50th and 55th degrees of north latitude, extending about 400 miles in length from fouth to north, and in fome places it is 300 miles in breadth. It is bounded by Scotland on the north; by the Englifh Channel on the fouth, dividing it from France; by the German Sea on the eaft; and on the weft by St. George's, or the Irifh Channel.

1 Whence peopled.

At what time the ifland of Britain was peopled is uncertain; nor do we know whether the fouthern or northern parts were firft inhabited. We have no accounts that can be depended upon before the arrival of Julius Cæfar, and it is certain he found the fouthern parts full of people of a very warlike difpofition. Thefe people, according to Cæfar, were a colony of the Gauls; and this opinion is embraced by moft of the ancient as well as the modern writers. It is chiefly founded on the agreement obferved by the Romans between the two nations in their cuftoms, manners, language, religion, government, way of fighting, &c. The more northern inhabitants, according to Tacitus

Plate CLXXXI

Scot, Philad.

England tus, came from Germany. This he infers from the make of their limbs; but Cæsar simply calls them *Aborigenes*.

2 Inhabited by 17 different nations. England, including the principality of Wales, when first invaded by the Romans, was divided into 17 petty states. 1. The Danmonii, called also *Dunmonii* and *Donmonii*, inhabiting the counties of Cornwal and Devonshire. 2. The Durotriges, who inhabited the track now called *Dorsetshire*. 3. The Belgæ possessed Somersetshire, Wiltshire, and Hampshire. 4. The Attrebatii, or inhabitants of Berkshire. 5. The Regni, whose country bordered on that of the Attrebatii, and comprehended Surrey, Sussex, and partof the sea-coast of Hampshire. 6. The Cantii, inhabiting the county now called *Kent*. 7. The Dobuni are placed by Ptolemy on the north side of the Thames, near its head, in the counties of Gloucestershire and Oxfordshire. 8. The Cattieuchlani, *Calyeuchlani*, *Cattidudani*, or *Cathicludani*, inhabited Buckinghamshire, Bedfordshire, and Hertfordshire. 9. The Trinobantes, who possessed the counties of Essex and Middlesex. 10. The Iceni, whose country comprehended Suffolk, Norfolk, Cambridge, and Huntingdonshire. These are by Ptolemy called *Simeni*, and by others *Tigeni*, Cambden is of opinion, that they were the same whom Cæsar calls *Cenomagni*. 11. The Coritani, whose country comprehended Northamptonshire, Licestershire, Rutlandshire, Lincolnshire, Nottinghamshire and Derbyshire. 12. The Cornavii possessed Warwickshire, Worcestershire, Staffordshire, Shropshire, and Cheshire, 13. The Silures inhabited the counties of Radnorshire. Brecknockshire, Glamorganshire, with Herefordshire and Monmouthshire. 14. The Dematæ inhabited part of Carmardinshire, Pembrokeshire, and Cardiganshire. 15. The country of the Ordovices comprehended Montgomeryshire, Merionethshire, Caernarvonshire, Denbighshire, and Flintshire. 16. The Brigantes possessed the counties of Yorkshire, the Bishopric of Durham, Lancastershire, Westmoreland, and Cumberland. 17. The county of Northumberland was held by the Ottadini, Ottadeni, or Ottalini. Their country, according to some, reached from the Tine to the river Forth; though the most common opinion is, that it reached only to the Tweed.

The abovementioned names of these nations are plainly Roman, but the etymology of them is not easily ascertained. Some attempt to derive them from words in the Old British language; but as this subject at best must be very obscure and uncertain, we shall not enter into it.

3 Julius Cæsar undertakes an expedition into Britain. Before the time of Julius Cæsar, the Romans had scarcely any knowledge of Britain; but that conqueror having subdued most of the Gallic nations on the opposite side of the channel, began to think of extending his conquests by the reduction of Britain. The motive for this expedition, ascribed to him by Suetonius, was a desire of enriching himself by the British pearls, which were then very much esteemed. The pretence, however, which he made use of in order to justify his invasion was, that the Britons had sent assistance to the Gauls during his wars with them.

Cæsar undertook his first expedition against Britain when the summer was already far spent, and therefore he did not expect to finish the conquest of the country that campaign. He thought, however, that it would be a considerable advantage to view the island, and England learn something of the manners and customs of the natives; after which he could more easily take such measures as would ensure a permanent conquest on his return. Having marched all his forces into the country of the Morini, now the province of Picardy, from whence was the shortest passage into Britain; he ordered at the same time all the vessels that lay in the neighbouring ports, and a fleet which he had built the year before for an expedition against the Morini, to attend him. The Britons, alarmed at his preparations, sent ambassadors with offers of submission; but Cæsar, though he received them with great kindness, did not abandon his intended scheme of an invasion. He waited till the arrival of C. Volusenus, whom he had sent out with a single galley to make discoveries on the coast. Volusenus did not think proper to land; but, having made what observations he could, returned after five days absence, and Cæsar immediately set sail for Britain. His force consisted of two legions embarked on board 80 transports; and he appointed 18 more which lay wind-bound about eight miles off, to convey over the cavalry; but these last orders were too slowly executed, which occasioned some difficulty in his landing.

The Britons at this time, according to Cæsar and other Roman historians, were very numerous, and had their country well stocked with cattle. Their houses resembled those of the Gauls; and they used copper or iron plates weighed by a certain standard instead of money. Their towns were a confused parcel of huts placed at a small distance from one another, generally in the middle of a wood, to which all the avenues were slightly guarded with ramparts of earth, or with trees. All the nations were in a state of the most wretched barbarism, even when compared with the barbarous Gauls on the continent. The use of clothes was scarce known in the island. Only the inhabitants of the southern coast covered their nakedness with the skins of wild beasts; and this rather to avoid giving offence to the strangers who came to trade with them, than out of any principle of decency. It was a general custom among the Britons to paint their bodies with the juice of woad; but whether this was designed as ornament, or for any other purpose, is not known. They shaved their beards, all except their upper lip, and wore long hair. They also had their wives in common, a custom which made them detestable to all other nations. 4 Manners, customs, &c. of the Britons.

The arms of the Britons were a sword, a short lance, and a shield. Breast-plates and helmets they looked upon rather to be incumbrances, and therefore made no use of them. They usually fought in chariots, some of which were armed with scythes at the wheels; they were fierce and cruel, and exceedingly bloodthirsty. When driven to distress, they could subsist themselves even on the bark and roots of trees; and Dio Cassius tells us, that they had ready on all occasions, a certain kind of food, of which, if they took but the quantity of a bean, they were not troubled with hunger or thirst for a considerable time after. The southern nations, however, were somewhat more civilized; and the Cantii, or inhabitants of Kent, more so than any of the rest.

All the British nations at this time were very brave and

England.

and resolute, owing to the continual dissensions among themselves. They proved therefore very formidable enemies to the Romans; but the same dissensions which had taught them the art of war, also prevented them from uniting in the defence of their country.

5 They oppose Cæsar's landing.

As soon as they perceived Cæsar's fleet approaching, a number of cavalry and chariots were dispatched to oppose his landing, while a considerable body of infantry hastened after. What chiefly embarrassed the Romans in their attempt to land, was the largeness of their ships, which required a considerable depth of water. The soldiers therefore were obliged to leap into the sea while loaded with their armour; and at the same time to encounter the enemy, who were quite disengaged, as they either stood on dry ground, or waded but a little way into the water. Cæsar perceiving this disadvantage, ordered his galleys to advance, with their broad sides towards the shore, in order to drive the Britons from the water-side with their slings and arrows. On this the Britons, surprised at the galleys, a sort of shipping they had never before seen, began to give ground. The fight, however, continued for some time, greatly to the disadvantage of the Romans; till at last Cæsar, observing the distress of his men, caused several boats to be manned, and sent them to the assistance of those who were most exposed to the enemy's assault. The Romans then soon got the better of the undisciplined barbarians, however brave, and made good their landing; but they were unable to pursue the enemy for want of cavalry, which had not yet arrived.

6 They are defeated and sue for peace.

The Britons were so disheartened with this bad success, that they immediately sent ambassadors to sue for peace: which was granted on condition of their delivering a certain number of hostages for their fidelity. Part of these they brought immediately; and promised to return in a few days with the rest, who, they said, lived at some distance. But, in the mean time, the 18 transports which carried Cæsar's cavalry, being driven back by a violent storm, and the fleet which lay in the road being greatly damaged by the same, the Britons thought proper to break their engagements.

7 Their treachery.

Having therefore privately assembled their forces, they fell unexpectedly on the seventh legion while at a distance from the rest and busied in foraging. Cæsar being apprised of their danger, hastened to their assistance with two cohorts, and at last repulsed the enemy.—This, however, proved only a temporary deliverance; for the Britons, thinking it would be possible for them to cut off all the Romans at once, dispatched messengers to inform several of the neighbouring nations of the weakness of the enemy's forces, and the happy opportunity that offered itself of destroying all these invaders at one blow.—On this, they drew together a great body of horse and foot, which boldly advanced to the Roman intrenchments. But Cæsar came out to meet them; and the undisciplined Britons being by no means able to cope with the Romans were put to flight with great slaughter. Having burnt several towns and villages, the victors returned to their camp, where they were soon followed by new deputies from the Britons. Cæsar being in want of horse, and afraid lest another storm should destroy the remainder of his fleet, granted them peace, on condition of their sending him double the number of hostages into Gaul which they had before promised. The same night he set sail, and soon arrived safe in Gaul.

The Britons no sooner perceived the Romans gone, than, as before, they broke through all their engagements. Of all the states who had promised to send hostages, only two performed their promises; and this neglect so provoked Cæsar, that he determined to return the year following with a far greater force.

8 Cæsar returns.

Having, therefore, caused his old vessels to be refitted, and a great many new ones to be built, he arrived off the coast of Britain with a fleet of 600 ships and 28 galleys. The Britons made no opposition to his landing; but Cæsar getting intelligence that an army was assembled at no great distance, marched in quest of them. He found them encamped on the banks of a river, supposed to be the *Stour*, about 12 miles distant from the place where he had landed. They attempted to oppose his passage; but being briskly attacked by the Roman cavalry, they were obliged to retire into a wood, all the avenues of which were blocked up by trees cut down for that purpose.

9 Defeats the Britons.

This fortification, however, proved insufficient to protect them. The seventh legion having cast themselves into a testudo, and thrown up a mount against their works, drove them from their asylum; but as the day was far spent, a pursuit was not thought adviseable.

Next morning Cæsar, with the greatest part of his army, which he divided into three bodies, marched out in quest of the enemy. But when he was already come in sight of their rear, he was overtaken by messengers, who informed him, that his fleet was greatly damaged by a violent storm which had happened the preceding night. This put an end to the pursuit for that time; but Cæsar having employed all the carpenters he had with him, and sent for others from Gaul, in order to repair the damage, resolved to prevent misfortunes of this kind for the future. He therefore drew all his ships ashore, and inclosed them within the fortifications of his camp. This arduous undertaking employed his whole army for 10 days; after which he again set out in quest of the enemy.

The Britons had made the best use they could of the respite afforded them by the storm. They were headed by Cassibelaunus king of the Trinobantes. He had formerly made war upon his neighbours: and having rendered himself terrible to them, was looked upon to be the most proper person for leading them on against the common enemy; and as several states had now joined their forces, the British army was very numerous. Their cavalry and chariots attacked the Roman army while on the march: but were repulsed with loss, and driven into the woods. The Romans pursued them too eagerly, and thus lost some of their own men; which encouraged the Britons to make another fierce attack: but in this also they were finally unsuccessful, and obliged to retire, though their loss seems not to have been great.

Next day the Britons suddenly attacked the Roman legions as they were foraging; but meeting with a vigorous resistance, they soon betook themselves to flight. The Romans pursued them so closely, that having neither time to rally or get down from their chariots according to custom, great numbers of them were cut in pieces: and this overthrow had such an effect upon the

auxiliaries

England.

auxiliaries of Cassibelaunus, that all of them abandoned him; nor did the Britons ever afterwards engage Cæsar with united forces. Cæsar, pursuing his victory, marched towards the Thames, with a design to cross that river, and enter the territories of the Trinobantes. The river was fordable only at one place, and that not without great difficulty; but when he came to it, he found the enemy's forces drawn up in a considerable body on the opposite bank, which was fortified with sharp stakes. They had likewise driven many stakes of the same kind into the bottom of the river, the tops of which were covered with water. These stakes are visible to this day at a place called *Walton* in Surry. They are made of oak; and though they have been so long in the water, are as hard as Brazil, and as black as jet; and have sometimes been pulled out in order to make knife-handles of them.

10 Cæsar crosses the Thames.

11 Gives the Britons frequent overthrows.

Cæsar was not at all dismayed at these difficulties, which he had intelligence of by prisoners and deserters. He ordered the cavalry to enter first, and the foot to follow. His orders were obeyed, and the soldiers advanced with such resolution, that though the infantry were up to the chin in water, the enemy, unable to sustain their assault, abandoned the bank and fled. After this defeat, Cassibelaunus himself despaired of success, and therefore dismissed all his forces except about 4000 chariots, with which he observed the motions of the Romans, harassing them by cutting off straggling parties, &c. This, however, was not sufficient to keep up the spirits of his countrymen. On the contrary, they deposed him from the kingdom, and chose Mandubratius, whose father had been murdered by Cassibelaunus, who thereupon usurped the kingdom. The young prince had fled to Cæsar, who gave him protection; and the Trinobantes now offered to submit to the conqueror, provided he would give them Mandubratius for their king.

Cæsar readily complied with the request of the Trinobantes upon their sending him 40 hostages: and the submission of the Trinobantes was soon followed by that of other states and tribes; for each of the 17 nations already mentioned were composed of several different tribes, of which no particular account can be given.—Cæsar next marched to Verulamium, or Canterbury, which was Cassibelaunus's capital, and which he still kept possession of; but tho' the place was strongly fortified both by nature and art, the Britons were unable to bear the assault of the Romans, and therefore soon fled out at one of the avenues. Many were taken as they attempted to make their escape, and many more cut in pieces.

After this loss, Cassibelaunus, as his last resource, found means to draw into confederacy with him four kings of the Cantii. But though Cæsar gives them the title of kings, it is probable that they were only petty princes, tributary to the king of that nation. Their names were Cingetorix, Corvilius, Taximagulus, and Segonax. These, having raised what forces they could, attacked the camp where the ships were laid up: but the Romans having made a sally, repulsed them with great slaughter, and then returned to their trenches without any loss; after which, Cassibelaunus though proper to submit to the conqueror. As the summer was already far spent, Cæsar hearkened to his proposals. A peace was concluded on the following terms, viz. that the Britons should pay an annual tribute to the Romans, that Cassibelaunus should leave Mandubratius in peaceable possession of his dominions, that he should not molest the Trinobantes, and that he should deliver a certain number of hostages. These terms being agreed to, Cæsar set sail with his whole fleet from Britain, to which he never returned.

12 He leaves the island altogether.

Such is the account given by Cæsar himself of his two expeditions into Britain; but other authors have spoken very doubtfully of his victories in that island. Dio Cassius tells us, that the Britons utterly defeated the Roman infantry, but were at last put in disorder by their cavalry. Horace and Tibullus, in many parts of their works, speak of the Britons as a people not yet conquered. Tacitus says, that Cæsar rather showed the Romans the way to Britain, than put them in possession of it; and Lucan tells us plainly, that Cæsar turned his back to the Britons and fled. This last, however, considering the consummate military genius of Cæsar, is by no means probable. That he left Britain during the winter, was, in all probability, to prevent insurrections among the Gauls, which might very readily have happened; and that he did not return to finish his conquest can be no wonder, seeing his ambition would certainly be more gratified by being called emperor of Rome, than conqueror of Britain.

The departure of Julius Cæsar, which happened about 53 years before Christ, left the Britons without any fear of a foreign enemy. We are not, therefore, to imagine, that they would regard their promises of paying tribute; nor was it probably demanded for a good number of years afterwards. Augustus, however, when he had got himself fully established on the throne, had twice a design of invading Britain and forcing the inhabitants to pay the tribute promised to Julius Cæsar. Both times, however, he was prevented by revolts in different provinces in the empire, so that the Britons still continued to enjoy their liberty. They thought proper, however, to court the favour of the Romans as much as they could by pretended submissions; but, in the reign of Claudius, the Romans set about reducing them to subjection in good earnest. The occasion of this war is related by Dio Cassius as follows. "Cunobelinus, the third in succession from Cassibelaunus, being dead, his two sons, Togodumnus and Caractacus, succeeded to the throne; but whether they reigned jointly or separately, is not known. In their reign one Bericus, of whom we also know very little, being driven out of the island for attempting to raise a sedition, fled with some of his partisans to Rome, and persuaded Claudius to make war on his countrymen. The Britons, on the other hand, resented the behaviour of Claudius in receiving these vagabonds, and therefore prohibited all intercourse with the Romans. A much smaller offence than this would have been sufficient at any time to provoke that haughty nation to declare war. An army was therefore immediately ordered into Britain, under the command of Plautius prætor in Gaul. The soldiers at first refused to embark, from a superstitious notion, that they were going to be sent without the compass of the world; and this mutiny being related to the Britons, they did not make the necessary preparations for their own defence. The Roman soldiers were soon brought to a sense of their duty; and set out from three different ports, in order to

13 Why the war with the Romans was renewed.

to land in three different places of Britain at once. Being driven back by contrary winds, their fears began to return; but they resumed their courage on the appearance of a meteor shooting from the east, which they imagined was sent from heaven to direct their course. They landed without opposition; and the Britons, not having drawn together a sufficient army, kept in small bodies behind their marshes, and in woods, in order to spin out the war till winter; which they imagined Plautius would, like Cæsar, spend in Gaul.

14 The Britons defeated.

The Roman general marched first in quest of the two kings Togodumnus and Caractacus; both of whom he found out, and defeated one after another. He then reduced part of the Dobuni, at that time subject to the Cattieuchlani; and leaving a garrison to keep them in awe, he advanced to a river where the Britons lay carelessly encamped, supposing that the Romans could not pass it without a bridge. But the Germans in the Roman army had been accustomed to swim across the strongest currents in their heavy armour. They therefore passed the river first; and having, according to their orders, fallen only upon the enemy's horses which drew their chariots, these formidable machines were rendered entirely useless; and the Britons were put to flight as soon as another part of the forces could pass the river.

The Britons were not disheartened with this defeat, but engaged the Romans next day with great bravery. Victory continued long doubtful; but at length the Romans prevailed, and the Britons were forced to betake themselves to flight. This battle is thought to have been fought on the banks of the Severn. From thence the Britons fled to the mouth of the Thames. They were closely pursued by the Romans; but the latter being unacquainted with the flats and shallows of the river, were often in great danger. The Germans, however, crossed by swimming as before, and the rest on a bridge somewhat further up the river; so that the Britons were in a short time surrounded on all sides, and great numbers of them cut in pieces. Many of the Romans, also, pursuing the fugitives with too great eagerness, were lost in the marshes.—In one of these battles Togodumnus was killed; but the Britons were so far from being disheartened, that they showed more eagerness than ever to oppose the Romans, in order to revenge his death. Plautius, therefore, did not think proper to penetrate farther into the country, but contented himself with putting garrisons in the places he had already conquered. He then wrote to

15 Claudius arrives in Britain.

the emperor himself; who no sooner received an account of his success, than he set out for Britain; where, having landed after a short voyage, he joined Plautius on the banks of the Thames.

Soon after the arrival of Claudius, the Romans passed the Thames, attacked the British army, and totally defeated it. The consequence of this was the taking of Cunobelinus's capital, and the submission of several of the neighbouring states. The emperor, however, did not make a long stay in the island, but left Plautius to pursue his conquests. This he did with such success, that, on his return to Rome, he was met without the gates by the emperor himself, who, at his solemn entry, gave him the right hand.—The Britons seem to have made a very obstinate resistance to the Roman arms about this time. Vespasian, who was afterwards emperor, is said to have fought 30 battles with them; and the exploits of Titus his son are also much celebrated by the Roman historians.

In the ninth year of Claudius, P. Ostorius Scapula was sent into Britain. By far the greater part of the 17 nations formerly mentioned were at this time unconquered. Some of these had broken into the Roman territories; but Ostorius falling unexpectedly upon them, put great numbers to the sword, and dispersed the rest. To prevent them for the future from making inroads into the territories of the Romans or their allies, he built several forts on the Severn, the Avon, and the Nen, reducing the country south of these rivers to a Roman province. This so highly offended the Iceni, that, being joined by the neighbouring nations, they raised a considerable army, and encamped in an advantageous situation, in order to prevent the Romans from penetrating farther into the island. Ostorius, however, soon advanced against them. The Romans, as usual, got the victory, and the enemy were pursued with great slaughter. The Roman general then, having quelled an insurrection among the Brigantes, led his army against the Silures. They were headed by their king Caractacus, a most renowned warrior. He showed his military talents by choosing a very advantageous place for engaging the enemy.

16 Caractacus defeated and taken prisoner.

Tacitus tells us, "it was on the ridge of an exceeding steep mountain; and where the sides of it were inclining and accessible, he reared walls of stone for a rampart. At the foot of the mountain flowed a river dangerous to be forded, and an army of men guarded his entrenchments." This hill is thought to be one called *Caer-Caradoc* in Shropshire, situated near the conflux of the rivers Colun and Teme, and where the remains of ancient entrenchments are still visible.—On the approach of the enemy, Caractacus drew up his troops in order of battle, animating them with the following speech, according to Tacitus. "That from this day, and this battle, they must date their liberty rescued, or their slavery for ever established. He then invoked the shades of those heroes who had expelled Cæsar the dictator; those brave men by whose valour they still enjoyed freedom from Roman tribute and taxes, and by which their wives and children were as yet preserved from prostitution." The whole army then took a solemn oath either to conquer or die, and prepared for the charge with the most terrible shouts. Ostorius was somewhat dismayed when he considered the uncommon fierceness of the enemy, and the other difficulties which he had to encounter. He led on his men, however, to the charge; and the Romans were attended with their usual good fortune. The Britons were put to flight. Vast numbers fell on the field of battle and in the pursuit, and many more were taken prisoners. Among the latter were the wife, the daughter, and the brothers, of Caractacus. The unfortunate prince himself fled to Cartismandua queen of the Brigantes, by whom he was delivered up to the Roman general, who sent him in chains to Rome. Caractacus bore his misfortunes with magnanimity; and when he came before the emperor, addressed him in the follow-

17 His speech to the Roman emperor.

ing terms. "If my moderation in prosperity, O Claudius! had been as conspicuous as my birth and fortune, I should now have entered this city as a friend, and not as a prisoner; nor would you have disdained

the

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the friendship of a prince descended from such illustritious ancestors, and governing so many nations. My present condition, I own, is to you honourable, to me humiliating. I was lately possessed of subjects, horses, arms, and riches. Can you be surprised that I endeavoured to preserve them! If you Romans have a desire to arrive at universal monarchy, must all nations, to gratify you, tamely submit to servitude? If I had submitted without a struggle, how much would it have diminished the lustre of my fall, and of your victory? And now, if you resolve to put me to death, my story will soon be buried in oblivion; but, if you think proper to preserve my life, I shall remain a lasting monument of your clemency."—This speech had such an effect upon Claudius, that he immediately pardoned Caractacus and his whole family, and commanded them to be set at liberty.

The Silures, notwithstanding this terrible blow, continued the war with great vigour, and gained considerable advantages over the Romans; which so much affected Ostorius, that he died of grief. He was succeeded by A. Didius, who restrained the incursions of the Silures, but was not able to restore Cartismundua queen of the Brigantes, who had been deposed by her subjects. Didius was succeeded by Veranius, and he

18 General revolt of the Britons.

by Suetonius Paulinus, who reduced the island of ANGLESEY, as related under that article. But while Paulinus was employed in the conquest of this island, he was alarmed by the news of an almost universal revolt among those nations which had submitted to the Romans. The Britons, tho' conquered, had still a desire of returning to their former state of independence; and the Roman yoke became every day more unsupportable to them through the insolence and oppressions of the Roman soldiers. The Britons had been long discontented, and were already in a very proper disposition for a revolt, when an event happened which kindled these discontents into an open flame. Prasutagus, king of the Iceni, a prince renowned for opulence and grandeur, had, by his last will, left the Roman emperor joint-heir with his two daughters, in hopes of obtaining his favour and protection by so great an obligation. But the event turned out very different. No sooner was he dead, than his houses and possessions were all plundered by the Roman soldiers. The queen Boadicea remonstrated against this injustice; but, instead of obtaining any redress, she herself was publicly whipped, her daughters ravished, and all the relations of the late king reduced to slavery. The whole country also was plundered, and all the chiefs of the Iceni deprived of their possessions.

Boadicea was a woman of too haughty a spirit tamely to bear such indignities. She therefore persuaded the Iceni to take up arms, which they very readily did. Then, being joined by the Trinobantes, and some other nations, they poured like a torrent on the Roman colonies. Every thing was destroyed with fire and sword. The ninth legion, which had been left for the defence of the country under Petilius Cerealis, was defeated, the infantry totally cut in pieces, and the commander himself with the cavalry escaped with the utmost difficulty. Suetonius, alarmed at this news, immediately left Anglesey, and marched with the greatest expedition to London. The inhabitants were overjoyed at his arrival, and used their utmost endeavours to detain him for their defence. But he refused to stay, and in a short time left the place, notwithstanding the intreaties of the inhabitants. The whole city lamented his departure; and they had reason. Suetonius was scarce gone, when Boadicea with her Britons entered, and put all they found in it to the sword. None were taken prisoners, nor was any sex or age spared, and many were tortured in the most cruel manner. Seventy thousand persons are said to have perished on this occasion at London and other Roman colonies.

19 They destroy 70,000 Romans.

The Britons, now elated with success, assembled from all quarters in great numbers, so that Boadicea's army soon amounted to 230,000 men. They despised the Romans; and became so confident of victory, that they brought their wives and children along with them in waggons to be spectators of the destruction of their enemies. The event was what might naturally have been expected from such ill judged confidence. The Britons were overthrown with most terrible slaughter, no fewer than 80,000 being killed in the battle and pursuit: while the Romans had not above 400 killed, and not many more wounded. Boadicea, not able to survive so great a calamity, put an end to her life by poison.

20 They are utterly defeated.

By this overthrow the Britons who had once been subdued were thoroughly prevented from raising any more insurrections, and even those who had not yet submitted to the Roman yoke seemed to be intimidated from making incursions into their dominions. Nothing remarkable therefore happened for some time. In the time of Vespasian, Petilius Cerealis being appointed governor of Britain, attacked the Brigantes, defeated them in several battles, and reduced great part of their country. He was succeeded by Julius Frontinus; who not only maintained the conquests of his predecessor, but reduced entirely the warlike nation of the Silures. Frontinus was succeeded by the celebrated Cneius Julius Agricola, who completed the conquest of all the southern Britons.

21 Britain conquered by Agricola.

Just before the arrival of Agricola, the Ordovices had cut in pieces a band of horse stationed on their confines, after which the whole nation had taken arms. The summer was pretty far spent, and the Roman army was quite separated and dispersed, the soldiers having assured themselves of rest for the remaining part of the year. Agricola, however, was no sooner landed, than having drawn together his legions, he marched against the enemy without delay. The Britons kept upon the ridges of the mountains; but Agricola led them in person up the ascents. The Romans were victorious; and such a terrible slaughter was made of the Britons that almost the whole nation of Ordovices was cut off. Without giving the enemy time to recover from the terror which this overthrow had occasioned, Agricola resolved upon the immediate reduction of Anglesey, which had been lost by the revolt of Boadicea. Being destitute of ships, he detached a chosen body of auxiliaries who knew the fords, and were accustomed to manage their arms and horses in the water. The Britons, who had expected a fleet and transports, were so terrified by the appearance of the Roman forces on their island that they immediately submitted, and Anglesey was once more restored to the Roman s

With the conquest of Anglesey ended the first campaign

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paign of Agricola; and he employed the winter in reconciling the Britons to the Roman yoke. In this he met with such success, through his wise and equitable conduct, that the Britons, barbarous as they were, began to prefer a life of security and peace to that independency which they had formerly enjoyed, and which continually exposed them to the tumults and calamities of war. The succeeding compaigns of Agricola were attended with equal success; he not only subdued the 17 nations inhabiting England, but carried the Roman arms almost to the extremity of Scotland. He also caused his fleet to sail round the island, and discovered the Orcades, or Orkney islands, which had before been unknown to the rest of the world. His expedition took him up about six years, and was completed in the year of Christ 84.

Had this commander been continued in Britain, it is probable that both Scotland and England would have been permanently subdued; but he was recalled by Domitian in the year 85, and we are then almost totally in the dark about the British affairs till the reign of the emperor Adrian. During this interval the Caledonians had taken arms, and not only refused subjection to the Roman power themselves, but ravaged the territories of the Britons who continued faithful to them. Adrian, for what reason is not well known, abandoned to them the whole track lying between the Tyne and the Forth. At the same time, in order to restrain them from making incursions into the Roman territories, he built a wall 80 miles in length from the river Eden in Cumberland to the Tyne in Northumberland*. He was succeeded by Antoninus Pius, in whose reign the Brigantes revolted; and the Caledonians, having in several places broken down the wall built by Adrian, began anew to ravage the Roman territories. Against them the emperor sent Lollius Urbicus, who reduced the Brigantes; and having defeated the northern nations, confined them within narrower bounds by a new wall†, extending probably between the friths of Forth and Clyde. From the time of Antoninus to that of Severus, the Roman dominions in Britain continued to be much infested by the inroads of the northern nations. That emperor divided Britain into two governments, the southern and northern; but the governor of the northern division was so harassed by continual incursions of the Caledonians, that he was at length obliged to purchase a peace with money. The Caledonians kept the treaty for fifteen years; after which, breaking into the Roman territories anew, they committed terrible ravages. Virius Lupus the governor, not being in a condition to withstand them, acquainted the emperor with his distress, intreating him to send powerful and speedy supplies. Upon this Severus resolved to put an end to the perpetual incursions of the enemy by making a complete conquest of their country; for which purpose he set out for Britain, together with his two sons Caracalla and Geta, at the head of a numerous army. The Caledonians no sooner heard of his arrival, than they sent ambassadors offering to conclude a peace upon honourable terms. But these the emperor detained till he was ready to take the field, and then dismissed them without granting their request.

* See *Adrian*.

† See *Antoninus's* wall.

22
Expedition of Severus into Britain.

As soon as the season was fit for action, Severus marched into the territories of the Caledonians, where he put all to fire and sword. He advanced even to the most northerly parts of the island; and though no battle was fought in this expedition, yet through the continual ambuscades of the enemy, and the inhospitable nature of the country, he is said to have lost 50,000 men. At last the Caledonians were obliged to sue for peace; which was granted them on condition of their yielding part of their country, and delivering up their arms. After this the emperor returned to York, leaving his son Caracalla to command the army, and finish the new wall which had been begun between the friths of Forth and Clyde. But the emperor being taken ill at York, the Caledonians no sooner heard of his indisposition, than they again took up arms. This provoked Severus to such a degree, that he commanded his son Caracalla to enter their country anew with the whole army, and to put all he met to the sword without distinction of sex or age. Before these orders, however, could be put in execution, his two sons, having concluded a shameful peace with the Caledonians, returned to Rome.

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A long chasm now takes place in the history of the Roman dominions in Britain. In the beginning of Dioclesian's reign, Carausius a native of Gaul, passing over into Britain, took upon him the title of *emperor*, and was acknowledged by all the troops quartered here. He was, however, killed in a battle with one of Constantius's officers, after he had enjoyed the sovereignty for six or seven years. Constantine the Great began his reign in this island; and returned soon after he had left it, probably with a design to put a stop to the daily incursions of the Caledonians. He altered the division of that part of Britain subject to the Romans. Severus had divided it only into two provinces; but Constantine increased the number to three: *viz.* Britannia Prima, Britannia Secunda, and Maxima Cæsariensis; and this last was afterwards divided into two, *viz.* Maxima Cæsariensis and Flavia Cæsariensis. The removal of the imperial seat from Rome to Constantinople, which happened in the reign of Constantine, gave the northern nations an opportunity of making frequent incursions into the Roman province; the emperor having carried with him, first into Gaul, and then into the East, not only most of the Roman troops, but likewise the flower of the British youth.

About the latter end of the reign of Constantius son to Constantine the Great, the government of the province of Britain and other western parts of the empire, was committed to Julian, afterwards called the *apostate*. While he was in his winter-quarters at Paris, he was informed that the Scots and Picts, about this time first distinguished by these names, had broken into the Roman territories and committed every where dreadful ravages. Against them Julian dispatched a body of troops under the command of Lupicinius. He embarked from Bologne in the depth of winter, but was no sooner arrived at London than he was recalled; the enemy having probably found means to appease Julian by their submissions. Till the reign of Valentinian I. these nations still continued to infest the Roman territories in Britain, and had now reduced the country to a most deplorable condition by their continual ravages. Valentinian sent against them Theodosius, father to the emperor of that name. That general

ral having divided his forces into several bodies, advanced against the enemy, who were roving up and down the country. The Scots and Picts were obliged to yield to the superior valour and discipline of the Romans. Great numbers were cut in pieces; they were forced to abandon all the booty and prisoners they had taken, and to retire beyond the friths of Forth and Clyde. Theodosius then entered London in triumph, and restored that city to its former splendor, which had suffered greatly by the former incursions of the northern Britons. To restrain them from breaking anew into the provinces, Theodosius built several forts or castles between the two friths; and having thus recovered all the country between Adrian's wall and the friths of Forth and Clyde, he formed of it a fifth province which he called *Valentia*.

Though Britain was now reduced to a state of temporary tranquillity, yet as the Roman empire was daily declining, it is not to be supposed that sufficient care could be taken to secure such a distant province. In the reign of the emperor Honorius, the provincial Britons found themselves annoyed not only by the Scots and Picts, but also by the depredations of the Saxons, who began to commit ravages on the sea-coasts. By the care, however, of Stilicho, prime minister to Honorius, matters were once more settled, and a particular officer was appointed to guard the coast against the attempts of the Saxons, with the title of *Comes limitis Saxonici*. But, not long after, the empire being over-run by barbarians, most of the Roman troops quartered in Britain were recalled, and the country left quite open to the attacks of the Scots and Picts.

23 The Britons choose an emperor of their own.

Upon this the provincials expecting no more assistance from Honorius, resolved to set up an emperor of their own. Accordingly they invested with the imperial dignity one *Mark*, an officer of great credit among them. Him they murdered in a few days, and placed on the throne one Gratian a native of Britain. After a reign of four months, Gratian underwent the fate of his predecessor; and was succeeded by *Constantine*, a common soldier, who was chosen merely for the sake of his name. He seems, however, to have been a man of some knowledge and experience in war. He drove the Scots and Picts beyond the limits of the Roman territories; but being elevated with this success, he would now be satisfied with nothing less than the conquest of the whole Roman empire. He therefore passed over into Gaul; and took with him not only the few Roman forces that had been left, but such of the provincial Britons as were most accustomed to arms. That unhappy people, being now left entirely defenceless, were harassed in the most cruel manner by their enemies; who broke into the country, and destroyed all with fire and sword. In this miserable situation they continued from the year 407, when the usurper Constantine passed over into Gaul, till the year 410. Having during the last three years frequently implored assistance from Rome without receiving any, they now resolved to withdraw their allegiance from an empire which was no longer able to protect them. Honorius himself applauded their conduct; and advised them by letters, to provide for their own safety, which was in effect an implicit resignation of the sovereignty of the island.

The provincial Britons now regained their liberty; but they had lost the martial spirit which had at first rendered them so formidable to the Romans. They seem, however, to have met with some success in their first enterprises; for Zosimus tells us, that they delivered their cities from the insults of an haughty enemy. But being at last overpowered, they were again obliged to have recourse to the Roman emperor, to whom they promised a most perfect submission, provided they were delivered from the hands of their merciless and implacable enemies. Honorius, touched with compassion, sent a legion to their relief. The Roman forces landed in Britain unexpectedly; and having destroyed great numbers of the Scots and Picts, they drove them beyond the friths of Forth and Dunbritton. After this they advised the natives to build a wall on the isthmus from sea to sea, and to reassume their courage, and defend themselves from their enemies by their own valour. The Romans then quitted the country; being obliged to return, in order to repulse those barbarians who had broken into the empire from all quarters.

24 Implore the assistance of the Romans.

The Britons immediately set about building the wall, as they had been desired, with great alacrity. But as it was constructed only of turf, the Scots and Picts soon broke it down in several places; and, pouring in upon the defenceless and effeminate provincials, committed more cruel ravages than ever. At last, after very many and grievous calamities, the latter sent ambassadors once more to Rome. These appeared with their garments rent and dust on their heads; and at last prevailed on the emperor, by their earnest intreaties, to send another legion to their relief. The troops arrived in Britian before the enemy had the least knowledge of their having set sail. They were therefore quite unprepared for an attack, and roving up and down the country in the utmost disorder. The Romans made a terrible havoc among them, and drove the remainder into their own country. As Honorius had sent them not with any ambitious view of retaining the island in subjection, but merely out of compassion to the unhappy provincials, the Romans told them, they had now no farther assistance to expect from them. They informed them, that the legion must immediately return to the continent, to protect the empire from the barbarians, who had extended their ravages to almost every part of it; and therefore, that they must now take their last farewel of Britain, and totally abandon the island. After this declaration Gallio, the commander of the Roman troops, exhorted the provincials to defend themselves, by fighting bravely for their country, wives, and children, and what ought to be dearer than life itself, their liberty; telling them, at the same time, that their enemies were no stronger than themselves, provided they would but lay aside their fears, and exert their ancient courage and resolution. That they might the better withstand the attacks of the enemy, he advised them to build a wall, not of turf, but of stone: offering to assist them with his soldiers, and to direct them himself in the execution. Upon this the Britons immediately fell to work; and with the assistance of the Romans, finished it in a short time, though it was no less than eight feet thick, and twelve feet in height. It is thought to have been built on the same place where Severus's wall formerly stood. Towers were also built at convenient

25 Send ambassadors a second time to Rome.

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venient distances on the east coast, to prevent the descents of the Saxons and other barbarians that came from Germany. Gallio employed the rest of his time in teaching the provincials the art of war. He left them patterns of the Roman weapons, which he also taught them to make; and after many encouraging exhortations, he took his last farewel of Britain, to which the Romans never returned. There is a great disagreement among chronologers as to the year in which the Romans finally abandoned Britain; some placing it in 422; others in 423, or 426; and some in 431, 435, or 437.

26 Britain finally abandoned by the Romans.

The final departure of the Romans was no sooner known to the Scots and Picts, than they poured in upon the provincial Britons from all quarters, like hungry wolves breaking into a sheep-fold. When the Scots approached the new-built wall, they found it completely finished, and guarded by a great number of armed men. But so little had the provincial Britons profited by the military instructions of the Romans, that instead of placing proper guards and centinels, and relieving one another by turns; their whole number had staid several days and nights upon the ramparts without intermission. Being therefore quite benumbed and wearied out, they were able to make but very little resistance. Many were pulled down with hooks from the battlements, and dashed to pieces. The rest were driven from their stations with showers of darts and arrows. They betook themselves to flight; but that could not save them. The Scots and Picts pursued them close, made a dreadful havoc among the fugitives, and took possession of the frontier towns, which they found deserted by the inhabitants. As they now met with no more opposition, they over-ran the whole country, putting every thing to fire and sword. Their ravages soon occasioned a famine; and this was followed by a kind of civil war. The provincials, unable to support themselves, were obliged to plunder each other of the little the common enemy had left them. The whole country at last become so incapable of supporting those who were left in it, that many fled into the woods, in order to subsist themselves there by hunting. In this extremity of distress, they had once more recourse to the Romans; and wrote in the most mournful style that can possibly be imagined to Aetius, who was then consul the third time. Their letter they directed thus; "The groans of the Britons to the consul Aetius." The contents of this letter were answerable to the direction. "The barbarians (say they) drive us to the sea; the sea drives us back again to the barbarians; between which we have only the choice of two deaths, either to be swallowed up by the waves, or to be cruelly massacred by the enemy."

27 Britons miserably harassed by the Scots and Picts.

28 Implore the assistance of the Romans.

To this letter the Roman general gave no satisfactory answer, and the provincials were thereupon reduced to despair. Great numbers of them fled over to Armorica, where they settled along with others who had formerly gone over with an usurper called *Maximus*; while others submitted to the Scots and Picts. Some, however, more resolute than the rest, had once more recourse to arms. They sallied out in parties from the woods and caves where they had been obliged to hide themselves, and, falling unexpectedly on the enemy, cut great numbers of them in pieces, and obliged the rest to retire. Having thus obtained some respite, they began again to cultivate their lands; which having lain fallow for a long time, now produced all sorts of corn in the greatest plenty. This plenty, according to the historian Gildas, occasioned the most consummate wickedness and corruption of manners among all ranks of men. The clergy, says he, who should have reclaimed the laity by their example, proved the ringleaders in every vice; being addicted to drunkenness, contention, envy, &c.—It is possible, however, that this description might be exaggerated by Gildas, who himself was a monk. But however this was, the Britons had not long enjoyed peace, when they were alarmed by a report that the Scots and Picts were about to return with a far greater force than before, utterly to extirpate the name of their southern neighbours, and seize upon the country for themselves. This report threw them into a terrible consternation; and to add to the rest of their misfortunes, they were now visited by a dreadful plague, which raged with such violence, that the living were scarce sufficient to bury the dead. The contagion no sooner ceased, than they found their country invaded by the Scots and Picts, who destroyed every thing with fire and sword; so that the provincials were soon reduced to the same miserable state they had formerly been in.

29 They at last repulse their enemies.

30 Are again threatened with an invasion.

At this time the chief, if not the only, king of the southern division of Britain, was one *Vortigern*. He is said to have been a cruel, debauched tyrant, regardless of the public welfare, and totally incapable of promoting it. Being now roused from his sensibility, however, by a sense of his own danger, he summoned a council of the chief men of the nation, in order to deliberate about the proper means for delivering the country from those calamities under which it groaned. In this council the most pernicious measure was adopted that could possibly have been resolved on; namely, to invite to their assistance the *Saxons*, a people famous for their piracies and cruelty, and justly dreaded by the Britons themselves*. This fatal expedient being agreed upon, ambassadors were immediately dispatched into Germany with advantageous proposals to the Saxons in case they would come over to their assistance.

31 They resolve to call in the Saxons.

* See *Saxons*.

The British ambassadors soon arrived in Germany, and according to Witichind, a Saxon historian of the ninth century, made the following speech before an assembly of the Saxons.—"Illustrious Saxons, the fame of your victories having reached our ears, the distressed Britons, harassed by the continual inroads of a neighbouring enemy, send us to implore your assistance. We have a fertile and spacious country, which we are commanded to submit to you. We have hitherto lived under the protection of the Roman empire, but our ancient masters having abandoned us, we know no nation more powerful than you, and better able to protect us. We therefore recur to your valour. Forsake us not in our distress, and we shall readily submit to what terms you yourselves shall think fit to prescribe to us."—If this abject and shameful speech was really made, it must give us a very strange idea of the national spirit of the provincial Britons at that time. It is, however, probable that the whole is a fiction, designed only to excuse the perfidious treatment which these Britons afterwards received from the Saxons.

Saxons. The most respectable even of the Saxon historians make no mention of such a speech; and it is certain, that when the Saxons themselves wanted to quarrel with the Britons, they never insisted upon the promise made by the British ambassadors; which they most certainly would have done, had any such promise ever been made.

The British ambassadors were very favourably received by the Saxons. The latter embraced their proposal with joy; and the rather, because their soothsayers foretold that they should plunder their British allies for 150 years, and reign over them for twice that time. Three long ships, in the Saxon language called *chiules*, were therefore fitted out, under the the conduct of Hengist and Horsa. These were two brothers much celebrated both for their valour and nobility. They were sons of Witigisil, said to be great-grandson to the Saxon god Woden; a circumstance which added much to their authority. Having embarked about 1600 men on board their three vessels, the two brothers arrived in the isle of Thanet, in the year 449 or 450.

32 The Saxons arrive in Britain, and defeat the Scots and Picts.

They were received by the inhabitants with the greatest demonstrations of joy: the isle in which they had landed was immediately appointed for their habitation; and a league was concluded, in virtue of which the Saxons were to defend the provincial Britons against all foreign enemies; and the provincials were to allow the Saxons pay and maintenance, besides the place allotted then for their abode. Soon after their arrival, king Vortigern led them against the northern nations who had lately broke into the kingdom, and advanced as far as Stanford in the county of Lincolnshire. Here a battle was fought, in which the Scots and Picts were utterly defeated, and obliged to relinquish their booty.

Vortigern was so highly pleased with the behaviour of his new allies, that he bestowed large possessions in the country they had newly delivered, upon the two commanders Hengist and Horsa. It it said, that, even at this time, Hengist was taken with the wealth and fertility of the country; and at the same time observing the inhabitants to be quite enervated with luxury, began to entertain hopes of conquering part of it. He therefore, with Vortigern's consent invited over some more of his countrymen; giving them notice at the same time of the fruitfulness of the country, the effeminacy of the inhabitants, and how easily a conquest might be effected.

33 New supplies of Saxons arrive.

The Saxons readily complied with the invitation: and, in 452, as many more arrived in 17 vessels, as, with those already in Britain, made up an army of 5000 men. Along with these, according to Nennius, came over Rowena the daughter of Hengist. Vortigern fell in love with this lady; and in order to obtain her in marriage, divorced his lawful wife. Hengist pretended to be averse to the match; but Vortigern obtained his consent by investing him with the sovereignty of Kent. The Saxon historians, indeed, make no mention of Rowena; but rather insinuate, that their countrymen made themselves masters of Kent by force of arms. It seems most probable, however, that Vortigern had as yet continued his friendship with the Saxons, and even put more confidence in them than in his own subjects. For, not long after the arrival of this first reinforcement, Hengist obtained leave to send for a second, in order, as was pretended, to defend the king from the attempts of his rebellious subjects, as well as of the Scots and Picts. These embarked in 40 ships, under the command of Octa and Ebusa, the son and nephew, or, according to some, the brother and nephew of Hengist. They landed at the Orkney islands; and having ravaged them, as well as all the northern coasts of Scotland, they conquered several places beyond the Frith, and at last obtained leave to settle in Northumberland.

The pretence made for this settlement was, that the Saxons under Octa and Ebusa might defend the northern frontiers of the kingdom, as those under Hengist and Horsa did the southern parts. Many more Saxons were, under various pretences, invited over; till at last the countries from whence they came were in a manner depopulated. And now their numbers being greatly increased, the Saxons began to quarrel with the natives. They demanded larger allowances of corn, and other provisions: threatening to lay waste the whole country if their demands were not complied with.

34 They quarrel with the Britons.

The Britons, instead of complying with these demands, desired them to return home, since their numbers exceeded what they were able to maintain. Upon this, the Saxons concluded a peace with the Scots and Picts; and, turning their arms against the unhappy provincials, over ran the whole country. The Saxons committed every where the greatest cruelties. All buildings whether public or private, they levelled with the ground. The cities were pillaged and burnt; and the people massacred without distinction of sex or age, and that in such numbers, that the living scarce sufficed to bury the dead. Some of those who escaped the general slaughter, took refuge among inaccessible rocks and mountains; but there great numbers perished with hunger, or were forced to surrender themselves as slaves to their enemies. Some crossed the sea and settled either in Holland or in Armorica, now the province of Brittany in France.

Vortigern, we are told by Nennius, was so far from being reclaimed by these calamities, that he added incest to his other crimes, and married his own daughter. At last, his own subjects, provoked at his enormous wickedness, and the partiality he shewed to the Saxons, deposed him, and raised his son Vortimer to the throne. He was a young man of great valour, and willingly undertook the defence of his distressed country.

35 They are defeated and driven out by Vortimer.

He first fell upon the Saxons with what troops he could assemble, and drove them into the isle of Thanet. Here they were besieged, till, being reinforced by fresh supplies from Germany, they opened themselves a way through the British troops. Vortimer, however, was not yet disheartened. He engaged the Saxons on the banks of the Derwent in Kent, where he obtained a complete victory, and cut in pieces great numbers of the enemy. Another battle was fought at Aylesford in Kent. Some ascribe the victory at this time to the Saxons, and some to the Britons. It is certain, however, that Horsa the brother of Hengist was killed in the engagement. He is said to have been buried at a place in the neighbourhood, which from him obtained the name of *Horsted*.—A third battle was fought, in which the victory was uncertain, as is also the place where it happened. The fourth battle, however, acccording to Nennius, proved decisive

England.

decisive in favour of the Britons. Vortimer engaged his enemies according to some, at Folkstone; according to others, at a place called *Stonar*, in the isle of Thanet. The Saxons were defeated with great slaughter, and driven back to their ships. So complete is this victory said to have been, that the Saxons quitted the island, without making any attempt upon it for five years afterwards. These battles, however, rest entirely upon the credit of Nennius, and the historians who have followed him. They are taken notice of neither by Gildas nor Bede. The former only acquaints us, that the Saxons retired. This, by most historians, is understood of their returning home; tho' it is possible he might mean no more, than that, after they had laid waste the country, they retired into the territories allotted them by Vortigern, in Kent and Northumberland.

Vortimer is said to have died after a reign of six years. On his death-bed, he desired his servants to bury him near the place where the Saxons used to land; being persuaded, that the virtue of his bones would effectually prevent them from ever touching the British shore. This command, however, was neglected; and Vortimer was buried at Lincoln, according to some, or London, or according to others. Hengist was no sooner informed of his death, than he invaded Britain anew with a numerous body of Saxons. He was opposed by Vortigern, who had been restored to the throne after the death of his son Vortimer. Several battles were fought on this occasion; but at last the provincials being overthrown at a place called *Crecanford*, with the loss of 4000 men, were obliged to abandon Kent to their enemies, and retire to London. This happened about the year 458 or 459; and from this time most historians date the erection of the first Saxon kingdom in Britain, viz. that of Kent. Hengist assumed the title of *king*, and chose Esk his son for his colleague.

36 They return and defeat the Britons, and erect a kingdom in Kent.

The Britons under Vortigern still continued the war. Hengist finding himself unable to gain a decisive advantage over them in the field, had recourse to treachery. He pretended to be desirous of concluding a peace with the British monarch, and of renewing his ancient friendship with him; and therefore required an interview. To this Vortigern readily consented, and accepted of an entertainment prepared for him by Hengist. The king was attended by 300 nobility all unarmed, but the Saxons had concealed daggers below their garments. The British nobility were all treacherously massacred in the height of their mirth; Vortigern himself was taken and put in fetters; nor could his liberty be procured, but by ceding to the Saxons those provinces now called *Essex*, *Sussex*, and *Middlesex*. Thus the Saxons got such a footing in Britain that they could never afterwards be expelled. Vortigern, after being set at liberty, is said to have retired to a vast wilderness near the fall of the Wye in Radnorshire, where he was some time after consumed by lightning, together with a city called *Kaer Gourtigern* which he had built in that place.

37 Treachery of the Saxons.

On the retreat of Vortigern, the command of the British forces devolved upon Aurelius Ambrosius, or, as Gildas calls him Ambrosius Aurelianus. He was a Roman, and perhaps the last that remained on the island. He is said to have gained several victories over the Saxons. Notwithstanding this, however, they still continued to gain ground; and in the year 491, the foundation of a second Saxon kingdom was laid in Britain. This at first comprehended only the county of Sussex, but soon after extended over most of the countries lying south of the Humber. It was called the *kingdom of the South Saxons*.

38 Second Saxon kingdom.

The German nations being now informed of the good success which had attended the Saxons in Britain, new adventurers daily flocked over to share the good fortune of the others. They were chiefly composed of three nations, the Saxons, Angles, and Jutes. All these passed under the common appellation sometimes of *Saxons*, sometimes of *Angles*. They spoke the same language, and agreed very much in their customs and institutions, so that all of them were naturally led to combine against the natives. The most active of these adventurers was Cerdic a Saxon, said to be the tenth in descent from Woden. He landed with his son Cenric, and as many men as he could convey in five ships, at Yarmouth in Norfolk. The provincials immediately attacked him with great vigour; but after a short engagement, they were totally defeated. Many other battles were fought, the event of which was always favourable to the Saxons, so that the Britons were forced to abandon their sea-coasts to them.

In 497, *Porta*, another Saxon, with his two sons *Bleda* and *Magla*, arrived at *Portsmouth*, so called, as some imagine, from this chieftain. The provincials, under the command of a young prince a native of the country, attempted to oppose the landing of the Saxons: but his army was defeated with great slaughter, and he himself killed in the engagement; after which Porta made himself master of all the neighbouring country. The progress of Cerdic, however, alarmed the Britons more than that of all the other Saxon princes. About the year 508, therefore, *Nazaleod*, styled, by Henry of Huntingdon, *the greatest of all the British kings*, assembled almost the whole strength of the provincial Britons in order to drive him out of the island. Cerdic on the other hand took care to strengthen himself by procuring assistance from all the Saxons already in the island. He then advanced against the Britons, commanding the right wing himself, and his son Cenric the left. As the two armies drew near each other, Nazaleod perceived the enemy's right wing to be much stronger than the left. He therefore attacked it with the flower of his army; and after an obstinate resistance, obliged Cerdic to save himself by flight. Being too eager in the pursuit, however, Cenric fell upon his rear, and the battle was renewed with great vigour. The British army was at last entirely defeated; and 5000 men, among whom was Nazaleod himself, were left dead on the spot.

39 Nazaleod king of Britain defeated and killed.

Who succeeded Nazaleod in the kingdom of Britain, is not known. The Welsh annals leave an interregnum of about six years; after which they place the beginning of the reign of Arthur, the most renowned British Prince mentioned in history. The history of king Arthur is so much obscured by fables, and many absurd, romantic, and ridiculous stories, that some have supposed that no such person ever existed. On this subject Milton gives the following reasons against the existence of king Arthur: 1. He is not mentioned by Gildas,

40 Whether such a person as king Arthur ever existed.

Gildas, or any British historian except Nennius, who is allowed on all hands to have been a very credulous writer, and to have published a great many fables. 2. Though William of Malmesbury and Henry of Huntingdon have both related his exploits, yet the latter took all he wrote from Nennius; and the former, either from the same fabulous writer, or some Monkish legends in the abbey of Glastenbury; for both these writers flourished several centuries after king Arthur. 3. In the pretended history of Geoffroy of Monmouth, such contradictions occur concerning this monarch's victories in France, Scotland, Ireland, Norway, Italy, &c. as must cause us to look upon him as an hero altogether fabulous and romantic.

In answer to this has been said, 1. That his not being mentioned by Gildas cannot seem strange to us, seeing it was not that author's design to write an exact history of his country, but only to give a short account of the causes of its ruin by the Scots, Picts, and Saxons. He had also a particular system to support, namely, That the ruin of the Britons was owing to the judgements of God upon them for their wickedness. He lies therefore under a great temptation to conceal the success of the Britons, and to relate only their misfortunes. 2. Though Nennius was a credulous writer, it is unreasonable to think that the whole history of king Arthur was an invention of his. It is more probable that he copied it from other more ancient authors, or took it from the common tradition of his countrymen. That the Saxon annals make no mention of this king is not to be wondered at, seeing it is natural to think that they would wish to conceal the many defeats he gave their nation. 3. The most convincing proof of the existence of king Arthur is, that his tomb was discovered at Glastenbury in Somersetshire, and his coffin dug up, in the reign of Henry II. with the following inscription upon it in Gothic characters: "Hac jacet sepultus inclytas rex Arturius in insula Avalonia." We are told that on his body were plainly to be seen the marks of 10 wounds, only one of which seemed to be mortal.

41
His exploits.

This renowned prince is said to have defeated the Saxons under Cerdic in 12 pitched battles. The last of these was fought on Badon-hill, supposed to be Bansdown near Bath; in which the Saxons received such a terrible overthrow, that for many years they gave the Britons no further molestation. As new supplies of Saxons, however, were continually flocking over, a third and fourth kingdom of them were soon formed. The third kingdom comprehended the counties of Devon, Dorset, Somerset, Wiltshire, Hampshire, and Berkshire; to which was afterwards added Cornwal. This was called the *kingdom of the West Saxons*. The other kingdom, which was called the *kingdom of the East Saxons*, comprehended Essex, Middlesex, and part of Hertfordshire.

42
Five other Saxon kingdoms erected.

In the year 542, happened the death of the great king Arthur, said to have been killed in battle by a treacherous kinsman of his own. Five years afterwards, was erected the Saxon kingdom of Northumberland. It extended, however, much farther than the present bounds of that country; for it comprehended all Yorkshire, Lancashire, Durham, Cumberland, Westmoreland, and Northumberland, with part of Scotland, as far as the frith of Forth. Between these Saxon kings frequent contentions now arose; by which means the Britons enjoyed an uninterrupted tranquillity for at least 44 years. This interval, however, according to Gildas, they employed only in corrupting their manners more and more, till at last they were roused from their security by the setting up of a sixth Saxon kingdom, called the kingdom of the *East Angles*. It was founded in 575, and comprehended the counties of Norfolk, Suffolk, Cambridgeshire, and the Isle of Ely. The Saxons once more attacked the Britons, and overthrew them in many battles. The war was continued for ten years; after which, another Saxon kingdom called *Mercia* was set up. It comprehended 17 counties; viz. Gloucester, Hereford, Worcester, Warwick, Leicester, Rutland, Northampton, Lincoln, Huntington, Bedford, Buckingham, Oxford, Stafford, Nottingham, Derby, Shropshire, Cheshire, and part of Hertfordshire.

43
The Britons defeat the Saxons, but are obliged to retire into Wales.

The provincial Britons were now confined within very narrow bounds. However, before they entirely gave up the best part of their country to their enemies, they once more resolved to try the event of a battle. At this time they were assisted by the Angles, who were jealous of the overgrown power of the West Saxons. The battle was fought in Wiltshire, at Woden's Bearth, a place near the ditch called *Wansdike* or *Wodensdike*; which runs through the middle of the county. The battle was very obstinate and bloody; but at last the Saxons were entirely defeated, and almost their whole army cut off. The victory, however, proved of little service to the Britons: for being greatly inferior in number to the Saxons, and harassed by them on the one side, and by the Scots and Picts on the other, they were daily more and more confined; and at last obliged to take refuge among the craggy and mountainous places in the west of the island, where their enemies could not pursue them. At first they possessed all the country beyond the rivers Dee and Severn, which anciently divided Cambria, or Wales, from England; the towns which stand on the eastern banks of these rivers having mostly been built in order to restrain the incursions of the Welsh. But the English, having passed the Severn, by degrees seized on the country lying between that river and the Wye. Nay, in former time, some parts of Flintshire and Denbighshire were subject to the kings of Mercia: for Uffa, the most powerful king of that country, caused a deep ditch to be drawn, and a high wall built, as a barrier between his dominions and the territories of the Welsh, from the mouth of the Dee, a little above Flint-castle, to the mouth of the Wye. This ditch is still to be seen in several places; and is called by the Welsh *Glaudh Uffa*, or the Ditch of Uffa. The inhabitants of the towns on the east side of this ditch are called by the same people *Guyr y Mers*; that is, the men of Mercia.

44
Account of the heptarchy.

Thus, after a violent contest of near 150 years, the Saxons entirely subdued the Britons whom they had come to defend, and had erected seven independent kingdoms in England, now commonly denominated the *Saxon Heptarchy*. By these conquerors the country was now reduced to a degree of barbarity almost as great as it had been in when first invaded by the Romans. The provincial Britons, during their subjection to that people, had made considerable advances in civilization.

England. vilization. They had built 28 considerable cities, besides a number of villages and country-seats; but now these were all levelled with the ground, the native inhabitants who remained in England were reduced to the most abject slavery, and every art and science totally extinguished among them.

Before these fierce conquerors could be civilized in any degree, it was necessary that all the seven kingdoms should be reduced under one head; for as long as they remained independent, their continual wars with each other still kept them in the same state of barbarity and ignorance.

The history of these seven kingdoms affords no event that can be in the least interesting. It consists only of a detail of their quarrels for the sovereignty. This was at last obtained by Egbert king of the West Saxons, or Wessex, in 827. Before this time, Christianity had been introduced into almost all the kingdoms of the heptarchy; and however much corrupted it might be by coming through the impure channel of the church of Rome, and misunderstood through the ignorance of those who received it, it had considerably softened the barbarous manners of the Saxons. It had also opened a communication between Britain and the more polite parts of Europe, so that there was now some hope of the introduction of arts and sciences into this country. Another effect was, that, by the ridiculous notions of preserving inviolable chastity even between married people, the royal families of most of the kingdoms were totally extinct; and the people, being in a state of anarchy, were ready to submit to the first who assumed any authority over them.

All these things contributed to the success of Egbert in uniting the heptarchy under his own dominion. He was of the royal family of Wessex; and a nearer heir than Brithric, who had been raised to the kingdom in 784. As Egbert was a prince of great accomplishments, Brithric, knowing that he had a better title to the crown than himself, began to look upon him with a very jealous eye. Young Egbert, sensible of his danger, privately withdrew to France; where he was well received by Charlemagne, the reigning monarch. The French were reckoned at this period the most valiant and polite people in Europe; so that this exile proved of great service to Egbert.

He continued at the court of France till he was recalled by the nobility to take possession of the kingdom of Wessex. This recal was occasioned by the following accident. Brithric the king of Wessex had married Eadburga, natural daughter of Offa king of Mercia; a woman infamous for cruelty and incontinence. Having great influence over her husband, she often persuaded him to destroy such of the nobility as were obnoxious to her: and where this expedient failed, she herself had not scrupled to become their executioner. She had mixed a cup of poison for a young nobleman, who had acquired a great share of her husband's friendship: but, unfortunately, the king drank of the fatal potion along with his favourite, and soon after expired. By this and other crimes Eadburga became so odious to the people, that she was forced to fly into France, whence Egbert was at the same time recalled, as abovementioned.

Egbert ascended the throne of Wessex in the year 799. He was the sole descendant of those conquerors who first invaded Britain, and who derived their pedigree from the god Woden. But though this circumstance might have given him great advantages in attempting to subdue the neighbouring kingdoms, Egbert for some time gave them no disturbance; but turned his arms against the Britons, who had retired into Cornwall, whom he defeated in several battles. He was recalled from his conquests in that country, by hearing that Bernulf king of Mercia had invaded his dominions. Egbert quickly led his army against the invaders, whom he totally defeated at Ellendun in Wiltshire. He then entered their kingdom on the side of Oxfordshire with an army, and at the same time sent his eldest son Ethelwolf with another into Kent. The young prince expelled Baldred the tributary king of Kent, and soon made himself master of the country. The kingdom of Essex was conquered with equal ease; and the East Angles, who had been reduced under subjection by the Mercians, joyfully put themselves under the protection of Egbert. Bernulf himself marched against them, but was defeated and killed; and Ludecan his successor met with the same fate two years after.

These misfortunes greatly facilitated the reduction of Mercia. Egbert soon penetrated into the very heart of the Mercian territories, and gained an easy victory over a dispirited and divided people; but in order to engage them to submit with the less reluctance, he allowed Wiglef, their countryman, to retain the title of *king*, whilst he himself exercised the real power of a sovereign. Northumberland was at present in a state of anarchy: and this tempted Egbert to carry his victorious arms into that kingdom also. The inhabitants, being desirous of living under a settled form of government, readily submitted, and owned him for their sovereign. To them, however, he likewise allowed the power of electing a king; who paid him a tribute, and was dependant on him.

45 Egbert the first king of England.

Egbert became sole master of England about the year 827. A favourite opportunity was now offered to the Anglo-Saxons of becoming a civilized people, as they were at peace among themselves, and seemed free from any danger of a foreign invasion. But this flattering prospect was soon overcast. Five years after Egbert had established his new monarchy, the Danes landed in the isle of Shepey, plundered it, and then made their escape with safety. 46 Danish invasion. Encouraged by this success, next year they landed from a fleet of 35 ships. They were encountered by Egbert at Charmouth in Dorsetshire. The battle was obstinate and bloody. Great numbers of the Danes were killed, but the rest made good their retreat to their ships. They next entered into an alliance with the Britons of Cornwall; and landing two years after in that country, they made an irruption into Devonshire. Egbert met them at Hengesdown, and totally defeated them; but before he had time to form any regular plan for the defence of the kingdom, he died, and left the government to his son Ethelwolf.

47 Ethelwolf.

The new king was weak and superstitious. He began with dividing the kingdom, which had so lately been united, with his son Athelstan. To the young prince he gave the counties of Essex, Kent, and Sussex. But though this division might have been productive of

England. of bad consequences at another time, the fear of the Danes kept every thing quiet for the present. These barbarians had some how or other conceived such hopes of enriching themselves by the plunder of England, that they scarce ever failed of paying it an annual visit. The English historians tell us, that they met with many severe repulses and defeats; but on the whole it appears that they had gained ground: for in 851 a body of them took up their winter-quarters in England. Next year they received a strong reinforcement of their countrymen in 350 vessels; and advancing from the isle of Thanet, where they had stationed themselves, they burnt the cities of London and Canterbury. Having next put to flight Brichtric the governor of Mercia, they marched into the heart of Surry, laying waste the whole country through which they passed.

Ethelwolf, though naturally little fitted for military enterprises, was now obliged to take the field. He marched against the Danes at the head of the West-Saxons, and gained an indecisive and bloody victory over his enemies. The Danes still maintained their settlement in the isle of Thanet. They were attacked by Ealher and Huda, governors of Kent and Surry; both of whom they defeated and killed. Afterwards they removed to the isle of Shepey, where they took up their winter-quarters, with a design to extend their ravages the next year.

The deplorable state of the kingdom did not hinder Ethelwolf from making a pilgrimage to Rome, whither he carried his fourth and favourite son Alfred, then only six years of age. He passed a twelvemonth in that city; made presents to the principal ecclesiastics there; and made a grant of 300 mancuses (a silver coin about the weight of our half-crown) annually to the see of Rome. One-third of this was to support the lamps of St. Peter's, another those of St. Paul's, and the third was for the Pope himself. In his return to England, Ethelwolf married Judith, daughter of the emperor Charles the Bald; but when he landed, he found himself deprived of his kingdom by his son Ethelbald. That prince assumed the government of Athelstan's dominions, who was lately dead; and, with many of Ethelwolf's nobles, formed a design of excluding him from the throne altogether, on account of his weaknesses and superstitions. Elthelwolf, however, delivered the people from the calamities of a civil war, by dividing the kingdom with his son. He gave to Ethelbald the government of the western, and reserved to himself that of the eastern part of the kingdom. Immediately after this, he summoned the states of the whole kingdom, and conferred on the clergy a perpetual donation of tythes, for which they had long contended, and which had been the subject of their sermons for several centuries.

This concession was deemed so meritorious by the English, that they now thought themselves sure of the favour of heaven; and therefore neglected to use the natural means for their safety which they might have done. They even agreed, that, notwithstanding the desperate situation of affairs at present, the revenues of the church should be exempted from all burdens, though imposed for the immediate security and defence of the nation. Ethelwolf died two years after he had made the abovementioned grant, and left the kingdom to his two eldest sons Ethebald and Ethelbert. Both these princes died in a few years, and left the kingdom to Ethered their brother, in the year 866.

48 Ethered.

The whole course of Ethered's reign was disturbed by the irruptions of the Danes. The king defended himself against them with great bravery, being seconded in all his military enterprizes by his younger brother Alfred, who afterwards ascended the throne. In this reign, the Danes first landed among the East Angles. That people treacherously entered into an alliance with the common enemy; and furnished them with horses, which enabled them to make an irruption into Northumberland. There they seized upon the city of York. Osbricht and Ælla, two Northumbrian princes who attempted to rescue the city, were defeated and killed. Encouraged by this success, the Danes penetrated into the kingdom of Mercia, took up their winter-quarters at Nottingham, and thus threatened the kingdom with a final subjection. From this post, however, they were dislodged by Ethered and Alfred, who forced them to retire into Northumberland. Their restless and savage disposition, however, did not suffer them to continue long in one place. They broke into East Anglia; defeated and took prisoner Edmund the tributary king of that country, whom they afterwards murdered; and committed every where the most barbarous ravages. In 871, they advanced to Reading; from whence they infested the neighbouring country by their incursions. The Mercians, desirous of recovering their independency, refused to join Ethered with their forces; so that he was obliged to march against the Danes, attended only by the West Saxons, who were his hereditary subjects. Several actions ensued, in which the Danes are said to have been unsuccessful; but being continually reinforced from their own country, they became every day more and more formidable to the English. During the confusion and distress in which the nation was now necessarily involved, king Ethered died of a wound he had received in an action with the Danes; and left to his brother Alfred the kingdom almost totally subdued by a foreign power.

49 Alfred the Great.

Alfred, who may properly be called the founder of the English monarchy, ascended the throne in the year 871, being then only 22 years of age. His great virtues and shining talents saved his country from ruin, which seemed almost unavoidable. His exploits against the Danes, his dangers and distresses, are related under the article ALFRED. Having settled the nation in a much better manner than could have been expected, he died in 901, leaving the kingdom to his second son Edward the Elder.

50 Edward the elder.

The beginning of this monarch's reign was disturbed by those intestine commotions from which the wise and politic Alfred had taken so much pains to free the nation. Ethelwald, son to king Ethelbert, Alfred's elder brother, claimed a right to the throne. Having armed his partisans, he took possession of Winburne, where he seemed determined to hold out to the last extremity. On the approach of Edward, however, with a powerful army, he first fled into Normandy, and afterwards into Northumberland. He hoped to find the Northumbrians ready to join him, as most of them were Danes, lately subdued by Alfred, and very impatient of peace. The event did not disappoint his ex-

England. pectations. The Northumbrians declared for him; and Ethelwald having thus connected himself with the Danish tribes, went beyond sea, whence he returned with a great body of these banditti. On his return, he was joined by the Danes of East Anglia and Mercia. Ethelwald, at the head of the rebels, made an irruption into the counties of Gloucester, Oxford, and Wilts; and having ravaged the country, retired with his booty before the king could approach him. Edward, however, took care to revenge himself, by conducting his forces into East Anglia, and ravaging it in like manner. He then gave orders to retire; but the Kentish men, greedy of more plunder, staid behind, and took up their quarters at Bury. Here they were assaulted by the Danes; but the Kentishmen made such an obstinate defence, that though their enemies gained the victory, it was bought by the loss of their bravest men, and, among the rest, of the usurper Ethelwald himself.

The king, now freed from the attempts of so dangerous a rival, concluded an advantageous peace with the East Angles. He next set about reducing the Northumbrians; and for this purpose equipped a fleet, hoping that thus they would be induced to remain at home to defend their own county, without attempting to invade his territories. He was disappointed in his expectations. The Northumbrians were more eager to plunder their neighbours than to secure themselves. Imagining that the whole of Edward's forces were embarked on board his fleet, they entered his territories with all the troops they could raise. The king, however was better prepared for them than they had expected. He attacked them on their return at Tetenhall in the county of Stafford, put them to flight, recovered all the booty, and pursued then with great slaughter into their own country.

The rest of Edward's reign was a scene of continued and successful action against the Northumbrians, East Angles, the Danes of Mercia, and those who came from their native country in order to invade England. He put his kingdom in a good posture of defence, by fortifying the towns of Chester, Eddesbury, Warwick, Cherbury, Buchingham, Towcester, Maldon, Huntingdon, and Colchester. He vanquished Turketill a Danish chieftan, and obliged him to retire with his followers into France. He subdued the east Anglians, Northumbrians, and several tribes of the Britons; and even obliged the Scots to make submissions. He died in 925, and was succeeded by Athelstan his natural son.

51 Athelstan. This prince, notwithstanding his illegitimate birth, ascended the throne without much opposition, as the legitimate children of Edward were too young to rule a nation so much liable both to foreign invasions and domestic troubles as England at present was. One Alfred, however, a nobleman of considerable power, entered into a conspiracy against him. It is said, that this nobleman was seized upon strong suspicions, but without any certain proof. He offered to swear to his innocence before the pope; and in those ages it was supposed that none could take a false oath in presence of such a sacred person, without being visited by an immediate judgment from God. Alfred was accordingly conducted to Rome, and took the oath required of him before Pope John. The words were no sooner pronounced, than he fell into convulsions, of which he expired in three days. The king, fully convinced of his guilt, confiscated his estate, and made a present of it to the monastery of Malmesbury.

This accident proved the means of establishing the authority of Athelstan in England. But finding the Northumbrians bore the English yoke with impatience, he gave Sithric, a Danish nobleman, the title of king of Northumberland; and in order to secure his friendship, gave him his own sister Editha in marriage. This was productive of bad consequences. Sithric died the year after his marriage with Editha; upon which Anlaf and Godfrid, Sithric's sons by a former marriage, assumed the sovereignty without waiting for Athelstan's consent. They were, however, soon obliged to yield to the superior power of that monarch. The former fled to Ireland; and the latter to Scotland, where he was protected by Constantine king of that country. The Scottish monarch was continually importuned by Athelstan to deliver up his guest, and even threatened with an invasion in case he did not comply. Constantine, detesting this treachery, advised Godfrid to make his escape. He did so, turned pirate, and died soon after. Athelstan, however, resenting this conduct of Constantine, invaded his kingdom, and reduced him, it is said, so low, that he was obliged to make the most humble submissions. This, however, is denied by all the Scottish historians.

Constantine, after the departure of Athelstan, entered into a confederacy with Anlaf, who subsisted by his piracies, and with some of the Wesh princes who were alarmed at the increase of Athelstan's power. All these 52 Defeats his enemies. confederates made an irruption into England at once; but Athelstan meeting them at Brumsbury in Northumberland, gave them a total overthrow. Anlaf and Constantine made their escape with difficulty, leaving the greatest part of their men dead on the field of battle. After this period, Athelstan enjoyed his crown in tranquillity. He died in 941, after a reign of 16 years. He passed a remarkable law, for the encouragment of commerce; *viz.* that a merchant, who had made three long sea-voyages on his own account, should be admitted to the rank of a thane or gentleman.

Athelstan was succeeded by his brother Edmund. 53 Edmund. On his accession, he found the kingdom disturbed by the restless Northumbrians, who watched for every opportunity of rising in rebellion. They were, however, soon reduced; and Edmund took care to ensure the peace of the kingdom, by removing the Danes from the towns of Mercia where they had been allowed to settle, because it was found that they took every opportunity to introduce foreign Danes into the kingdom. He also conquered Cumberland from the Britons. This country, however, be bestowed upon Malcom king of Scotland, upon condition that he should do homage for it, and protect the north of England from all future incursions of the Danes.

Edmund was unfortunately murdered in Gloucester, 54 Murdered by one Leolf a notorious robber. This man had been by Leolf. formerly sentenced to banishment; yet had the boldness to enter the hall where the king himself dined, and to sit at table with his attendants. Edmund immediately ordered him to leave the room. The villain refused to obey; upon which the king leaped upon him,

him, and seized him by the hair. Leolf then drew a dagger, and gave the king a wound, of which he instantly died, A. D. 946, being the sixth year of his reign.

55 Edred.

As the children of Edmund were too young at the time of his decease, his brother Edred succeeded to the throne. The beginning of his reign, as well as those of his predecessors, was disturbed by the rebellions and incursions of the Northumbrian Danes, who looked upon the accession of every new king to be a favourable opportunity for shaking off the English yoke. On the appearance of Edred with an army, however, they immediately submitted; but before the king withdrew his forces, he laid waste their territories as a punishment for their offence. He was no sooner gone, than they rose in rebellion a second time. They were again subdued; and the king took effectual precautions against their future revolts, by placing English garrisons in all their towns, and appointing an English governor to watch their motions, and suppress their insurrections on the first appearance.

56 Subdues the Northumbrians.

In the reign of Edred, celibacy of the clergy began to be preached up under the patronage of St DUNSTAN. This man had obtained such an ascendant over Edred, who was naturally superstitious, that he not only directed him in affairs of conscience, but in the most important matters of state. He was placed at the head of the treasury; and being thus possessed of great power at court, he was enabled to accomplish the most arduous undertakings. He professed himself a partizan of the rigid monastic rules; and having introduced celibacy among the monks of Glastenbury and Abingdon, he endeavoured to render it universal among the clergy throughout the kingdom. The monks in a short time generally embraced the pretended reformation; after which they inveighed bitterly against the vices and luxury of the age. When other topics of defamation were wanting, the marriages of clergymen became a sure object of invective. Their wives received the appellation of *concubines* or some other more opprobrious name. The secular clergy, on the other hand, who were numerous and rich, defended themselves with vigour, and endeavoured to retaliate upon their adversaries. The people were thrown into the most violent ferments; but the monks, being patronised by king Edred, gained ground greatly upon their opponents. Their progress, however, was somewhat retarded by the king's death, which happened in 955, after a reign of nine years. He left children; but as they were infants, his nephew Edwy, son to Edmund, was placed on the throne.

57 Celibacy of the clergy introduced.

58 Edwy.

The new king was not above 16 or 17 years of age at the time of his accession. His reign is only remarkable for the tragical story of his queen Elgiva. She was a princess of the royal blood, with whom Edwy was deeply enamoured. She was his second or third cousin, and therefore within the degrees of affinity prohibited by the canon law. Edwy, however, hearkening only to the dictates of his passion, married her, contrary to the advice of the more dignified ecclesiastics. The monks on this occasion were particularly violent; and therefore Edwy determined not to second their ambitious projects. He soon found reason to repent his having provoked such dangerous enemies. On his coronation day, while his nobility were indulging themselves in riotous mirth in a great hall where they had assembled, Edwy withdrew to another apartment to enjoy the company of his beloved queen and her mother. Dunstan guessed the reason of his absence. With unparalleled impudence, he burst into the queen's apartment; and upbraiding Edwy with his lasciviousness, as he termed it, pushed him back to the hall where the nobles were assembled. The king determined to resent such a daring insult. He required from Dunstan an account of his administration of the treasury during the late reign. The monk, probably unable to give a just account, refused to give any; upon which Edwy accused him of malversation in his office, and banished him the kingdom.

This proved the worst step that could possibly have been taken. Dunstan was no sooner gone than the whole nation was in an uproar about his sanctity and the king's impiety. These clamours, as they had been begun by the clergy, so they were kept up and increased by them, till at last they proceeded to the most outrageous violence. Archbishop Odo sent a party of soldiers to the palace. They seized the queen, and burned her face with a red-hot iron, in order to destroy her beauty by which she had enticed her husband; after which they carried her by force into Ireland, there to remain in perpetual exile. The king, finding it in vain to resist, was obliged to consent to a divorce from her, which was pronounced by Archbishop Odo. A catastrophe still more dismal awaited Elgiva. She had been cured of her wounds, and had even found means to efface the scars with which her persecutors had hoped to destroy her beauty. She then came to England, with a design to return to the king, whom she still considered as her husband. Unfortunately, however, she was intercepted by a party of soldiers sent for that purpose by the primate. Nothing but her most cruel death could now satisfy that wretch and his accomplices. She was hamstringed at Gloucester, and expired in a few days.

59 Tragical death of the queen.

The minds of the English were at this time so much sunk in superstition, that the monstrous inhumanity abovementioned was called a judgment from God upon Edwy and his spouse for their dissolute life, *i. e.* their love to each other. They even proceeded to rebellion against their sovereign; and having raised to the throne Edgar, the younger brother of Edwy, at that time only 13 years of age, they soon put him in possession of Mercia, Northumberland, and East Anglia. Edwy being thus confined to the southern counties, Dunstan returned, and took upon him the government of Edgar and his party; but the death of Edwy soon removed all difficulties, and gave Edgar peaceable possession of the government.

60 Edgar.

The reign of Edgar proved one of the most fortunate mentioned in the ancient English history. He took the most effectual means both for preventing tumults at home and invasions from abroad. He quartered a body of disciplined troops in the north, in order to repel the incursions of the Scots, and to keep the Northumbrians in awe. He built a powerful navy; and that he might keep the seamen in the practice of their duty, as well as present a formidable armament to his enemies, he commanded the fleet from time to time to make the circuit of his dominions.

The

England.

The greatness of king Edgar, which is very much celebrated by the English historians, was owing to the harmony which reigned between him and his subjects; and the reason of this good agreement was, that the king sided with Dunstan and the monks, who had acquired a great ascendant over the people. He enabled them to accomplish their favourite scheme of dispossessing the secular canons of all the monasteries; and he consulted them not only in ecclesiastical, but also in civil affairs. On these accounts, he is celebrated by the monkish writers with the highest praises; though it is plain, from some of his actions, that he was a man who could be bound neither by the ties of religion nor humanity. He broke into a convent, and carried off by force, and ravished, a nun called *Editha*. His spiritual instructor, Dunstan, for this offence, obliged the king, not to separate from his mistress, but to abstain from wearing his crown for seven years!

61 His licentious amours.

Edgar, however, was not to be satisfied with one mistress. He happened once to lodge at the house of a nobleman who had a very beautiful daughter. Edgar, enflamed with desire at the sight of the young lady, without ceremony asked her mother to allow her to pass a night with him. She promised compliance; but secretly ordered a waiting-maid, named *Elfleda*, to steal into the king's bed when the company were gone, and to retire before day-break. Edgar, however, detained her by force, till day-light discovered the deceit. His love was now transferred to the waiting-maid; who became his favourite mistress, and maintained a great ascendant over him till his marriage with Elfrida.

62 His marriage with Elfrida.

The circumstances of this marriage were still more singular and criminal than those abovementioned. Elfrida was daughter and heiress to Olgar Earl of Devonshire. She was a person of such exquisite beauty, that her fame was spread all over England, though she had never been at court. Edgar's curiosity was excited by the accounts he had heard of her, and therefore formed a design of marrying her. He communicated his intentions to Earl Athelwold his favourite; and ordered him, on some pretence or other, to visit the Earl of Devonshire, and bring him a certain account concerning Elfrida. Athelwold went as he was desired; but fell so deeply in love with the lady himself, that he resolved to sacrifice his fidelity to his passion. He returned to Edgar, and told him, that Elfrida's charms were by no means extraordinary, and would have been totally overlooked in a woman of inferior station. After some time, however, turning the conversation again upon Elfrida, he told the king that he thought her parentage and fortune made her a very advantageous match; and therefore, if the king gave his consent he would make proposals to the Earl of Devonshire on his own behalf. Edgar consented, and Athelwold was married to Elfrida.—After his marriage, he used his utmost endeavours to keep his wife from court, that Edgar might have no opportunity of observing her beauty. The king, however, was soon informed of the truth; and told Athelwold that he intended to pay him a visit in his castle, and be made acquainted with his new-married wife. The Earl could make no objections; only he desired a few hours to to prepare for the visit. He then confessed the whole to Elfrida, and begged of her to appear before the king as much to the disadvantage as possible. Instead of this, she dressed herself to the greatest advantage. Edgar immediately conceived a violent passion for her; and, in order to gratify it, seduced Athelwold into a wood under pretence of hunting, where he stabbed him with his own hand, and afterwards married his widow.

England.

The reign of Edgar is remarkable among historians for the encouragement he gave to foreigners to reside at his court and throughout the kingdom. These foreigners, it is said, corrupted the former simple manners of the nation. Of this simplicity, however, there seems to be no great reason to boast; seeing it could not preserve them from treachery and cruelty, the greatest of all vices: so that their acquaintance with foreigners was certainly an advantage to the people, as it tended to enlarge their views, and cure them of those illiberal prejudices and rustic manners to which islanders are often subject.—Another remarkable incident, is the extirpation of wolves from England. The king took great pleasure in hunting and destroying these animals himself. At last he found that they had all taken shelter in the mountains and forests of Wales. Upon this he changed the tribute imposed upon the Welsh princes by Athelstan, into an annual tribute of 300 wolves heads; and this produced such diligence in hunting them, that the animal has never since appeared in England.

63 Wolves extirpated from England.

Edgar died in 957, after a reign of 16 years. He left a son named *Edward*, whom he had by his first wife, the daughter of Earl Ordmer; and another, named *Ethelred*, by Elfrida. The mental qualifications of this lady were by no means answerable to the beauty of her person. She was ambitious, haughty, treacherous, and cruel. The principal nobility, therefore, were greatly averse from the succession of her son Ethelred, which would unavoidably throw too much power into the hands of his mother, as he himself was only seven years of age. Edward, afterwards surnamed the *Martyr*, was therefore pitched upon; and was certainly the most proper person, as he was 15 years of age, and might soon be able to take the government into his own hands. Elfrida opposed his advancement with all her might: but Dunstan overcame every obstacle, by anointing and crowning the young prince at Kingston; upon which the whole kingdom submitted without farther opposition.

64 Edward the martyr.

The only remarkable occurrence in this reign was the complete victory gained by the monks over the secular clergy, who were now totally expelled from the convents. Though this had been pretty nearly accomplished by Edgar, the secular clergy still had partisans in England who made considerable opposition; but these were all silenced by the following miracles. In one synod, Dunstan, finding the majority of votes against him, rose up, and declared that he had that instant received from heaven a revelation in favour of the monks. The whole assembly were so much overawed by this intelligence, that they proceeded no farther in their deliberations. In another synod, a voice issued from the crucifix, acquainting the members, that the establishment of the monks was founded on the will of heaven, and could not be opposed without impiety. But the third miracle was still more alarming. In another

65 Miracles of St Dunstan.

England. other synod the floor of the hall sunk, and great numbers of the members were killed or bruised by their fall. It was remarked that Dustan had that day, prevented the king from attending the synod, and that the beam on which his own chair stood was the only one which did not sink. These circumstances, instead of making him suspected as the author of the miracle, were regarded as proofs of the interposition of Providence in his favour.

Edward lived four years after he was raised to the throne, in perfect innocence and simplicity. Being incapable of any treacherous intention himself, he suspected none in others. Though his stepmother had opposed his succession, he had always behaved towards her with the greatest respect; and expressed on all occasions the most tender affection for his brother Ethelred. Being one day hunting in the neighbourhood of the castle where Elfrida resided, he paid her a visit unattended by any of his retinue. After mounting his

66 The king murdered. horse with a design to return, he desired some liquor to be brought him. But while he was holding the cup to his head, a servant of Elfrida stabbed him behind. The king finding himself wounded, clapped spurs to his horse; but soon becoming faint by the loss of blood, he fell from the saddle, and his foot being entangled in the stirrup, he was dragged along till he expired. His body was found and privately interred at Wereham by his servants. The English had such compassion for this amiable prince, that they bestowed on him the appellation of *Martyr*, and even fancied that miracles were wrought at his tomb. Elfrida built monasteries, and submitted to many penances, in order to atone for her guilt; but, even in that barbarous age, she could never regain the good opinion of the public.

67 Ethelred. After the murder of Edward, his brother Ethelred succeeded to the throne without opposition. As he was a minor when he was raised to the throne, and, even when he came to man's estate, never discovered any vigour or capacity of defending the kindom against invaders, the Danes began to renew their incursions. Before they durst attempt any thing of importance, however, they first made a small incursion by way of trial. In the year 981, they landed in Southampton from seven vessels; and having ravaged the country,

68 England invaded and ruined by the Danes. they retired with impunity, carrying a great booty along with them. In 687, they made a similar attempt on the west coast, and were attended with the like success. Finding that matters were now in a favourable situation for their enterprises, they landed in Essex under the command of two chieftains; and, having defeated and killed Brithnot duke of that county, laid waste all the neighbouring provinces. In this extremity, Ethelred, surnamed, on account of his preposterous conduct, the *Unready*, bribed the enemy with L.10,000 to depart the kingdom. This advance was given by Siricius archbishop of Canterbury, and some of the degenerate nobility; and was attended with the success that might have been expected The Danes appeared next year off the eastern coast. But, in the mean time, the English had determined to assemble at London a fleet capable of repulsing the enemy. This failed of success through the treachery of Alfric Duke of Mercia. Having been formerly banished the kingdom, and found great difficulty in getting himself restored to his former dignity, he trusted thenceforth, not to his services or the affections of his countrymen, but to the influence he had over his vassals, and to the public calamities. These last he determined always to promote as far as he could; because in every revolution his assistance would be necessary, and consequently he must receive continual accession of power. The English had formed a plan for surrounding and destroying the Danish fleet in the harbour; but Alfric not only gave the enemy notice of this design, but also deserted with his squadron the night before the engagement. The English by this means proved unsuccessful; and Ethelred, in revenge, took Alfgar, Alfric's son, and ordered his eyes to be put out. This piece of cruelty could be productive of no good effect. Alfric had become so powerful, that notwithstanding his treachery, it was found impossible to deprive him of the government of Mercia.

In 993, the Danes under the command of Sweyn their king, and the Norwegians conducted by Olave king of that country, sailed up the Humber, and destroyed all around them. A powerful army was assembled to oppose these invaders: but through the treachery of the three leaders, all men of Danish extraction, the English were totally defeated. Encouraged by this success, the Danes entered the Thames in 94 vessels, and laid siege to London. The inhabitants, however, made such a brave defence, that the besiegers were finally obliged to give over the attempt. Out of revenge for this disappointment, they laid waste Essex, Sussex, and Hampshire. In these counties they procured horses; by which means they were enabled to penetrate into the more inland parts, and threatened the kingdom with total subjection Ethelred and his nobles had now recourse to their former expedient. They sent ambassadors to the two northern kings, to whom they promised subsistence and tribute, provided they would, for the present, put an end to their ravages, and soon after depart the kingdom. They agreed to the terms, and peaceably took up their quarters at Southampton. Olave even paid a visit to Ethelred, and received the rite of confirmation from the English bishops. The king also made him many presents; and Olave promised never more to infest the English territories; which promise it is said he afterwards religiously observed.

After the departure of Olave with his Norwegians Sweyn, though less scrupulous than the king of Norway, was obliged to leave the kingdom also. But this shameful composition procured only a short relief to the nation. The Danes soon after appeared in the Severn; and having ravaged Wales as well as Cornwall and Devon, they sailed round, and, entering the mouth of the Tamar, completed the ruin of these two counties. Then, returning to the Bristol channel, and penetrating into the country by the Avon, they over-ran all that country, and carried fire and sword even into Dorsetshire. In 998, they changed the seat of war; and, after ravaging the isle of Wight, they entered the Thames and Medway, where they laid siege to Rochester, and defeated the Kentish men in a great battle. After this victory, the whole province of Kent was made a scene of slaughter and devastation. The extremity of these miseries forced the English into counsels for common defence both by sea and land: but the weakness of the king, the divisions among the nobility, the treachery of some, the cowardice of others, the

England. the want of concert in all, frustrated every endeavour; and their fleets and armies either came too late to attack the enemy, or were repulsed with dishonour. The English, therefore, devoid both of prudence and unanimity in council, had recourse to the expedient which by experience they had found to be ineffectual. They offered the Danes a large sum if they would conclude a peace and depart the kingdom. These ravagers continually rose in their demands; and now required the payment of L.24,000, which the English submitted to give. The departure of the Danes procured them a temporary relief; which they enjoyed as if it was to be perpetual, without making any effectual preparations for giving them a more vigorous reception upon their next return.

Besides the receiving this sum, the Danes were at present engaged by another motive to depart from England. They were invited over by their countrymen in Normandy, who at this time were hard pressed by Robert king of France, and who found it difficult to defend their settlements against him. Is is probable also, that Ethelred, observing the close connection of all the Danes with one another, however they might be divided in government or situation, was desirous of procuring an alliance with that formidable people. For this purpose, being at present a widower, he made his addresses to Emma, sister to Richard II. Duke of Normandy. He soon succeeded in his negociations; the princess came over to England, and was married to the king in the year 1001.

69 Marriage of the king with the princess of Normandy.

Though the Danes had been for a long time established in England, and though the similarity of their language with the Saxon had invited them to an early coalition with the natives; they had as yet found so little example of civilized manners among the English, that they retained all their ancient ferocity, and valued themselves only on their national character of military bravery. The English princes had been so well acquainted with their superiority in this respect, that Athelston and Edgar had been accustomed to keep in pay large bodies of Danish troops, who were quartered about the country, and committed many violences upon the inhabitants. These mercenaries had attained to such an height in luxury, according to the old English writers, that they combed their hair once a day, bathed themselves once a-week, changed their clothes frequently; and by these arts of effeminacy, as well as by their military character, had rendered themselves so agreeable to the fair sex, that they debauched the wives and daughters of the English, and had dishonoured many families. But what most provoked the inhabitants was, that, instead of defending them against invaders, they were always ready to betray them to the foreign Danes, and to associate themselves with every straggling party which came from that nation. England.

70 Danes massacred.

The animosities between the native English and the Danes who had inhabited among them, had from these causes risen to a great height; when Ethelred, from a policy commonly adopted by weak princes, took the cruel resolution of massacring the Danes throughout the kingdom. On the 13th of November 1002, secret orders were dispatched to commence the execution every where on the same day; and the festival of St Brice, which fell on a Sunday, the day on which the Danes usually bathed themselves, was chosen for this purpose. These cruel orders were executed with the utmost exactness. No distinction was made betwixt the innocent and the guilty; neither sex nor age was spared; nor were the cruel executioners satisfied without the tortures as well as death, of the unhappy victims. Even Gunilda, sister to the king of Denmark, who had married Earl Paling, and had embraced Christianity, was, by the advice of Edric Earl of Wilts, seized and condemned to death by Ethelred, after seeing her husband and children butchered before her face. This unhappy princess foretold, in the agonies of despair, that her murder would soon be avenged by the total ruin of the English nation (A).

71 New invasion by Sweyn.

The prophecy of Gunilda was exactly fulfilled. In 1003, Sweyn and his Danes, who wanted only a pretence to renew their invasions, appeared off the western coast, and threatened revenge for the slaughter of their countrymen. The English took measures for repulsing the enemy; but these were defeated thro' the treachery first of Alfric; and then of Edric, a still greater traitor, who had married the king's daughter, and succeeded Alfric in the command of the British armies. The Danes therefore ravaged the whole country. Agriculture was neglected, a famine ensued, and the kingdom was reduced to the utmost degree of misery. At last the infamous expedient of buying a peace was recurred to; and the departure of the Danes was purchased in 1007, at the expence of L.30,000.

The English endeavoured to employ this interval in making preparations against the return of the Danes, which they had reason soon to expect. A law was made, ordering the proprietors of eight hides of land to provide themselves of a horseman and a complete suit of armour; and those of 310 hides to equip a ship for the defence of the kingdom. By this means a formidable armament was raised. There were 243,600 hides in England; consequently the ships equipped must be 785. The cavalry was 30,450 men. All hopes of success from this equipment, however, were disappointed by the factions, animosities, and dissentions

(A) On the subject of this massacre, Mr Hume has the following observations: "Almost all the ancient historians speak of this massacre of the Danes as if it had been universal, and as if every individual of that nation throughout England had been put to death. But the Danes were almost the sole inhabitants of the kingdoms of Northumberland and East Anglia, and were very numerous in Mercia. This representation of the matter was absolutely impossible. Great resistance must have been made, and violent wars ensued; which was not the case. This account given by Wallingford, though he stands single, must be admitted as the only true one. We are told that the name of *lurdane, lord Dane*, for an idle lazy fellow who lives at other people's expence, came from the conduct of the Danes who were put to death. But the English princes had been entirely masters for several generations; and only supported a military corps of that nation. It seems probable, therefore, that these Danes only were put to death."

tions of the nobility. Edric had caused his brother Brightric to advance an accusation of treason against Wolfnoth governor of Sussex, the father of the famous Earl Godwin; and that nobleman, knowing the power and malice of his enemy, consulted his own safety by deserting with 20 ships to the Danes. Brightric pursued him with a fleet of 80 sail; but his ships being shattered in a tempest, and stranded on the coast, he was suddenly attacked by Wolfnoth, and all his vessels were burnt or otherwise destroyed. The treachery of Edric frustrated every plan of future defence; and the whole navy was at last scattered into the several harbours.

By these fatal miscarriages, the enemy had leisure to over-run the whole kingdom. They had now got such a footing, indeed, that they could hardly have been expelled though the nation had been ever so unanimous. But so far did mutual diffidence and dissention prevail, that the governors of one province refused to march to the assistance of another; and were at last terrified from assembling their forces for the defence of their own. At last the usual expedient was tried. A peace was bought with L.48,000; but this did not procure even the usual temporary relief. The Danes, knowing that they were now masters of the kingdom, took the money, and continued their devastations. They levied a new contribution of L.8000 on the county of Kent alone; murdered the archbishop of Canterbury, who had refused to countenance this exaction; and the English nobility submitted every where to the Danish monarch, swearing allegiance to him, and giving hostages for their good behaviour. At last, Ethelred himself, dreading equally the violence of the enemy and the treachery of his own subjects, fled into Normandy, whither he had already sent queen Emma and her two sons Alfred and Edward. The Duke received his unhappy guests with a generosity which does honour to his memory.

72
Ethelred flies to Normandy.

The flight of king Ethelred happened in the end of the year 1013. He had not been above six weeks in Normandy, when he heard of the death of Sweyn, which happened at Gainsborough before he had time to establish himself in his new dominions. At the same time he received an invitation from the prelates and nobility to resume the kingdom; expressing also their hopes, that, being now better taught by experience, he would avoid those errors which had been so fatal to himself and his people. But the misconduct of Ethelred was incurable; and, on his resuming the government, he behaved in the very same manner that he had done before. His son-in-law Edric, notwithstanding his repeated treasons, retained such influence at court, that he instilled into the king, jealousies of Sigefert and Morcar, two of the chief nobles of Mercia. Edric enticed them into his house, where he murdered them; while Ethelred partook of the infamy of this action, by confiscating their estates, and confining the widow of Sigefert in a convent. She was a woman of singular beauty and merit; and in a visit which was paid her during her confinement, by prince Edmund the king's eldest son, she inspired him with so violent an affection, that he released her from the convent, and soon after married her without his father's consent.

73
Returns, but behaves as ill as ever.

In the mean time, Canute, the son and successor of Sweyn, proved an enemy no less terrible to the English than his father had been. He ravaged the eastern coast with merciless fury; and put ashore all the English hostages at Sandwich, after having cut off their hands and noses. He was at last obliged, by the necessity of his affairs, to return to Denmark. In a short time, however, he returned and continued his depredations along the southern coast. He then broke into the counties of Dorset, Wilts, and Somerset; where an army was assembled against him under the command of Prince Edmund and Duke Edric. The latter still continued his perfidious machinations; and after endeavouring in vain to get the prince into his power, found means to dissipate the army, and then deserted to Canute with 40 vessels.

Edmund was not disheartened by this treachery. He again assembled his forces, and was in a condition to give the enemy battle. Ethelred, however, had now such frequent experience of the treachery of his subjects, that he had lost all confidence in them. He remained in London, pretending sickness, but in reality from an apprehension that they intended to buy their peace by delivering him into the hands of his enemies. The army called aloud for their sovereign to march at their head against the Danes; and on his refusal to take the field, they were so discouraged, that all the preparations which had been made became ineffectual for the defence of the kingdom. Edmund, deprived of all regular resources for the maintenance of the soldiers, was obliged to commit similar ravages to those practised by the Danes; and after making some fruitless expeditions in the north, which had submitted entirely to Canute's power, he returned to London, where he found every thing in confusion by the death of the king.

Ethelred died in 1016, after an unhappy reign of 35 years; and was succeeded by his eldest son Edmund, surnamed *Ironside* on account of his great strength and valour. He possessed abilities sufficient to have saved his country from ruin, had he come sooner to the throne; but it was now too late. He bravely opposed the Danes, however, notwithstanding every disadvantage; till at last the nobility of both nations obliged their kings to come to a compromise, and divide the kingdom between them by treaty. Canute reserved to himself Mercia, East Anglia, and Northumberland, which he had entirely subdued. The southern parts were left to Edmund. This prince survived the treaty only about a month; being murdered at Oxford by two of his chamberlains, accomplices of Edric.

74
Edmund Ironside divides the kingdom with the Danes.

After the death of Edmund, nothing was left for the English but submission to Canute. The least scrupulous of mankind, however, dare not at all times openly commit injustice. Canute, therefore, before he seized the dominions of Edwin and Edward, the two sons of Edmund, suborned some of the nobility to depose, that, in the last treaty with Edmund, it had been verbally agreed, that, in case of Edmund's death, Canute should either be successor to his dominions, or tutor to his children; for historians differ with regard to this particular. This evidence, supported by the great power of Canute, was sufficient to get him elected king of England. Immediately after his accession to the throne, he sent the two sons of Edmund to the court of Sweden, on pretence of being there educated; but

75
Canute.

but charged the king to put them to death as soon as they arrived. The Swedish monarch did not comply with this request; but sent them to Solomon king of Hungary, to be educated in his court. The elder, Edwin was afterwards married to Solomon's sister: but he dying without issue, that prince gave his sister-in-law, Agatha, daughter of the emperor Henry II. in marriage to Edward, the younger brother; and she bore him Edgar Atheling; Margaret, afterwards queen of Scotland; and Christina, who retired into a convent.

Canute was obliged at first to make great concessions to the nobility: but he afterwards put to death many of those in whom he could not put confidence; and, among the rest, the traitor Edric himself, who was publicly executed, and his body thrown into the Thames.

76 Marries Ethelred's widow.

In order to prevent any danger from the Normans, who had threatened him with an invasion, he married Emma, the widow of Ethelred, and who now came over from Normandy; promising that he would leave the children he should have by that marriage heirs to the crown after his decease. The English were at first displeased with Emma for marrying the mortal enemy of her former husband; but at the same time were glad to find at court, a sovereign to whom they were accustomed, and who had already formed connections with them: and thus Canute, besides securing by his marriage the alliance with Normandy, gradually acquired by the same means the confidence of his own people.

The most remarkable transaction in this prince's reign, besides those mentioned under the article CANUTE, is his expedition to Scotland against Malcolm king of that country, whom he forced to do homage for the county of Cumberland, which the Scots at that time possessed. After this enterprise, Canute passed four years in peace, and died at Shaftsbury; leaving three sons, Sweyn, Harold, and Hardicanute. Sweyn, whom he had by his first marriage with Alfwen, daughter of the earl of Hampshire, was crowned in Norway; Hardicanute, whom Emma had born, was in possession of Denmark; and Harold, who was of the same marriage with Sweyn, was at that time in England.

77 Harold.

Harold succeeded to the crown of England; though it had been stipulated that Emma's son, Hardicanute, should be heir to that kingdom. This advantage Harold obtained by being on the spot, and getting possession of his father's treasures, while Hardicanute was at a distance. As Hardicanute, however, was supported by earl Godwin, a civil war was likely to ensue, when a compromise was made; by which it was agreed, that Harold should enjoy London, and all the provinces north of the Thames, while the possession of the south should remain to Hardicanute: and till that prince should appear and take possession of his dominions, Emma fixed her residence at Winchester, and ruled her son's part. Harold reigned four years; during which time, the only memorable action he performed was a most infamous piece of treachery.—Alfred and Edward, the two sons of Emma by Ethelred, paid a visit to their mother in England. But, in the mean time, earl Godwin being gained over by Harold, a plan was laid for the destruction of the two princes. Alfred was accordingly invited to London by Harold, with many professions of friendship; but when he had reached Guildford, he was set upon by Godwin's vassals: about 600 of his train were murdered in the most cruel manner; he himself was taken prisoner, his eyes were put out, and he was conducted to the monastery of Ely, where he died soon after. Edward and Emma, apprised of the fate which awaited them, fled beyond sea, the former into Normandy, the latter into Flanders; while Harold took possession of all his brother's dominions without opposition.—He died in April 1039.

78 His treachery and cruelty.

Hardicanute succeeded his brother Harold without opposition. His government was extremely violent and tyrannical. However, it was but for a short duration. He died, in 1041, of a debauch at the marriage of a Danish lord. After his death, a favourable opportunity was offered to the English for shaking off the Danish yoke. Sweyn, king of Norway, the eldest son of Canute, was absent; and as the two last kings had died without issue, there appeared none of that race whom the Danes could support as successor to the throne. For this reason, the eyes of the nation were naturally drawn towards prince Edward, who happened to be at court when the king died. There were some reasons, however, to fear, that Edward's succession would be opposed by earl Godwin, who was by far the most powerful nobleman in the kingdom. A declared animosity subsisted between Edward and Godwin, on account of the hand which the latter had in the murder of his brother Alfred; and this was thought to be an offence of so grievous a nature, that Edward could never forgive it. But here their common friends interposed; and representing the necessity of their good correspondence, obliged them to lay aside their animosities, and to concur in restoring liberty to their native country. Godwin only stipulated that Edward, as a pledge of his sincere reconciliation, should promise to marry his daughter Editha. This proposal was agreed to; Edward was crowned king of England, and married Editha as he had promised. The marriage, however, proved rather a source of discord than otherwise between the king and Godwin. Editha, though a very amiable woman could never obtain the confidence and affection of her husband. It is even said, that, during the whole course of her life, he abstained from all matrimonial converse with her; and this ridiculous behaviour was highly celebrated by the monkish writers of the age, and contributed to the king's acquiring the title of Saint and Confessor.

79 Edward the Confessor.

Though the neglect of his daughter could not fail to awaken Godwin's former enmity against king Edward, it was necessary to choose a more popular ground before he could vent his complaints against the king in a public manner. He therefore chose for his theme the influence which the Normans had on the affairs of government; and a declared opposition took place between him and these favourites. In a short time, this animosity openly broke out with great violence. Eustace, count of Bologne having paid a visit to the king, passed by Dover on his return. One of his train being refused access to a lodging which had been appointed for him, attempted to make his way by force, and wounded the master of the house in the contest. The townsmen resented this insult by the death of the stranger; the count and his train took arms, and mur-

80 Variance of the king and earl Godwin.

England. murdered the townsman in his own house. A tumult ensued; near 20 persons were killed on each side; and Eustace being overpowered with numbers, was at last obliged to fly. He complained to the king; who gave orders to earl Godwin, in whose government Dover lay, to punish the inhabitants. But this nobleman refused to obey the command, and endeavoured to throw the whole blame on count Eustace, and his followers. The king was displeased; and threatened to make him feel the utmost effects of his resentment, in case he finally refused to comply. Upon this, Godwin assembled a powerful army, on pretence of repressing some disorders on the frontiers of Wales; but, instead of this, marched directly to Glocester, where the king at that time was without any military force, as suspecting no danger.

Edward perceiving his danger applied to Siward duke of Northumberland, and Leofric duke of Mercia, two very powerful noblemen. They hastened to him with such followers as they could assemble, issuing orders at the same time for all the forces under their respective governments to march without delay to the defence of the king. Godwin, in the mean time suffered himself to be deceived by negociations, till the king's army became so powerful, that he was not able to cope with it. He was therefore obliged to fly with his family to Flanders. Here he was protected by Baldwin earl of that country, together with his three sons Gurth, Sweyn, and Tosti; the last of whom had married Baldwin's daughter. Harold and Leofwin, two other sons of Godwin, took shelter in Ireland.

81 Godwin flies to Flanders.

After the flight of earl Godwin, he was proceeded against as a traitor by king Edward. His estates, and those of his sons, were confiscated; his governments given to others: queen Editha was confined in a monastery; and the great power of this family, which had become formidable to the crown itself, seemed to be totally overthrown. Godwin, however, soon found means to retrieve his affairs. Having hired some ships, and manned them with his followers, he attempted to make a descent at Sandwich. The king, informed of his preparations, equipped a fleet which Godwin could not resist, and he therefore retreated into the Flemish harbours. On his departure, the English dismissed their armament. This Godwin had expected, and therefore kept himself in readiness for the favourable opportunity. He immediately put to sea, and sailed to the isle of Wight, where he was joined by Harold with a squadron which he had collected in Ireland. Being thus master of the sea, Godwin entered the harbours on the southern coast; seized all the ships; and being joined by great numbers of his former vassals, he sailed up the Thames, and appeared before London.

82 Returns, and is reconciled with the king.

The approach of such a formidable enemy threw every thing into confusion. The king alone seemed resolute to defend himself to the last extremity; but the interposition of many of the nobility, together with the submissions of Godwin himself, at last produced an accommodation. It was stipulated, that Godwin should give hostages for his good behaviour, and that all the foreigners should be banished the kingdom; after which, Edward, sensible that he had not power sufficient to detain the earl's hostages in England, sent them over to his kinsman the young duke of Normandy.

Soon after his reconciliation, Godwin died as he was sitting at table with the king. He was succeeded in the government of Wessex, Sussex, Kent, and Essex, and in the office of steward of the household, a place of great power, by his son Harold. The son was no less ambitious than his father had been; and as he was a man of much greater abilities, he became a more dangerous enemy to Edward than even Godwin had been. Edward knew no better expedient to prevent the increase of Harold's power, than by giving him a rival. This was Algar son of Leofric duke of Mercia, whom he invested with the government of East Anglia, which had formerly belonged to Harold. The latter, however, after some broils, finally got the better of his rival, and banished him the kingdom. Algar returned soon after with an army of Norwegians, with whom he invaded East-Anglia; but his death in a short time freed Harold from all further apprehensions from that quarter. His power was still further increased in a short time after by the accession of his brother Tosti to the government of Northumberland: and Edward now declining in years, and apprehensive that Harold would attempt to usurp the crown after his death, resolved to appoint a successor. He therefore sent a deputation into Hungary, to invite over his nephew, Edward, son to his elder brother, who was the only remaining heir of the Saxon line. That prince accordingly came over with his children, Edgar Atheling, Margaret, and Christina; but died a few days after his arrival. His death threw the king into greater perplexity than ever. Being resolved to exclude Harold if possible, he secretly cast his eye on his kinsman William Duke of Normandy; a person of whose power, character, and capacity, he had justly a very high opinion. This advice had formerly been given him by Robert archbishop of Canterbury, who was himself a Norman, and had been banished along with the rest upon the return of earl Godwin. But Edward finding that the English would more easily acquiesce in the restoration of the Saxon line, had in the mean time invited his brother's descendants from Hungary as already mentioned. The death of his nephew, and the inexperience and unpromising qualities of young Edgar, made him resume his former intentions in favour of the duke of Normandy, though his aversion to hazardous enterprises engaged him to postpone the execution, and even to keep his purpose concealed from all his ministers.

England. 83 His son Harold aspires to the throne.

Harold in the mean time increased his popularity by all possible means, in order to prepare his way for being advanced to the throne after the death of Edward, which now seemed to be fast approaching. He had no suspicion of the duke of Normandy as a rival; but as he knew that a son and grandson of the earl Godwin were in the hands of that prince as hostages, he feared that they might be made use of as checks upon his ambition, in case he attempted afterwards to ascend the throne. He therefore prevailed upon Edward to release these hostages unconditionally; and having obtained his consent, he set out for Normandy himself, attended by a numerous retinue. He was driven by a tempest on the territory of Guy count of

England. Ponthieu, who detained him prisoner, and demanded an exorbitant sum for his ransom. Harold found means to acquaint William with his situation. The duke of Normandy, desirous of gaining Harold over to his party, commanded Guy to restore his prisoner to his liberty. Upon his Harold was immediately put into the hands of the Norman ambassador, who conducted him to Rouen. William received him with great demonstrations of respect and friendship; but soon took an opportunity of acquainting him with his pretensions to the crown of England, and asked his assistance in the execution of his scheme. Harold was surprised with this declaration of the duke; but being entirely in his power, he feigned a compliance with his desires, and promised to second to the utmost of his ability the will of king Edward. William, to secure him as much as possible to his interest, promised him his daughter in marriage, and required him to take an oath that he would fulfil his promises. Harold readily complied; but to make the oath more binding, William privately conveyed under the altar where the oath was taken, relics of some of the most revered martyrs; and when Harold had taken the oath, he showed him the relics, and admonished him to observe religiously such a solemn engagement.

Harold was no sooner at liberty, than he found himself master of casuistry, sufficient to excuse the breaking of his oath, which had been extorted from him, and which, if kept, might be attended with the subjection of his country to a foreign power. He continued to practise every art to increase his popularity; and about this time, two accidents enabled him to add much to that character which he had already so well established. The Welsh had for some time made incursions into the English territories, and had lately become so troublesome, that Harold thought he could not do a more acceptable piece of service to the public, than undertake an expedition against these invaders. Having therefore prepared some light armed foot to pursue the natives into their fortresses, some cavalry to secure the open country, and a squadron of ships to attack the sea-coasts, he employed all these forces against the enemy at once; and thus reduced them to such distress, that they were obliged to purchase peace by sending their prince's head to Harold, and submitting to the government of two Welsh noblemen appointed by Edward.

The other incident was no less honourable to Harold. Tosti his brother had been created duke of Northumberland; but being of a violent tyrannical temper, had treated the inhabitants with such cruelty, that they rose in rebellion against him, and drove him from his government. Morcar and Edwin, two brothers, grandsons of the great duke Leofric, joined in the insurrection; and the former being elected duke, advanced with an army to oppose Harold, who had been commissioned by the king to reduce and punish the Northumbrians. Before the armies engaged, Morcar endeavoured to justify his conduct, and represented to Harold, that Tosti had behaved in such a manner, that no one, not even a brother, could defend him without participating of the infamy of his conduct: that the Northumbrians were willing to submit to the king, but required a governor that would pay some attention to their privileges; and they trusted that Harold would not defend in another that violent conduct from which his own government had always kept at so great a distance. This speech was accompanied by such a detail of well-supported facts, that Harold abandoned his brother's cause; and returning to Edward, persuaded him to pardon the Northumbrians, and confirm Morcar in his government. He even married the sister of that nobleman; and by his interest procured Edwin the younger brother to be chosen governor of Mercia. Tosti, in a rage, departed the kingdom, and took shelter in Flanders with Baldwin his father-in-law; while William of Normandy saw that now he had nothing to expect from Harold, who plainly intended to secure the crown to himself. 84

Harold succeeds Edward the Confessor.

Edward died in 1067, and was succeeded by Harold with as little opposition as though he had been the lawful heir. The very day after Edward's death, he was anointed and crowned by the archbishop of York. The whole nation seemed joyfully to swear allegiance to him. But he did not long enjoy the crown, to obtain which he had taken so much pains, and which he seemed to have such capacity for wearing. His brother Tosti, provoked at his success, stirred up against him every enemy he could have any influence with. The duke of Normandy also was enraged to the last degree at the perfidy of Harold; but before he commenced hostilities, he sent an embassy to England, upbraiding the king with his breach of faith, and summoning him to resign the kingdom immediately. Harold replied, that the oath with which he was reproached, had been extorted by the well-grounded fear of violence, and for that reason could never be regarded as obligatory: that he never had any commission either from the late king or the states of England, who alone could dispose of the crown, to make any tender of the succession to the duke of Normandy; and if he, a private person, had assumed so much authority, and had even voluntarily sworn to support the Duke's pretensions, the oath was unlawful, and it was his duty to take the first opportunity of breaking it: that he had obtained the crown by the unanimous suffrages of the people; and should show himself totally unworthy of their favour, did he not strenuously maintain those liberties with which they had entrusted him; and that the Duke, if he made any attempt by force of arms, should experience the power of an united nation, conducted by a prince, who, sensible of the obligations imposed upon him by his royal dignity, was determined, that the same moment should put a period to his life and to his government.

This answer was according to William's expectations; and therefore he had already made preparations for invading England. He was encouraged and assisted in this enterprise by Howel count of Brittany, Baldwin earl of Flanders, the emperor Henry IV. and Pope Alexander II. The latter declared Harold a perjured usurper; denounced excommunication against him and his adherents; and the more to encourage William in his enterprises, sent him a consecrated banner, and a ring with one of St Peter's hairs in it. Thus he was enabled to assemble a fleet of 3000 vessels, on board of which were embarked 60,00 men, chosen from among those numerous supplies which were sent him from all quarters. Many eminent persons were enlisted under

England. der his banners. The most celebrated were Ustace count of Boulogne, Aimeri de Thouars, Hugh d'Estaples, William d'Evreux, Geoffroy de Rotrou, Roger de Beaumont, William de Warranne, Roger de Montgomeri, Hugh de Grantmesnil, Charles Martel, and Geoffroy Gitford.

In order to embarrass the affairs of Harold the more effectually, William also excited Tosti, in concert with Halfager king of Norway, to infest the English coasts. These two having collected a fleet of 350 ships, sailed up the Humber, and disembarked their troops, who began to commit great depredations. They were opposed by Morcar earl or duke (B) of Northumberland, and Edwin earl of Mercia, who were defeated. Harold, on the news of this invasion, assembled a considerable army, engaged the enemy at Standford, and after a bloody battle entirely defeated them. Tosti and Halfager were killed in the action, and all the fleet fell into the hands of the victors; but Harold generously allowed Olave the son of Halfager to depart with 20 vessels.

85 Defeats the Danes.

The king of England had scarce time to rejoice on account of his victory, when news were brought him that the Normans were landed in Sussex. Harold's victory had considerably weakened his army. He lost many of his bravest officers and soldiers in the action; and he disgusted the rest, by refusing to distribute the Danish spoils among them. He hasted, however, by quick marches, to repel this new invader; but though he was reinforced at London and other places with fresh troops, he found himself weakened by the desertion of his old soldiers, who, from fatigue and discontent, secretly withdrew from their colours. Gurth, the brother of Harold, a man of great conduct as well as bravery, became apprehensive of the event; and entreated the king to avoid a general engagement for some time, or at least not to hazard his person. But though this advice was in itself evidently proper, and enforced by all the arguments which Gurth could suggest, Harold continued deaf to every thing that could be said. Accordingly, on the 14th of October 1066, the two armies engaged near Hastings a town of Sussex. After a most obstinate and bloody battle*, the English were entirely defeated, Harold and his two brothers killed, and William left master of the kingdom of England.

86 Is defeated and killed by William of Normandy.

* See Hastings.

Nothing could exceed the terror of the English upon the news of the defeat and death of Harold. As soon as William passed the Thames at Wallingford, Stigand, the primate, made submissions to him in the name of the clergy; and before he came within sight of London, all the chief nobility, and even Edgar Atheling himself, who, being the rightful heir to the throne, had just before been declared king, came and submitted to the conqueror. William very readily accepted of the crown upon the terms that were offered him, which were, that he should govern according to the established customs of the country. He could indeed have made what terms he pleased; but, though really a conqueror, he choose rather to be thought an elected king. For this reason he was crowned at Westminster by the archbishop of York, and took the oath administered to the former kings of England; namely, that he would protect and defend the church, observe the laws of the realm, and govern the kingdom with impartiality.

87 William the Conqueror.

88 The English grievously oppressed.

The English historians complain of the most grievous oppression by William and his Normans. Whether by his conduct the conqueror willingly gave the English opportunities of rebelling against him, in order to have a pretence for oppressing them afterwards, is not easy to say; but it is certain that the beginning of his reign cannot justly be blamed. The first disgust against his government was excited among the clergy. William could not avoid the rewarding of those numerous adventurers who had accompanied him in his expedition. He first divided the lands of the English barons who had opposed him among his Norman barons; but as these were found insufficient, he quartered the rest on the rich abbeys, of which there were many in the kingdom, until some other opportunity of providing for them offered itself.

Though this last step was highly resented by the clergy, it gave very little offence to the laity. The whole nation, however, was soon after disgusted, by seeing all the real power of the kingdom placed in the hands of the Normans. He disarmed the city of London, and other places which appeared most warlike and populous, and quartered Norman soldiers wherever he dreaded an insurrection. This was indeed acting as a conqueror, and not as an elected king; but the event showed the necessity of such precautions. The king having thus secured, as he imagined, England from any danger of a revolt, determined to pay a visit to his Norman dominions. He appointed his brother Odo, bishop of Bayeaux, and William Fitz-Osborne, regents in his absence; and to secure himself yet farther, he resolved to carry along with him such of the English nobility as he put the least confidence in.

Having taken all these methods to ensure the tranquillity of his new kingdom, William set sail for Normandy in March 1067; but his absence produced the most fatal consequences. Discontents and murmurings were multiplied every where; secret conspiracies were entered into against the government; hostilities were commenced in many places; and every thing seemed to threaten a speedy revolution. William of Poictiers, a Norman historian, throws the blame entirely on the English. He calls them a fickle, and mutinous race, while he celebrates with the highest encomiums the justice and lenity of Odo's and Fitz-Osborne's administration. On the other hand, the English historians tell us, that these governors took all opportunities of oppressing the people, either with a view to provoke them to rebellion, or in case they tamely submitted to their impositions, to grow rich by plundering them. Be this as it will, however, a secret conspiracy was formed among the English for a general massacre of the Normans, like what had formerly been made of the Danes. This was prosecuted with so much animosity, that the vassals of the earl of Coxo put him to death because he refused to head them in the enterprise. The conspirators had already taken the resolution, and fixed the day for their intended massacre, which was to be on Ash-Wednesday, during the time of divine service,

(B) Anciently these two titles were synonymous.

England.

vice, when all the Normans would be unarmed as penitents, according to the discipline of the times. But the presence of William disconcerted all their schemes. Having got intelligence of their bloody purpose, he hastened over to England. Such of the conspirators as had been more open in their rebellion, consulted their safety by flight; and this served to confirm the proofs of an accusation against those who remained. From this time the king not only lost all confidence in his English subjects, but regarded them as inveterate and irreconcileable enemies. He had already raised such a number of fortresses in the country, that he no longer dreaded the tumultuous or transient efforts of a discontented multitude. He determined therefore to treat them as a conquered nation. The first instance of this treatment was his revival of the tax of Danegelt, which had been imposed by the Danish conquerors, and was very odious to the people. This produced great discontents, and even insurrections. The inhabitants of Exeter and Cornwall revolted; but were soon reduced, and obliged to implore the mercy of the Conqueror. A more dangerous rebellion happened in the north: but this was also soon quashed, and the English became sensible that their destruction was intended. Their easy submission after the battle of Hastings had inspired the Normans with contempt; their commotions afterwards had rendered them objects of hatred; and they were now deprived of every expedient which could make them either regarded or beloved by their sovereign. Many fled into foreign countries; and among the rest Edgar Atheling himself, who made his escape to Scotland, and carried thither his two sisters Margaret and Christina. They were well received by Malcolm, who soon after married Margaret the elder sister, and also received great numbers of other exiles with the utmost kindness.

The English, though unable to make any resistance openly, did not fail to gratify their resentment against the Normans in a private manner. Seldom a day passed, but the bodies of assassinated Normans were found in the woods and high-ways, without any possibility of bringing the perpetrators to justice. Thus, at length, the conquerors themselves began again to wish for tranquillity and security; and several of them, though entrusted with great commands, desired to be dismissed the service. In order to prevent these desertions, which William highly resented, he was obliged to allure others to stay by the largeness of his bounties. The consequences were, fresh exactions from the English, and new insurrections on their part against their cruel masters. The Norman power, however, was too well founded to be now removed, and every attempt of the English to regain their liberty served only to rivet their chains the more firmly. The county of Northumberland, which had been most active in these insurrections, now suffered most severely. The whole of it was laid waste, the houses were burned, the instruments of agriculture destroyed, and the inhabitants forced to seek new places of abode. On this occasion it is said that above 100,000 persons perished either by the sword or famine; and the country is supposed, even to this day, to retain the marks of its ancient depopulation. The estates of all the English gentry were next confiscated, and bestowed on the Normans. By this means all the ancient and honourable families were reduced to beggary; and the English found themselves totally excluded from every road that led either to honour or preferment.

By proceeding in this manner, William at last broke the spirit of the English nation, and received no farther trouble from them. In 1076, however, he found that the latter part of his life was likely to be unhappy through dissensions in his own family. He had four sons, Robert, Richard, William, and Henry, besides several daughters. Robert, his eldest son, surnamed *Curthose*, from the shortness of his legs, was a prince who inherited all the bravery and ambition of his family. He had formerly been promised by his father the government of the province of Maine in France, and was also declared successor to the dukedom of Normandy. He demanded from his father the fulfilment of these promises; but William gave him a flat denial, observing, that "it was not his custom to throw off his clothes till he went to bed." Robert declared his resentment; and openly expressed his jealousy of his two brothers William and Henry, (for Richard was killed, in hunting, by a stag). An open rupture was soon commenced. The two young princes one day took it into their heads to throw water on their elder brother as he passed through the court after leaving their apartment. Robert construed this frolic into a studied indignity; and having these jealousies still farther inflamed by one of his favourites, he drew his sword, and ran up stairs with an intent to take revenge. The whole castle was quickly filled with tumult, and it was not without some difficulty that the king himself was able to appease it. But he could not allay the animosity which from that moment prevailed in his family. Robert, attended by several of his confederates, withdraw to Rouen that very night, hoping to surprise the castle; but this design was defeated by the governor. The popular character of the prince, however, engaged all the young nobility of Normandy, as well as of Anjou and Brittany, to espouse his quarrel; even his mother is supposed to have supported him in his rebellion by secret remittances. The unnatural contest continued for several years; and William was at last obliged to have recourse to England for support against his own son. Accordingly, he drew an army of Englishmen together: he led them over to Normandy, where he soon compelled Robert and his adherents to quit the field, and was quickly reinstated in all his dominions. Robert then took shelter in the castle of Gerberoy, which the king of France had provided for him, where he was shortly after besieged by his father. As the garrison was strong, and conscious of their treason, they made a gallant defence; and many skirmishes and duels were fought under its walls. In one of these the king and his son happened to meet; but being both concealed by their helmets, they attack each other with mutual fury. The young prince wounded his father in the arm, and threw him from his horse. The next blow would probably have put an end to his life, had he not called for assistance. Robert instantly recollected his father's voice, leaped from his horse, and raised him from the ground. He prostrated himself in his presence, asked pardon for his offences, and promised for the future a strict adherence to his duty. The king was not so easily appeased; and perhaps his resentment was heightened by

89 Dissentions in William's family.

England.

England. by the disgrace of being overcome. He therefore gave his malediction to his son; and returned to his own camp on Robert's horse, which he had assisted him to mount. After some recollection, however, he was reconciled to Robert, and carried him with him into England.

William returned in 1081; and being now freed from his enemies both at home and abroad, began to have more leisure to attend to his own domestic affairs. For this purpose the *Doomsday-Book* was composed by his order, of which an account is given under that article. He reserved a very ample revenue for the crown; and in the general distribution of land among his followers, kept possession of no fewer than 1400 manors in different parts of the country. No king of England was ever so opulent; none was able to support the splendor and magnificence of a court to such a degree; none had so many places of trust and profit to bestow; and consequently none ever had such implicit obedience paid to his commands. He delighted greatly in hunting; and to indulge himself in this with the greater freedom, he depopulated the county of Hampshire for 30 miles, turning out the inhabitants, destroying all the villages, and making the wretched outcasts no compensation for such an injury. In the time of the Saxon kings, all noblemen without distinction had a right to hunt in the royal forests; but William appropriated all these to himself, and published very severe laws to prohibit his subjects from encroaching on this part of his prerogative. The killing of a boar, a deer, or even an hare, was punished with the loss of the delinquent's eyes; at the time when the killing of a man might be atoned for by paying a moderate fine or composition.

As the king's wealth and power were so great, it may reasonably be supposed, that the riches of his ministers were in proportion. Odo, bishop of Bayeux, William's brother, was become so rich, that he resolved to purchase the papacy. For this purpose, taking the opportunity of the king's absence, he equipped a vessel in the Isle of Wight, on board of which he sent immense treasures, and prepared for his embarkation. He was detained, however, by contrary winds; and, in the mean time, William, being informed of his designs, resolved to prevent the exportation of so much wealth from his dominions. Returning therefore from Normandy, where he was at that time, he came to England the very instant his brother was stepping on board. He immediately ordered him to be made prisoner: but his attendants, respecting the bishop's ecclesiastical character, scrupled to execute his commands; so that the king was obliged to seize him with his own hand. Odo appealed to the Pope: but the king replied, that he did not seize him as bishop of Bayeux, but as earl of Kent; and, in that capacity, he expected, and would have, an account of his administration. He was therefore sent prisoner to Normandy; and, notwithstanding all the remonstrances and threats of Pope Gregory, was detained in custody during the remainder of William's reign.

90
Death of the queen;

Soon after this, William felt a severe blow in the death of Matilda his queen; and, almost at the same time, received information of a general insurrection in Maine, the nobility of which had always been averse to his government. Upon his arrival on the continent, he found that the insurgents had been secretly assisted and excited by the king of France, who took all opportunities of lessening the Norman power, by creating dissensions among the nobles. His displeasure on this account was very much increased, by notice he received of some railleries thrown out against him by the French monarch. It seems that William, who was become corpulent, had been detained in bed some time by sickness; and Philip was heard to say, that he only lay in of a big belly. This so provoked the English monarch, that he sent him word, he would soon be up, and would, at his churching, present such a number of tapers as would set the kingdom of France in a flame.

To perform this promise, he levied a powerful army; and, entering the Isle of France, destroyed every thing with fire and sword. He took the town of Mante, and reduced it to ashes. But a period was soon put to the conquests and to the life of this great warrior by an accident. His horse happening to put his fore feet on some hot ashes, plunged so violently, that the rider was thrown forward, and bruised his belly on the pommel of the saddle. Being now in a bad habit of body, as well as somewhat advanced in years, he began to be apprehensive of the consequences, and ordered himself to be carried in a litter to the monastery of St. Gervaise. Finding his illness increase, and being sensible of the approach of death, he discovered at last the vanity of all human grandeur; and was struck with remorse for those many cruelties and violences of which he had been guilty. He endeavoured to make compensation by presents to churches and monasteries, and gave orders for the liberation of several English noblemen. He was even prevailed upon, though not without reluctance, to release his brother Odo, against whom he was very much incensed. He left Normandy and Maine to his eldest son Robert. He wrote to Lanfranc the primate of England, desiring him to crown William king of England. To Henry he bequeathed nothing but the possessions of his mother Matilda; but foretold, that one day he would surpass both his brothers in power and opulence. He expired on the 9th September 1087, in the 63d year of his age, in the 21st of his reign over England, and 54th of that over Normandy.

91
And of the king.

92
William Rufus.

William, surnamed *Rufus*, from his red hair, was in Normandy at the time of his father's illness. He no sooner received the letter for Lanfranc, than, leaving his father in the agonies of death, he set out for England; where he arrived before intelligence of the decease of the Conqueror had reached that kingdom. Being sensible that his brother Robert, as being the eldest son, had a preferable title to himself, he used the utmost dispatch in getting himself firmly established on the throne. The English were so effectually subdued, that they made no opposition; but the Norman barons were attached to Robert. This prince was brave, open, sincere, and generous; and even his predominant fault of indolence was not disagreeable to those haughty barons, who affected an almost total independence of their sovereign. The king, on the other hand, was violent, haughty, and tyrannical. A powerful conspiracy was therefore carried on against William; and Odo, bishop of Bayeux, undertook to conduct it. Many of the most powerful nobility were concerned; and as as the conſpirators expected to be in a ſhort time ſupported by powerful ſuccours from Normandy, they retired to their caſtles, and put themſelves in an offenſive poſture.

William, ſenſible of his danger, engaged the Engliſh on his ſide, by promiſing ſome mitigation of their hardſhips, and liberty to hunt in the royal foreſts. Robert, in the mean time, through his natural indolence, neglected to give his allies proper aſſiſtance. The conſpirators were obliged to ſubmit. Some of them were pardoned: but moſt of them confiſcated, and their eſtates beſtowed on the barons who had continued faithful to the king.

93 Proves a tyrant.

William, freed from this danger, thought no more of his promiſes to the Engliſh. He proved a greater tyrant than his father; and, after the death of Lanfranc, who had been his preceptor, and kept him within ſome bounds, he gave full ſcope to his violent and rapacious diſpoſition. Not content with oppreſſing the laity, he invaded the privileges of the church; which, in thoſe days, were held moſt ſacred. He ſeized the temporalities of all the vacant biſhoprics and abbeys, and openly put to ſale thoſe ſees and abbeys which he thought proper to diſpoſe of.

94 Attempts the conqueſt of Normandy

Theſe proceedings occaſioned great murmurs among the eccleſiaſtics, which were quickly ſpread through the nation, but the terror of William's authority preſerved the public tranquillity. In 1090, the king thought himſelf ſtrong enough to attempt the conqueſt of Normandy, which at that time was in the greateſt confuſion through the indolent and negligent adminiſtration of Robert. Several of the barons had revolted, and theſe revolts were encouraged by the king of France. Robert alſo imagined he had reaſon to fear the intrigues of his other brother Henry, whom for 3000 merks he had put in poſſeſſion of *Cottentin*, near a third part of the duchy of Normandy. He therefore threw him into priſon; but finding himſelf threatened with an invaſion from the king of England, he gave Henry his liberty, and even made uſe of his aſſiſtance in ſuppreſſing the inſurrections of his rebellious ſubjects. William, however, was no ſooner landed in Normandy, than the nobility on both ſides interpoſed, and a treaty of peace was concluded. In this treaty Henry finding his intereſts entirely neglected, retired to St. Michael's Mount, a ſtrong fortreſs on the coaſt of Normandy, and infeſted the neighbourhood with his incurſions. He was beſieged by his two brothers, and obliged to capitulate in a ſhort time; after which, being deprived of all his dominions, he wandered about for ſome time with very few attendants, and often in great poverty.

The peace with Robert was of no long duration. In the interval ſome hoſtilities with Scotland ſucceeded, and theſe terminated in the death of Malcolm king of that country; after which new broils enſued with Normandy. The rapacious temper of William prompted him to encroach upon his brother's territories, and the ſame rapacity prompted him to uſe a very extraordinary expedient in order to accompliſh his deſigns. Having gone over to Normandy to ſupport his partiſans, he ordered an army of 20,000 men to be raiſed in England, and conducted to the ſea-coaſt as if they were to be immediately embarked: but when they came there, inſtead of embarking, they were forced to pay the king ten ſhillings a man; after which they were diſmiſſed to their ſeveral counties. With this money William engaged the king of France to depart from the protection of Robert; and alſo bribed many of the Norman barons to revolt. He was called from Normandy, however, by an irruption of the Welſh; and having repulſed them, he was prevented from attempting other enterprizes by a conſpiracy of his barons.

95 Purchaſes the duchy for 10,000 merks.

In 1096, however, the ſuperſtition of Robert put the king of England in poſſeſſion of thoſe dominions which he had not been able to conquer by force of arms. The cruſades were now commenced, and Robert was deſirous of undertaking an expedition into the Holy Land. As money for this purpoſe was wanting, he mortgaged his dominions to his brother for 10,000 merks. The king raiſed the money by violent extortions on his ſubjects; forcing even the convents to melt their plate, in order to furniſh the quota demanded of them. He was then put in poſſeſſion of Normandy and Maine; and Robert with a magnificent train ſet out for the Holy Land.

After the death of Lanfranc, the king had retained in his own hands the revenues of Canterbury, as he had done thoſe of many other biſhoprics; but falling into a dangerous illneſs, he was ſeized with remorſe; and the clergy repreſented to him that he was in danger of eternal perdition if he did not make atonement for thoſe impieties and ſacrileges of which he had been guilty. He therefore inſtantly reſolved to ſupply the vacancy of Canterbury: he ſent for Anſelm, a Piedmonteſe by birth, abbot of Bec in Normandy, who was much celebrated for his piety and devotion. The abbot refuſed the dignity with great earneſtneſs; fell on his knees, wept, and intreated the king to change his purpoſe; and when he found him obſtinate in forcing the paſtoral ſtaff upon him, he kept his fiſt ſo hard clenched, that it required the utmoſt violence of the byſtanders to open it, and force him to receive that enſign of his ſpiritual dignity. William ſoon after recovered his health, and with it his violence and rapacity. 96
As he now ſpared the church no more than before, a quarrel with Anſelm ſoon enſued; and this was the more dangerous to the king, on account of the great character for piety which the primate had acquired by his zeal againſt abuſes of all kinds, particularly thoſe of dreſs and ornament. His quarrel with the primate.

At this time there was a mode which prevailed not only in England, but throughout Europe, both among men and women, of giving an enormous length to their ſhoes, drawing the toe to a ſharp point, and affixing to it the figure of a bird's bill, or ſome ſuch ornament, which was turned upwards, and which was often ſuſtained by gold or ſilver chains tied to the knee. The eccleſiaſtics took exception at this ornament, which they ſaid was an attempt to bely the ſcripture, where it is affirmed, that no man can add a cubit to his ſtature; and they not only declared againſt it with vehemence, but aſſembled ſome ſynods, in which the faſhion was abſolutely condemned. Such, however, are the contradictions in human nature, that all the influence of the clergy, which at that time was ſufficient to ſend vaſt multitudes of people into Aſia to butcher one another, was not able to prevail againſt thoſe long-pointed ſhoes. The faſhion, contrary to what hath happened to almoſt all others, maintained its ground for ſeveral centuries; and even Anſelm found his endeavours

deavours against it ineffectual. He was more successful in decrying the long hair and curled locks then worn by the courtiers. He refused the ashes on Ash-Wednesday to such as were so accoutred; and his authority and eloquence had such influence, that the young men universally abandoned that ornament, and appeared in the cropt hair recommended to them by the sermons of the primate. For this reformation Anselm is highly celebrated by his historian Eadmer, who was also his companion and secretary.

When William's profaneness returned with his health, he was engaged in almost perpetual contests with this austere prelate*. These were pretty well settled, when the king, who had undertaken an expedition into Wales, required Anselm to furnish him with a certain number of soldiers. The primate regarded this as an invasion of the rights of the church; and therefore, tho' he durst not refuse compliance, sent the men so miserably accoutred, that the king was exceedingly displeased, and threatened him with a prosecution. Anselm demanded restitution of all his revenues which the king had seized, and appealed to the Pope. The quarrel, however, ran so high that the primate found it

97 Who leaves the kingdom.

dangerous to remain in England. He desired and obtained the king's permission to retire beyond sea. His temporalities were confiscated immediately on his departure; but pope Urban received him as a martyr in the cause of religion, and even threatened the king with sentence of excommunication. William, however, proceeded in his projects of ambition and violence, without regarding the threats of the Pope; who he knew was at that time too much engaged with the crusades to mind any other business. Though his acquisition of Maine and Normandy had brought him into perpetual contests with the haughty and turbulent barons who inhabited those countries, and raised endless tumults and insurrections; yet William seemed still intent on extending his dominions either by purchase or conquest. William Earl of Poictiers and Duke of Guienne had resolved upon an expedition to the Holy Land; and, for this purpose, had put himself at the head of a vast multitude, consisting, according to some historians, of 60,000 horse, and a much greater number of foot. Like Robert of Normandy, he offered to mortgage his dominions for money sufficient to conduct this multitude into Asia. The king accepted his offer; and had prepared a fleet and army to take possession of these dominions, when an unfortunate accident put an end to his projects and his life. He was engaged in hunting, the sole amusement, and indeed the principal occupation, of princes in those rude times. Walter Tyrell, a French gentleman, remarkable for his skill in archery, attended him in this recreation, of which

98 Death of the king.

the new forest was the scene. William had dismounted after a chase; and Tyrell, impatient to show his dexterity, let fly an arrow at a stag which suddenly started before him. The arrow glanced from a tree, and struck the king to the heart. He instantly fell down dead; and Tyrell, terrified at the accident, clapt spurs to his horse, hastened to the sea-shore, and embarked for France, where he joined the crusade that was setting out from that country. This happened on the 2d of August 1100, after the king had reigned 13 years, and lived about 40. His body was found in the woods by the country people, and buried without ceremony at Winchester.

* See *Anselm*.

After the death of William, the crown of right devolved to Robert his elder brother; for William had no legitimate children. But what Robert had formerly lost by his indolence, he was again deprived of by his absence at the holy war. Prince Henry was in the forest with William Rufus at the time the latter was killed. He no sooner heard the important news, than he hurried to Winchester, and secured the royal treasure. William de Breteuil, keeper of the treasure, arrived almost the same instant, and opposed his pretensions; telling him, that the treasure belonged to his elder brother, who was now his sovereign, and for whom he was determined to keep it. But Henry, drawing his sword, threatened him with instant death if he dared to disobey him; and others of the late king's retinue, who came every moment to Winchester, joining the prince's party, he was obliged to desist. Henry lost no time in fully accomplishing his purpose. In less than three days he got himself crowned king of England by Maurice bishop of London. Present possession supplied every deficiency of title; and no one dared to appear in defence of the absent prince.

99 Prince Henry usurps the crown.

100 His charter in favour of the people.

The beginning of king Henry's reign promised to be favourable to the English liberty; owing chiefly to his fear of his brother. To conciliate the affections of his subjects, he passed a charter calculated to remove many of the grievous oppressions which had been complained of during the reigns of his father and brother. He promised, that at the death of any abbot or bishop, he never would seize the revenues of the see or abbey during the vacancy, but would leave the whole to be reaped by the successor; and that he would never let to farm any ecclesiastical benefice, or dispose of it for money. To the laity he promised, that, upon the death of any earl, baron, or military tenant, his heir should be admitted to the possession of his estate, on paying a just and lawful relief; without being exposed to those enormous exactions which had been formerly required. He remitted the wardship of minors; and allowed guardians to be appointed, who should be answerable for the trust. He promised not to dispose of any heiress in marriage but by advice of all the barons; and if any baron intended to give his daughter, sister, niece, or kinswoman, in marriage, it should only be necessary for him to consult the king, who promised to take no money for his consent, nor ever to refuse permission, unless the person to whom it was proposed to marry her should happen to be his enemy. He granted his barons and military tenants the power of bequeathing by will their money or personal estates; and if they neglected to make a will, he promised that their heirs should succeed to them. He renounced the right of imposing moneyage, and of levying taxes at pleasure, on the farms which the barons kept in their own hands. He made some general professions of moderating fines; he offered a pardon for all offences; and remitted all debts due to the crown. He also required, that the vassals of the barons should enjoy the same privileges which he granted to his own barons; and he promised a general confirmation and observance of the *laws of king Edward**. To give greater authenticity to these concessions, a copy

* See *Feodal System*.

England. copy of the charter was lodged in some abbey of each county.

King Henry, farther to increase his popularity, degraded and committed to prison Ralph Flambard bishop of Durham, who had been the chief instrument of oppression under his brother. He sent for Anselm, who was then at Lyons, inviting him to return and take possession of his dignities. Anselm returned; but when Henry proposed to him to do the same homage to him which he had done to his brother, the king met with an absolute refusal. During his exile, Anselm had assisted at the council of Bari; where, besides fixing the controversy between the Greek and Latin churches concerning the procession of the Holy Ghost, the right of election to church-preferments was declared to belong to the clergy alone, and spiritual censures were denounced against all ecclesiastics who did homage to laymen for their sees and benefices, and on all laymen who exacted it. The rite of homage † by the feudal customs was, that the vassal should throw himself on his knees, put his joined hands between those of his superior, and should in that posture swear fealty to him. But the council declared it execrable, that pure hands, which could create God, and offer him up for the salvation of mankind, should be put, after this humiliating manner, between profane hands, which, besides being inured to rapine and bloodshed, were employed day and night in impure pupoles and obscene contacts. To this decree therefore Anselm appealed; and declared, that so far from doing homage for his spiritual dignity, he would not even communicate with any ecclesiastic who paid that submission, or who accepted of investitures from laymen. Henry durst not insist; and therefore desired that the controversy might be suspended, and that messengers might be sent to Rome to accommodate matters with the Pope, and to obtain his confirmation of the laws and customs of England.

101 Quarrels with the Primate.

† See Feodal *Tenure*.

Henry now took another step which seemed capable of confirming his claims to the crown without any danger of a rival. The English remembered with regret their Saxon monarchs, when they compared the liberty they enjoyed under them with the tyranny of the Normans. Some descendants of that favourite line still remained; and among the rest, Matilda, the niece of Edgar Atheling. Upon her the king fixed his eyes as a proper consort, by whose means the breach between the Saxons and Normans might be cemented. A difficulty, however, occurred, because she had been educated in a nunnery. The affair was examined by Anselm in a council of prelates and nobles summoned at Lambeth. Matilda there proved, that she had put on the veil, not with a design of entering into a religious life, but merely in imitation of a custom familiar to the English ladies, who protected their chastity from the brutal violence of the Normans by taking shelter under that habit, which amid the horrid licentiousness of the times was yet generally revered. The council, sensible that even a princess had otherwise no security for her honour, admitted this reason as valid. They pronounced that Matilda was still free to marry; and her nuptials with Henry were celebrated by Anselm with great solemnity and pomp.

102 He marries Matilda.

While Henry was thus rendering himself popular at home, his brother Robert, who had loitered away a twelvemonth in Italy, where he married Sibylla daughter of the count of Conversana, arrived in England, in 1101, in order to put in his late and ineffectual claim to the crown. His fame, however, on account of the exploits he had performed in Palestine, was so great, that even yet he was joined by many noblemen of the first rank, and the whole nation seemed prepossessed in his favour. But Henry, having paid his court to Anselm, by his means retained the army in his interests, and marched with them to Portsmouth, where Robert had landed his forces a few days before. The armies lay for some time in sight of each other; when an accommodation was effected through the mediation of Anselm and other great men. By this treaty it was agreed, that Robert should resign his pretensions to England, and receive in lieu of them an annual pension of 3000 marks; that if either of the princes died without issue, the other should succeed to his dominions; that the adherents of each should be pardoned, and restored to all their possessions either in Normandy or England; and that neither Robert nor Henry should thenceforth encourage, receive, or protect, the enemies of each other.

England. 103 Crown of England claimed by Robert.

The two princes separated with mutual marks of friendship; but next year, Henry, under various pretences confiscated the estates of almost all the noblemen who had favoured his brother's pretensions. Robert, enraged at the fate of his friends, ventured to come to England in order to remonstrate with his brother in person. But he met with such a bad reception, that, apprehending his liberty to be in danger, he was glad to make his escape by resigning his pension. 104

This infringement of the treaty was followed the ensuing year by an invasion of Normandy, at the desire of Robert's own subjects, whom he was totally incapable of governing *. The event of this war was the defeat and captivity of Robert, who was henceforth deprived not only of all his dominions, but of his personal liberty. He lived 28 years a prisoner, and died in the castle of Cardiff in Glamorganshire. It is even said by some, that he was deprived of his sight by a red-hot copper bason applied to his eyes, and that king Henry appeased his conscience by founding the monastery of Reading.

Normandy invaded by Henry.

* See *Normandy*.

The conquest of Normandy was completed in 1006; and next year the controversy between the king and primate, concerning the investitures of clergymen and their doing homage to princes, was resumed. The king was very sensible that it was not his interest to quarrel with such a powerful body as the clergy were at that time; and on the other hand he fully understood the necessity of guarding the prerogatives of the crown from their encroachments. While, therefore, he avoided an open rupture with Anselm, he obstinately refused to give up the privileges which had been enjoyed by his predecessors. On the first arrival of Anselm, the king had avoided the dispute in the manner already mentioned. A messenger was dispatched to Rome, in order to compromise matters with the Pope. The messenger returned with an absolute refusal of the king's demands. One of the reasons given by the Pope on this occasion, was expressed in the following words: "It is monstrous that a son should pretend to beget his father, or a man to create his God: priests are

105 Quarrel with the primate.

called

England.

called *gods* in scripture, as being the vicars of God: and will you, by your abominable pretensions to grant them their investiture, assume the right of creating them?" Henry was not yet convinced; but as he was determined to avoid, or at least to delay, the coming to any dangerous extremity with the church, he persuaded Anselm, that by farther negociation he should be able to compound matters with the Pope. Messengers were therefore dispatched to Rome a second time from the king; and also from Anselm, who wanted to be fully assured of the Pope's intentions. They returned with letters wrote in the most arrogant and positive manner, both to the king and primate. The king suppressed the letter sent to himself; and persuaded the three bishops, by whom it was sent, to assert, upon their episcopal faith, that the Pope had assured them of his private good intentions towards king Henry, and of his resolution not to resent any future exertion of his prerogative in granting investitures; though he himself scrupled to give this assurance under his hand, lest other princes should copy the example and assume a like privilege. Anselm's two messengers, who were monks, affirmed that it was impossible this story could have any foundation; but their word was not deemed equivalent to that of three bishops; and the king, as if he had finally gained his cause, proceeded to fill the sees of Hereford and Salisbury, and to invest the new bishops in the usual manner. Anselm, however, gave no credit to the assertions of the king's messengers; and therefore refused not only to consecrate them, but even to communicate with them; and the bishops themselves, finding they were become universally odious, returned the ensigns of their spiritual dignity.

The quarrel continued between the king and primate, till the latter, sensible of his dangerous situation, desired leave to make a journey to Rome, in order to lay the case before the Pope. This permission was easily obtained; but no sooner was the primate gone, than Henry confiscated all his revenues, and sent another messenger to negociate with the Pope. The new messenger told his holiness, that his master would sooner part with his crown than the right of granting investitures. "And I (replied the Pope) would rather lose my head than allow him to retain it." This quarrel now became very dangerous to the king; as he was threatened by the Pope with excommunication, which would have been attended with terrible consequences. At last, however, a compromise was made in the following manner. Before bishops took possession of their dignities, they had formerly been accustomed to pass through two ceremonials: They received, from the hands of the sovereign, a ring and crosier as the symbols of their office, and this was called their *investiture*: they also made those submissions to the prince, which were required of the vassals by the rites of the feudal law, and which received the name of *homage*. The Pope, therefore, was for the present contented with Henry's resigning his right of granting investitures, by which the spiritual dignity was supposed to be conferred; and he allowed the bishops to do homage for their temporal properties and privileges. After this, the Pope allowed Anselm to communicate with the prelates who had already received investitures from the crown; and he only required of them some submissions for their past conduct. He also granted to Anselm a plenary power of remedying every disorder, which he said might arise from the barbarousness of the country. About the same time the marriage of priests was prohibited; and even laymen were not allowed to marry within the seventh degree of affinity. By this contrivance the Pope augmented the profits which he reaped from granting dispensations, and likewise those from divorces. For as the art of writing was then rare, and parish-registers were not regularly kept, it was not easy to ascertain the degrees of affinity even among people of rank; and any man who had money to pay for it, might obtain a divorce, on pretence that his wife was more nearly related to him than was permitted by the canons. A decree was also published, prohibiting the clergy to wear long hair; and the king, tho' he would not resign his prerogatives to the church, very willingly cut his hair in the form which was required of him, obliging all the courtiers at the same time to follow his example.

From the time of this compromise, which happened in 1107, to the year 1120, nothing remarkable happened except some slight commotions in Normandy: but this year, prince William, the king's only son, 106
was unfortunately drowned off the coast of Normandy: Prince
and Henry was so much affected, that he is said never William
afterwards to have smiled or recovered his wonted drowned.
cheerfulness. It is very doubtful, however, whether the death of this prince was not an advantage to the British nation, since he was often heard to express the utmost hatred to the natives: insomuch that he had threatened, that when he came to the throne, he would make them draw the plough, and would turn them into beasts of burden. These prepossessions he inherited from his father; who, though he was wont, when it might serve his purposes, to value himself on his birth as a native of England, showed, in the course of his government, an extreme prejudice against that people. All hopes of preferment to ecclesiastical as well as civil dignities were denied to the English during this whole reign; and any foreigner, however ignorant or worthless, was sure to have the preference in every competition. The charter formerly mentioned, which the king granted at the beginning of his reign, was no more thought of; and the whole fell so much into neglect and oblivion, that in the following century, when the barons, who had heard an obscure tradition of it, desired to make it the model of the great charter which they exacted from king John, they could only find one copy of it in the whole kingdom; while the grievances, proposed to be redressed by it, continued still in their full extent.

As Henry had now no legitimate children except Matilda, whom in 1110 he had betrothed, though only eight years of age, to the emperor of Germany, he was induced to marry a second time in hopes of having sons. He made his addresses accordingly to Adelais the daughter of Godfrey Duke of Lovaine, and niece to Pope Calixtus; a young princess of an amiable person. But Adelais brought him no children. 107
and in 1135, the king died in Normandy, from eating Death of
too plentifully of lampreys; having lived 67 years, and King Henreigned 35. ry.

By the will of king Henry, his daughter Matilda became heiress of all his dominions. She had been

England. married, after her first husband's death, to Geoffrey Plantagenet eldest son of the count of Anjou, by whom she had a son named *Henry*; but as Geoffrey had given umbrage to the king of England in several instances, no notice was taken of him in the will. The nobility had already sworn fealty to her; and the foremost to show this mark of submission to the king's will had been Stephen, son of the count of Blois (who had married Adela the daughter of William the Conqueror). He had been married to Matilda daughter and heiress of Eustace Count of Boulogne; who brought him, besides that feudal sovereignty of France, a vast property in England, which in the distribution of lands had been conferred by the Conqueror on the family of Boulogne. By this marriage Stephen acquired a new connection with the royal family of England: for Mary his wife's mother, was sister to David the present king of Scotland, and to Matilda the first wife of Henry and mother of the empress. The king also, imagining that by the aggrandizement of Stephen he strengthened the interest of his own family, had enriched him with many possessions; but instead of this, it appeared by the event, that he had only put it more and more in his power to usurp the throne.

108 Stephen usurps the throne.

No sooner was Henry dead, than Stephen hastened from Normandy into England. The citizens of Dover and Canterbury, apprized of his purpose, shut their gates against him; but when he arrived at London, some of the lower class of people, instigated by his emissaries, immediately proclaimed him king. The archbishop of Canterbury refused to give him the royal unction; but this difficulty was got over by Stephen's brother the bishop of Winchester. Hugh Bigod, steward of the household, made oath before the primate, that the late king, on his death-bed, had discovered a dissatisfaction with his daughter Matilda, and had expressed his intention of leaving the Count of Boulogne heir to all his dominions; and the bishop, either believing, or pretending to believe, this testimony, gave Stephen the royal unction. Very few of the nobility attended his coronation; but none opposed his usurpation, however unjust or flagrant.

Stephen, in order to establish himself on the throne as firmly as possible, passed a charter, in which he made liberal promises to all ranks of men. To the clergy he promised, that he would speedily fill all the vacant benefices, and never would levy any of the rents during the vacancy. To the nobility he gave liberty to hunt in their own forests; and to the people he promised to remit the tax of danegelt, and to restore the laws of Edward the Confessor. He seized the king's treasure at Winchester, amounting to L.100,000; with part of which money he hired mercenary soldiers from the continent; and with another part procured a bull from the Pope, confirming his title to the English throne.

Matilda, in the mean time, endeavoured to recover her just rights of which Stephen had deprived her; but for some time she met with no success either in England or Normandy. Her husband Geoffrey himself was obliged to conclude a peace with Stephen, on condition of the king's paying him during that time an annual pension of L.5000.

Robert Earl of Glocester was the first who shook the power of Stephen. He was natural son to the late king; a man of great honour and ability, and was very much attached to the interests of Matilda. When Stephen usurped the throne, he offered to do him homage, and take the oath of fealty; but with an express condition, that the king should maintain all his stipulations, and never invade any of Robert's rights or dignities. With this condition Stephen was obliged to comply, on account of the great power of that nobleman, though he knew that it was meant only to afford him a favourable opportunity of revolting when occasion served. The clergy imitated Robert's example; and annexed to their oath of allegiance the following condition, namely, that they were only bound as long as the king defended the ecclesiastical liberties, and supported the discipline of the church. 109

Distracted state of the kingdom.

The barons, in return for their submission, exacted terms of still more pernicious tendency. Many of them required to have the right of fortifying their castles, and putting themselves in a posture of defence; and with this exorbitant demand the king was forced to comply. All England was immediately filled with these fortresses; which the noblemen garrisoned either with their vassals, or with licentious soldiers, who flocked to them from all quarters. The whole kingdom now became a scene of rapine and devastation. Wars were carried on by the nobles in every quarter; the barons even assumed the right of coining money, and of exercising, without appeal, every act of jurisdiction; and the inferior gentry, as well as the people, finding no defence from the laws, during this total dissolution of sovereign authority, were obliged, for their immediate safety, to pay court to some neighbouring chieftain, and to purchase his protection, both by submitting to his exactions, and by assisting him in his rapine upon others.

In 1137, the Earl of Glocester having projected an insurrection, retired beyond sea, sent the king a defiance, and solemnly renounced his allegiance. The next year David king of Scotland appeared with an army in defence of his niece's title; and penetrating into Yorkshire, committed the greatest devastations. He was defeated, however, with great slaughter, at Northallerton, by some of the northern barons, who had raised a powerful army; and this success so much overawed the malecontents in England, that Stephen's power might have received some stability, had he not unfortunately engaged himself in a contest with the clergy. He had already seen the mischief arising from the liberty he had granted of fortifying so many castles in different parts of the kingdom. He therefore determined to abridge this liberty as much as possible; and for that purpose he began with the castles erected by the clergy, who seemed to have less right to these military securities than the barons. Taking advantage therefore of a fray which had arisen at court between the retinue of the bishop of Salisbury and the Earl of Brittany, he seized the bishops of both Salisbury and Lincoln, threw them into prison, and obliged them to deliver up the castles which they had lately erected. This produced such a violent commotion, that the opportunity seemed favourable to the pretensions of Matilda. On the 22d of September 1139, she landed in England with Robert Earl of Glocester, attended only by 140 knights; but her partizans daily increased, and she was soon in a condition to face Stephen

110 Matilda lands in England.

England. phen with equal forces in the field. Numberless encounters happened, the detail of which could afford very little entertainment to the reader. War was spread through every quarter; and the turbulent barons having, in a great measure, shaken off all restraint of government, and now obtained the sanction of fighting in the cause of their country, redoubled their oppressions, tyrannies, and devastations. The castles of the nobility became receptacles of licensed robbers; who, sallying forth day and night, spoiled the open country, plundered the villages, and even cities. They tortured the captives to make them reveal their treasures; sold their persons to slavery; and set fire to the houses, after they had pillaged them of every thing valuable. In consequence of this destruction, the land was left untilled; the instruments of husbandry were abandoned; and a grevious famine reduced the nation to the most deplorable state that can be imagined.

After a multitude of indecisive conflicts, a battle ensued which seemed likely to ensure the public peace for some time. Stephen had marched his forces to relieve the city of Lincoln; the Earl of Glocester led a body of troops to assist those of Matilda's party, who were besieging that place. The two armies engaged on the 2d of February within sight of the city, and a desperate battle ensued. At last Stephen's army was defeated. He himself was for some time left without attendants; and fought on foot in the midst of his enemies, assaulted by multitudes, and resisting all their efforts with astonishing intrepidity. Being hemmed in on every side, he forced a way for some time with his battle-ax; but that breaking, he drew his sword, and with it furiously assailed his antagonists for some time longer. But at length the sword also flying in pieces, he was obliged to surrender himself a prisoner. He was conducted to Glocester; and though at first treated with respect, he was in a short time, upon some suspicions, thrown into irons.

111 Stephen defeated and taken prisoner.

About a month after, Matilda was crowned at Winchester with great solemnity; but soon showed herself totally incapable of governing such a turbulent nation. She determined to repress the power of the nobles, who had now left only the shadow of authority to their sovereign. But being destitute of policy or prudence sufficient to accomplish so difficult an undertaking, a conspiracy was soon formed against her, and the bishop of Winchester detached a party of his friends and vassals to block up the city of London where the queen resided. At the same time measures were taken to instigate the Londoners to a revolt, and to seize the queen's person. Matilda, having timely notice of this conspiracy, fled to Winchester. Here she was soon after besieged by the bishop: but the town being distressed by famine, she with difficulty made her escape; while her brother the Earl of Glocester, endeavouring to follow, was taken prisoner, and exchanged for Stephen.

112 Matilda crowned.

Matilda was now obligd to take shelter in Oxford, while Stephen reascended the throne. The civil war broke out with redoubled fury. Many battles were fought, and both parties were involved in many distresses. Matilda escaped from Oxford at a time when the fields were covered with snow, by being dressed all in white, with four knights her attendants dressed in the same colour. Another time Stephen was surprised by the earl of Glocester at Wilton, and made his escape with the utmost difficulty. At last Matilda was obliged to quit the kingdom; and the death of the earl of Glocester soon after seemed to give a fatal blow to her interests. In 1153, however, prince Henry, Matilda's son by her second husband Geoffrey, came over to England, in order once more to dispute Stephen's pretensions to the crown. After some success on his first landing, he was opposed by Stephen with a powerful army, and matters seemed likely to come to the decision of a general engagement. But while the two armies continued within a quarter of a mile of each other, a treaty was set on foot by the interposition of William earl of Arundel, for terminating the dispute in an amicable manner. The death of Eustace, Stephen's son, whom he had designed for the throne, which happened during the course of the treaty, facilitated its conclusion. It was agreed, that Stephen should reign during his life, and that justice should be administered in his name; that Henry, on Stephen's death, should succeed to the kingdom; and that William, Stephen's son, should inherit Boulogne and his patrimonial estate. This treaty filled all Europe with joy; and after the barons had sworn to it, Henry left England, and Stephen returned to the peaceable enjoyment of his throne. His reign, however, was but of short continuance; his death happening on the 25th of October 1154.

113 Stephen restored.

114 His death.

Henry was on the continent besieging a castle of one of the mutinous barons, when news was brought him of Stephen's death. But, as he was sensible of the goodness of his title, he did not abandon his enterprize till the place was reduced. He then set out on his journey, and was received in England with the utmost joy. The first acts of his reign seemed to promise an happy and prosperous administration. He instantly dismissed the mercenary soldiers who had committed the greatest disorders throughout the nation. He ordered all the castles which had been erected since the death of Henry I. to be demolished, except a few which he retained in his own hands for the protection of the kingdom. The adulterated coin which had been struck during the reign of Stephen was cried down, and new money struck of the right value and standard. He resumed many of those benefactions which had been made to churches and monasteries in the former reigns. He gave charters to several towns, by which the citizens claimed their freedom and privileges independent of any superior but himself. These charters were the ground-work of the English liberty; for thus a new order, namely, the more opulent of the people, began to claim a share in the administration, as well as the nobility and clergy. Thus the feudal government was at first impared; and liberty began to be more equally diffused throughout the nation.

115 Henry II.

Henry II. on his accession to the English throne, found himself possessed of very extensive dominions on the continent. In the right of his father, he possessed, Anjou, Touraine, and Maine; in that his mother, Normandy; in that of his wife, Guienne, Poictou, Xaintogne, Auvergne, Perigord, Angouonois, and the Limousin. Soon after, he annexed Brittany to his other states, by marrying his son, who was yet a child, to the heiress of Brittany, who was a child also

 alſo, and was already in poſſeſſion of the ſuperiority over that province. Theſe territories compoſed above a third of the French monarchy, and were by far the moſt opulent part of it; ſo that Henry, though vaſſal to the king of France, was greatly ſuperior to him in power: and when England was added to all theſe, the French king had great reaſon to apprehend ſome diſaſter to himſelf and family. The king of England, however, reſided at too great a diſtance to be able to employ this formidable power with ſucceſs againſt the French monarch. He ſoon became a kind of ſtranger in his continental dominions; and his ſubjects there conſidered their allegiance as more naturally due to their ſuperior lord, who lived in their neighbourhood, and who was acknowledged to be the ſupreme head of their nation. Their immediate lord was often at too great a diſtance to protect them; and a commotion in any part of Henry's extenſive dominions gave great advantages againſt him. The wiſe and vigorous adminiſtration of Henry, however, counterbalanced in a great meaſure theſe diſadvantages; and he maintained a ſurpriſing tranquillity throughout his extenſive dominions during the greateſt part of his reign.

116
Monſtrous wickedneſs of the clergy.

Henry found no great difficulty in circumſcribing the power of the barons; but when he attempted to do the ſame thing with the clergy, he met with the moſt violent oppoſition. That body had carried their independence on the civil power ſo far, that now they ſeemed to aim at nothing leſs than a liberty to commit all manner of crimes with impunity. During the reign of Stephen, they had extorted an immunity from all but eccleſiaſtical penalties*; and that grant they were reſolved to maintain for the future. It may eaſily be ſuppoſed, that a law which thus ſcreened their wickedneſs, contributed to increaſe it; and we accordingly find upon record, not leſs than 100 murders committed by men in holy orders in the ſhort period ſince the king's acceſſion, not one of which was puniſhed even with degradation; while the biſhops themſelves ſeemed to glory in this horrid indulgence. The king did not make any attempts againſt them during the life of Theobald archbiſhop of Canterbury, who was a man of a mild character, and beſides had great merit; becauſe, during the former reign, he had refuſed to put the crown on the head of Euſtace, Stephen's ſon. He died in 1162; and the king, after his death, advanced to the ſee of Canterbury Thomas a Becket, his chancellor, on whoſe compliance he thought he might entirely depend.

* See (Benefit of) *Clergy*.

117
Conteſts of the king with Thomas a Becket.

The new archbiſhop was the firſt man of Engliſh pedigree, who, ſince the Norman conqueſt, had riſen to any conſiderable ſtation. Before his inſtalment in the ſee of Canterbury, Becket had been exceedingly complaiſant, good-humoured, and agreeable to his maſter; and had alſo been accuſtomed to live very freely. But no ſooner was he inveſted with this high dignity, than he totally altered his conduct, and put on all thoſe airs of affected and oſtentatious humility which could recommend him to the ſuperſtitious and ignorant multitude in that age. The firſt ſtep taken by this hypocrite after his advancement, was to reſign the office of chancellor. This he did without conſulting the king; the reaſon he gave was, that henceforth he muſt detach himſelf from ſecular affairs, and be ſolely employed in the duties of his ſacred function; but in reality, that he might break off all connexion with Henry. As he knew that the king intended to abridge the eccleſiaſtical power, he thought the beſt method would be to become himſelf the aggreſſor. He therefore ſummoned the earl of Clare to ſurrender the barony of Tunbridge; which, ever ſince the Conqueſt, had remained in the family of that nobleman; but which, as it had formerly belonged to the ſee of Canterbury, the primate pretended that his predeceſſors were prohibited by the canons from alienating.—William de Eynsford, a military tenant of the crown, was patron of a living which belonged to a manor that held of the archbiſhop of Canterbury; and Becket, without regard to William's right, preſented, on a new and illegal pretence, one Laurance to that living, who was violently expelled by Eynsford. Upon this, Eynsford was excommunicated. He complained to the king, that he, who held *in capite* of the crown, ſhould, contrary to the practice eſtabliſhed by the Conqueror and maintained ever ſince by his ſucceſſors, be ſubjected to that terrible ſentence, without the previous conſent of the ſovereign. Henry, by a meſſenger, commanded Becket to abſolve Eynsford. The haughty primate anſwered, that it belonged not to the king to inform him whom he ſhould abſolve, and whom excommunicate; but, after all, he was obliged to comply with the king's orders, though with the worſt grace imaginable.

As Henry perceived that the crown was now in danger, through the ſuperſtition of the people, of falling totally under the power of the clergy, he reſolved to exert himſelf to the utmoſt againſt their ſcandalous uſurpations. Among their other inventions to obtain money, they had now inculcated the neceſſity of penance as an atonement for ſin; and having again introduced the practice of paying them large ſums as an equivalent for theſe penances, the ſins of the people had thus become a revenue to the prieſts; and the king computed, that, by this invention alone, they levied more money from his ſubjects than what flowed by all the funds and taxes into the royal exchequer. To eaſe the people of ſo heavy and arbitrary an impoſition, the king required, that a civil officer of his appointment ſhould be preſent in all eccleſiaſtical courts, and ſhould for the future give his conſent to every compoſition made for ſpiritual offences. About this time alſo the king had an opportunity of proceeding againſt the clergy on another footing. A clerk in Worceſterſhire, having debauched a gentleman's daughter, murdered her father. The king required that the clerk ſhould be delivered up to the magiſtrate. Becket pleaded the privileges of the church; confined the criminal in the biſhop's priſon, leſt he ſhould be ſeized by the king's officers; and maintained that no greater puniſhment could be inflicted on him than degradation. The king then required, that, immediately after he was degraded, he ſhould be tried by the civil powers; but the primate aſſerted, that it was iniquitous to try a man twice upon the ſame accuſation, and for the ſame crime. Upon this, Henry, ſummoned an aſſembly of all the prelates in England; and put to them this deciſive queſtion, Whether or not they were willing to ſubmit to the ancient laws and cuſtoms of the kingdom? The biſhops unanimouſly replied, that they were willing, *ſaving their own order*. The king was pro-

England. provoked to the last degree at this equivocal answer. He left the assembly with evident marks of displeasure; and required the primate instantly to surrender the castles of Eye and Berkham. The other prelates were terrified; but Becket continued inflexible: however, he was at last prevailed upon, by the interposition of Philip the pope's legate and almoner, to retract the saving clause, and promise without any reserve to observe the ancient customs.

The king was not now to be satisfied with general promises from the clergy. He was determined that the ancient laws and customs should be defined, as well as the privileges of the clergy. He therefore summoned another great council of the clergy and nobility at Clarendon, to whom he submitted this important affair. A number of regulations was there drawn up, which were afterwards well known by the title of the *Constitutions of Clarendon*. By these it was enacted, that clergymen accused of any crime should be tried in the civil courts; that laymen should not be tried in spiritual courts, except by legal and reputable witnesses; that the king should ultimately judge in ecclesiastical and spiritual appeals; that the archbishops and bishops should be regarded as barons, and obliged to contribute to the public expences like other persons of their rank; that the goods forfeited to the king, should not be protected in churches or churchyards by the clergy; and that the sons of villeins should not take orders without the consent of their lord. These, with some others of less consequence, to the number of 16, were subscribed by all the bishops present, and even by Becket himself; who, at first showed some reluctance.

Nothing now remained but to get the constitutions ratified by the Pope; but in this the king was disappointed. The Pope rejected them with the utmost indignation, and out of 16, admitted only six, which he thought were not important enough to deserve censure.—Becket was now mortified to the highest degree. He retracted his consent to the constitutions, redoubled his austerities, and even refused to execute any part of his sacerdotal function till he had obtained absolution from his holiness. Henry, considering these humilities as insults offered to himself, desired the Pope to send him a legate. He did so; but annexed a clause to his commission, by which he was prohibited from acting against the archbishop of Canterbury. The king sent back the commission to the Pope; and being now exasperated beyond all patience, commenced furious prosecutions against Becket. He first sued him for some lands belonging to his primacy; and Becket being detained by sickness from coming into court, his non-attendance was construed into disrespect. The primate afterwards defended his cause in person; but all his goods and chattels were confiscated, and the bishop of Winchester was obliged to pronounce the sentence. Another suit was commenced against him for L.300, which he had levied on the honours of Eye and Berkham, and the primate agreed to give securities for the payment of the sum. The next day a third suit was commenced against him for 1000 marks, which the king had lent him upon some former occasion: and immediately upon the back of these, a still greater demand was made; namely, that Becket should give an account of the money he had received and expended during the time he was chancellor. The money was computed at no less than 40,000 marks; and the primate, unable either to give an account, or find securities, took the following extraordinary method of evading the king's designs. He arrayed himself in his episcopal vestments; and with the cross in his hand, went forward to the palace. Having entered the royal apartments, he sat down, holding up the cross as his banner and protection. The king, who sat in an inner apartment, ordered by proclamation all the prelates and nobility to attend him; to whom he loudly complained of Becket's insolence. The whole council joined in condemning this instance of his unaccountable pride; and determined to expostulate with him about his inconsistency concerning the constitutions of Clarendon. But all their messages, threats, and arguments, were to no purpose. Becket put himself, in the most solemn manner, under the protection of the supreme pontiff, and appealed to him against any penalty which his iniquitous judges 118
might think proper to inflict. Then leaving the palace, he asked the king's immediate permission to quit Northampton; but being refused, he secretly withdrew in disguise, and at last found means to cross over to the continent.

Becket flies to the continent.

Becket was received with the greatest marks of esteem, first by the king of France (who hated Henry on account of his great power), and then by the Pope, whose cause he had so strenuously defended in England. Henry at the same time sent ambassadors to the Pope, who were treated with coolness and contempt, while Becket was honoured with the greatest marks of distinction. These favours bestowed upon an exile and a perjured traitor (for such had been Becket's sentence of condemnation in England), irritated the king to such a degree, that he resolved to throw off at once all dependence upon the Pope. He accordingly issued out orders to his justiciaries; inhibiting, under severe penalties, all appeals to the Pope, or the archbishop; and forbidding any of them to receive mandates from them, or to apply to their authority. He declared it treasonable to bring over from either of them any interdict upon the kingdom. This he made punishable in secular clergymen by the loss of their livings, and by castration; in regulars, by the amputation of their feet; and in laymen, by death. On the other hand, the Pope and the archbishop did not fail to issue forth their fulminations in such a manner as to shake the very foundation of the king's authority. Becket excommunicated by name all the king's chief ministers who had been concerned in sequestring the revenues of his see, and all who obeyed or favoured the constitutions of Clarendon. He even threatened to excommunicate the king if he did not speedily repent; and had not the Pope himself been threatened every day with the machinations of an antipope, whose pretensions he was afraid the king of England might support, the sentence of excommunication would certainly have been denounced.

At first Henry paid little regard to these fulminations; but afterwards, when he found that his authority over his subjects began to decline on that account, and that his rivals on the continent were endeavouring to disturb the tranquillity of his dominions, he began sincerely to desire a reconciliation. This the Pope and

Becket also became desirous of, because they saw that their utmost endeavours were insufficient to draw Henry's subjects into a revolt against him. The treaty of accommodation, however, was often broke off, through the extreme jealousy of each of the parties; but at length by the mediation of the Pope's legate, all differences were adjusted, and Becket was reinstated in

119 the see of Canterbury.

Is restored, and behaves with his former insolence.

On the recovery of his dignity, the primate behaved with all his usual arrogance. Instead of retiring quietly to his diocese when he landed in England, he made a progress through Kent with all the splendor and magnificence of a sovereign pontiff. As he approached Southwark, the clergy, the laity, and all ranks of people came forth to meet him, and celebrated his triumphal entry with hymns of joy. Being thus confident of the support of the people, he resolved to make his enemies feel the severest effects of his vengeance. He suspended the archbishop of York, who had crowned Henry's eldest son in his absence. He excommunicated the bishops of London and Salisbury, with some of the principal nobility and prelates who had assisted at the coronation. One man he excommunicated for having spoken against him, and another for having cut off the tail of one of his horses. The excommunicated and degraded prelates immediately made their complaints to the king; and he having dropped some passionate expressions, intimating a desire to have Becket's life taken away, the supposed will of the king was instantly accomplished; nor could the king's express orders to the contrary arrive time enough to hinder the execution of this fatal pur-

120 pose. See Becket.

Grief of the king for his death.

The king was thrown into the utmost consternation on hearing of Becket's murder. He knew that the primate's death would accomplish what his most violent opposition during his life could never have done, and therefore he gave himself up to sorrow; for three days he even refused all nourishment; till at last his courtiers were obliged to break in upon his solitude, and induce him to acquiesce in an event which could not possibly be recalled. The pope was with some difficulty made sensible of the king's innocence; but refused to grant him a pardon, except on condition that he should make every future submission and perform every injunction the holy see thought proper to demand. When things were thus adjusted, the assassins who had murdered Becket were allowed to retire in safety to the enjoyment of their former dignities; and the king, with a view to divert the minds of the people to a different object, undertook an expedition into Ireland, and totally reduced that island. See

121 Ireland.

Dissensions in Henry's family.

The king was scarce freed from the war with Ireland, and the dangerous controversy which he had engaged in with the church of Rome, when he found himself involved in the most unnatural contests with his children, to whom he had always behaved in the most tender and affectionate manner. He had ordered Henry his eldest son to be anointed king; and had destined him for his successor in the kingdom of England, the duchy of Normandy, and the counties of Anjou, Maine, and Touraine; territories which lay contiguous, and which might thus easily lend their assistance to one another. Richard his second son was invested in the duchy of Guienne and county of Poictou: Geoffrey, his third son, inherited, in right of his wife, the duchy of Brittany: and the new conquest of Ireland was destined for the appendage of John his fourth son, for whom he had negociated a marriage with Adelais the only daughter of Humbert count of Savoy and Maurienne; and with whom he was to receive as a dowry very considerable demesnes in Piedmont, Savoy, Bresse, and Dauphiny. This greatness of Henry's family alarmed the king of France; and he therefore excited young prince Henry to demand of his father, either the immediate resignation of the crown of England, or the duchy of Normandy. The king refused to comply with such an extravagant demand; upon which the prince made his escape to Paris, where he was protected by the French king. This happened in 1173; and the same year, queen Eleanor, finding that she was now grown very disagreeable to the king, communicated her discontent to her two younger children Geoffrey and Richard, whom she engaged also to demand the territories as- 122

signed them, and then fly to the court of France. The queen herself was meditating an escape to the same court, and had put on man's apparel for that purpose, when she was seized and confined by Henry's order.

Queen Eleanor confined.

The licentious barons in the mean time wished for a change of government; hoping to have liberty, under young and unexperienced princes, to commit those rapines and violences which they could not do with safety when governed by such a prudent and vigilant king as Henry. In the midst of this universal defection, however, the English monarch still retained his usual intrepidity, and prepared with as much vigour as possible for the contest. As he could depend on the fidelity of very few of his nobility, he was obliged to enlist in his service a number of desperate ruffians called *Brabençons*, and sometimes *Routiers* or *Cottereaux*, though for what reason is not mentioned in history. These banditti were very numerous during the times of the feudal government, when many private wars were carried on between the nobles; and 20,000 of these, with a few forces furnished by his faithful barons, composed the whole of Henry's army on this occasion.

With this force the king of England totally overthrew the schemes of his enemies on the continent; but being very desirous of putting an end to the war, he this very year (1173) agreed to a conference with the king of France. At this interview, Henry offered his children the most advantageous terms. He insisted only on retaining the sovereign authority in all his dominions. To Henry he offered half the revenues of the crown of England, with some places of surety in that kingdom; or if he chose rather to reside in Normandy, half the revenues of that duchy, with all those of Anjou. He made a like offer to Richard in Guienne; he promised to resign all Brittany to Geoffrey; and if these concessions were not deemed sufficient, he agreed to add to them whatever the Pope's legates, who were present, should require of him. The conference, however, was broke off by the violence of the earl of Leicester; who not only reproached Henry in the most indecent manner, but even put his hand to his sword, as if he intended to attempt some violence against him.

England.

In the mean time, the most of the English nobility united in opposition against their sovereign: and an irruption at this time by the king of Scotland assisted their rebellious schemes. The earl of Leicester soon after invaded Suffolk at the head of a body of Flemings; but they were repulsed with great slaughter, and the earl himself was taken prisoner. Soon after, William king of Scotland, who had been repulsed, and agreed to a cessation of arms, broke the truce, and invaded England with an army of 80,000 men, committing the most terrible devastations. Henry in the mean time, to reconcile himself thoroughly to the church, performed the penances at the tomb of Thomas a Becket which he had formerly promised to do. As soon as he came within sight of the church of Canterbury, he alighted from his horse, walked barefoot towards the town, and prostrated himself before the shrine of the saint. He remained a whole day in prayer and fasting, watched the holy relics all night, made a grant of 50l. a-year to the convent for a constant supply of tapers to illuminate the shrine; and not satisfied with these submissions, he assembled a chapter of monks, disrobed himself before them, put a scourge into each of their hands, and presented his bare shoulders to their strokes. Next day he received absolution; and, departing for London, had the agreeable news of the defeat and captivity of William king of Scotland, which happened on the very day of his absolution.

123 King of Scotland defeated and taken prisoner.

This victory proved decisive in Henry's favour. The English barons who had revolted, or were preparing for a revolt, instantly delivered up their castles to the victor, and the kingdom was in a few weeks restored to perfect tranquillity. Prince Henry, who was ready to embark with a great army to join the English rebels, abandoned all thoughts of the enterprise. Soon after a treaty was concluded with the king of France; in which Henry granted his children much less advantageous terms than he had offered them before. The principal were, some pensions for their support, castles for their residence, and an indemnity to all their adherents. The greatest sufferer by this war was William king of Scotland. He was compelled to sign a treaty, by which he obliged himself to do homage to Henry for the kingdom of Scotland. It was agreed, that his barons and bishops should do the same; and that the fortresses of Edinburgh, Sterling, Berwick, Roxburgh, and Jedburgh, should be delivered into the hands of the conqueror till the articles were performed. This treaty was executed most punctually and rigorously on the 10th of August 1175. The king, barons, and prelates of Scotland, did homage to Henry in the cathedral of York; the greatest humiliation to which the Scottish nation had ever been subjected.

124 Owns himself Henry's vassal.

125 New dissensions in Henry's family.

Henry was now freed from all troubles either at home or abroad, for five years; during which time he made several salutary laws for the good of his kingdom. But, in 1180, the ambitious spirits of his children involved him in fresh calamities. Richard, who had been invested by his father with the sovereignty of Guienne, refused to do homage to his elder brother, as king Henry had required him to do. Young Henry and Geoffrey, uniting their arms, invaded their brother's dominions; and while the king was endeavouring to compose their differences, he found himself conspired against by them all. The conspiracy, however, was defeated by the death of prince Henry in 1183. He had retired to Martel, a castle near Turenne, where he was seized with a fever; and perceiving the approaches of death, he was at last struck with remorse for his undutiful behaviour towards his father. He sent a messenger to the king, who was not far distant; expressed his contrition for his faults; and intreated the favour of a visit, that he might at least die with the satisfaction of having received his forgiveness. The king, who had so often experienced his son's ingratitude and violence, apprehended that his sickness was entirely a feint, and dared not trust himself in the prince's hands. But soon after, receiving certain intelligence of his death, and proofs of his sincere repentance, the good old king was affected with the deepest sorrow. He thrice fainted away; he accused his own hard-heartedness in refusing the dying request of his son; and he lamented that he had deprived the prince of the last opportunity of making atonement for his offences.

Prince Henry, who died in the 28th year of his age, left no posterity. His brother Richard succeeded to his dominions, and soon discovered as turbulent a spirit as that which had actuated his brother. He refused to give up Guienne, which Henry had designed for his fourth son John; and even made preparations for carrying on war against his father, and brother Geoffrey. Henry sent for Eleanor his queen, the heiress of Guienne; to whom Richard, either dreading an insurrection in her favour, or out of a sense of duty, willingly yielded up the territory, and retired peaceably to his father's court. This breach, however, was no sooner made up, than Geoffrey, demanded Anjou to be added to his dominions in Brittany. This the king refused; upon which he fled to the court of France, and prepared to levy an army against his father. Henry, however, was freed from the danger which threatened him from that quarter, by his son's death, who was killed in a tournament at Paris. The loss of this prince gave few, except the king himself, any uneasiness; for he was universally hated, and went among the people by the name of the *Child of Perdition*. The widow of Geoffrey, soon after his decease was delivered of a son, who received the name of *Arthur*, and was invested in the duchy of Brittany, under the guardianship of his grandfather, who as a Duke of Normandy, was also superior lord of that territory. Philip, as lord paramount, disputed for some time his title to this wardship; but was obliged to yield to the inclinations of the Bretons, who preferred the government of Henry. Some other causes inflamed the dissension between these two monarchs, and Philip once more seduced Richard from his duty. He insisted, that his marriage with Adelais, Philip's sister, should be immediately completed, and threatened to enforce his pretensions with a formidable army. This occasioned another conference between Gisors and Trie, the usual place of meeting, under a vast elm that is said to have shaded more than an acre. In the midst of this conference the archbishop of Tyre appeared before the assembly in the most miserable habit, and begged assistance against the infidels, who, under Saladin, had almost totally expelled the Christians from Asia. His intelligence

England. gence appeared so very dismal, that the kings of France and England laid aside their animosity. Both of them immediately took the cross; but Richard, who had long wished to have all the glory of such an expedition to himself, could not bear to have even his father for a partner in his victories. He therefore entered into a confederacy with the king of France; so that Henry found himself at last obliged to give up all thoughts of the crusade, in order to defend himself against this unnatural combination. The event of the war, proved very unfortunate for Henry, who lost several towns, and narrowly escaped falling into the hands of the enemy himself. At last a treaty was concluded at the intercession of the Duke of Burgundy, the count of Flanders, and the archbishop of Rheims; but upon terms very humiliating to the king of England. It was agreed, that Richard should marry the princess Adelais, and be crowned king of England during the lifetime of his father; that Henry should pay 20,000 marks to the king of France, as a compensation for the charges of the war; that his own barons should engage to make him observe this treaty, and in case of violating it, to join Philip and Richard against him; and that all his vassals who had espoused the cause of Richard should receive an indemnity for their offence. These terms, mortifying as they were, Henry bore with patience; but when, upon receiving a list of the barons that were to be pardoned, he found his own son John, who was his favourite, among them, he could no longer support his grief. He broke out into the most lamentable expressions of despair; cursed the day in which he received his miserable being; and bestowed on his ungrateful children a malediction which he could never afterwards be prevailed upon to retract. Soon after, he fell into a lingering fever occasioned by his grief; and of this he died on the 6th of July 1189, in the 58th year of his age and 35th of his reign. His natural son Geoffrey, who alone had behaved dutifully towards him, attended his corps to the nunnery of Fontevrault, where it lay in state in the abbey-church. Next day Richard, who came to visit the dead body of his father, was struck with horror at the sight. At his approach, the blood was seen to gush out at the mouth and nostrils of the corpse; and this accident was, by the superstition of the times, interpreted as the most dreadful rebuke. Richard could not endure the sight. He exclaimed that he was his father's murderer; and expressed a strong, though too late, sense of his undutiful conduct.

126 His extreme grief and death.

127 Richard I.

Richard succeeded to the throne without opposition, immediately after his father's death; and, on his accession, set his mother Eleanor (who had been again confined) at liberty. A romantic desire for strange adventures, and an immoderate zeal for the external rites of religion, were the ruling passions of the times. By the first of these Richard was inflamed to the highest degree, and therefore behaved as if the whole design of his government had been to attempt the recovery of the Holy Land from the Infidels. The superstition of the people showed itself in a most violent and tragical manner on the very day of the king's coronation. The Jews were the objects of universal hatred, so that Richard had issued out orders forbidding any of them from appearing at his coronation. But some of them bringing him large presents from their nation, presumed, notwithstanding these orders, to approach the hall in which the king dined. Being discovered, they were exposed to the insults and injuries of the bystanders; in consequence of which they fled, and were pursued by the people. A report was spread, that the king had given orders to massacre all the Jews. This supposed command was executed in the most cruel manner. Multitudes were slaughtered in the city of London, and this example was followed in most of the cities in England. Five hundred Jews had retired into York castle for safety: but finding themselves unable to defend the place, they murdered their wives and children; threw the dead bodies over the wall against their enemies who attempted to scale it; and then, setting fire to the houses, perished in the flames. The gentry in the neighbourhood, who were all indebted to the Jews, ran to the cathedral where their bonds were kept, and made a solemn bonefire of them before the altar.

128 Massacre of the Jews.

129 Richard's preparations for his journey into Palestine.

Richard immediately began to take measures for his expedition into Palestine. His father had left him 100,000 merks; and this sum he augmented by all expedients he could think of, however pernicious to the public, or dangerous to the royal authority. He set up to sale the revenues and manors of the crown, and several offices of the greatest trust and power. Liberties, charters, castles, were given to the best bidders. His friends warned him of the danger attending this venality; but he told them he would sell the city of London it self, if he could find a purchaser. Numerous exactions were also practised upon all ranks and stations; menaces, promises, and expostulations, were used to fright the timid, and allure the avaricious. A zealous preacher of those times was emboldened to remonstrate against the king's conduct; and advised him to part with his three daughters, which were pride, avarice, and sensuality. To this Richard readily replied, "You counsel right, my friend; and I have already provided husbands for them all. I will dispose of my pride to the templars; my avarice to the monks; and as for my sensuality, the clergy shall share that among them." At length the king having got together a sufficient supply for his undertaking, and even sold his superiority over Scotland for a moderate sum, set out for the Holy Land; whether he was impelled by repeated messages from the king of France, who was ready to embark in the same enterprise.

An account of Richard's exploits in this expedition is given under the articles EGYPT, SICILY, CYPRUS, &c.—Having at last concluded a truce with Saladin, he set out on his return for England. He was, however, at a loss how to proceed. He durst not return by the way he came, as this would put him in the power of the king of France, between whom and the king of England an irreconcileable enmity had taken place. No way therefore was left, but by going more to the north; for which reason he took shipping for Italy, but was wrecked near Aquileia. From thence he travelled towards Ragusa, and resolved to make his way through Germany in the habit of a pilgrim. But his expences and liberalities having betrayed him notwithstanding this disguise, he was arrested by Leopold duke of Austria, who commanded him to be loaded with shackles. This prince had served under Richard at

130 Taken prisoner on his return.

at the siege of Acres (the ancient Ptolemais), where having received some disgust, he took this base method of revenging himself. Henry VI. emperor of Germany, was then equally an enemy to Richard on account of his having married Berengaria the daughter of Tancred king of Sicily. He therefore required the royal captive to be delivered up to him, and stipulated a large sum of money to the duke as a reward for his service.

The kingdom of England in the mean time was in great confusion. Richard had left it under the directien of Hugh bishop of Durham, and Longchamp bishop of Ely. The tempers of these prelates being very different, an animosity between them soon took place. Longchamp at last arrested his colleague, and obliged him to resign his power in order to obtain his liberty. The king, by many letters, commanded Longchamp to replace his coadjutor, but to no purpose. When the situation of the king became uncertain, Longchamp tyrannized to such a degree, that John the king's brother thought proper to oppose him. He then left the kingdom; and upon this the archbishop of Rouen was made justiciary in his room. The king of France being informed of these dissensions, strove to increase them as much as possible; and had even almost prevailed upon John to throw off his allegiance, by promising to put him in possession of all Richard's continental dominions.

131 Treachery of John the king's brother.

When the English first received the news of Richard's captivity, a general indignation was excited through the whole nation. The greatest, and almost the only traitor in the kingdom, was the king's own brother John. On the very first invitation from the court of France, he went abroad; and held a consultation with Philip, the object of which was the perpetual ruin and captivity of his unhappy brother. He promised to deliver into Philip's hands a great part of Normandy; and, in return, he received the investiture of all Richard's transmarine dominions: it is even said, that he did homage to the French king for the crown of England.

In consequence of this treaty, Philip invaded Normandy, and made considerable progress in the conquest of it. He was, however, at last repulsed by the Earl of Leicester, who was now returned from the Holy Land; and a truce was concluded on condition of paying the French king 20,000 merks, and putting four castles into his hands by way of security for the payment.—John, who had come over to England, met with still less success in his enterprises. He was only able to make himself master of the castles of Windsor and Wallingford; but when he came to London, and demanded the kingdom as heir to his brother, of whose death he pretended to have received certain intelligence, he was rejected by all the barons, and measures were taken to oppose and subdue him. The defence of the kingdom was so well provided for, that John, after some fruitless efforts, was obliged to conclude a truce with his opponents; and, before the expiration of it, he thought proper to retire to France, where he openly acknowledged his alliance with Philip.

All the efforts of Richard's enemies proved ineffectual to detain him in captivity. He was brought before the diet of the empire at Worms, where the emperor Henry brought against him a charge of many crimes and misdemeanors: but to this the king replied with so much spirit and eloquence, that the German princes exclaimed loudly against the conduct of the emperor; the Pope threatened him with excommunication; and Henry, who had harkened to the proposals of the king of France and prince John, found that it would be impossible for him to execute his and their base purposes, and detain the king of England any longer in captivity. He therefore concluded a treaty with him for his ransom; and agreed to restore him to his liberty for 150,000 merks, about L. 300,000 sterling, of which 100,000 merks were to be paid immediately, and 67 hostages delivered for the remainder.

132 Richard released from captivity.

The money for the king's ransom was most cheerfully raised by the English. The churches and monasteries melted down their plate to the amount of 30,000 merks; the bishops, abbots, and monks, paid a fourth part of their yearly rent; the parochial clergy contributed a tenth part of their tythes; and the requisite sum being thus collected, queen Eleanor and Walter archbishop of Rouen set out with it for Germany, paid the money to the emperor and duke of Austria at Mentz, delivered them hostages for the remainder, and freed Richard from his captivity. His escape was very critical. Henry had been detected in the assassination of the bishop of Liege, and in an attempt of the like nature on the duke of Louvaine; and finding himself extremely obnoxious to the Germon princes on account of these odious practices, he had determined to seek support from an aliance with the French king, and to detain Richard in perpetual captivity, notwithstanding the sum he had already received for his ransom. He therefore gave orders that Richard should be pursued and arrested; but the king making all imaginable haste, had already embarked at the mouth of the Scheldt, and was out of sight of land when the emperor's messengers reached Antwerp. The king of France no sooner heard of Richard's deliverance, than he wrote to John his confederate in these terms: "Take care of yourself: the devil is broke loose."

133 Returns to England.

The king of England returned from captivity on the 20th of March 1194, and was received with the utmost joy by his subjects. He had been but one day landed, when his treacherous brother John came to make his submission. At the intercession of queen Eleanor he was received into favour. "I forgive him (said the king), and hope I shall as easily forget his offences as he will my pardon." Richard was impatient to revenge himself on the king of France, and therefore instantly made war upon him. But though both kings were inflamed with the most violent resentment against each other, they found it impossible to engage their powerful barons heartily in their cause. The war, therefore, produced no remarkable event; and, in 1195, was concluded by a truce for five years. On some slight occasion it was ready to break out anew, when the pope's legate interposed, and a treaty was about to be concluded. King Richard in the mean time was wounded by an arrow at the siege of Chalus, a castle of Limoges. The wound was not in itself dangerous; but being unskilfully treated, a mortification ensued, and the king expired on the 6th of April 1199, in the 10th year of his reign and 42d of

134 His death.

his age. By his will he left the kingdom to his brother John, but distributed a fourth part of his treasure among his servants.

135 John succeeds to the crown.

John succeeded to the crown of England without opposition, but soon found his affairs embarrassed on the continent. The king of France, who, during the life of king Richard, had always supported the pretensions of John, now gave a like support to the claims of prince Arthur the son of Geoffrey, who, though only 12 years of age, promised to be deserving of the kingdom. But in this matter the king of France showed so much regard to his own interest, that Constantia the mother of the young prince, thinking that her ally designed to keep for himself the provinces which he pretended to conquer for Arthur, submitted herself and her son to John, who detained them in Mans; and thus became undisputed master of the whole empire.

136 His bad qualities.

The new king was weak, tyrannical, cruel, and treacherous. In short, he seemed to be endowed with almost every bad quality that can fall to the share of man. His conduct, therefore, soon rendered him universally odious. Imagining himself now secure on the side of France, he indulged his passion for Isabella the daughter and heiress of the count of Angouleme, with whom he was much enamoured. His queen, the heiress of the family of Glocester, was still alive; and Isabella was married to the count de la Marche, tho', by reason of her youth, the marriage had not been consummated. John persuaded the count de Angouleme to carry off his daughter from her husband; at the same time that he procured, under some pretence or other, a divorce from the queen. Thus he incurred the displeasure of the pope, and also of the count de la Marche, and a powerful confederacy was formed against him.

As John had neither courage nor policy sufficient to keep his barons in awe, he took a method for that purpose equally base and cruel. This was by hiring a set of ruffians, whom he called his *champions*, to fight duels with them, in cases where they required to clear themselves from any charge by fighting a duel, according to the custom of those times. Thus he proposed to get rid of his refractory barons: but they, despising opponents who were so far below their rank, refused to fight with them, and a dangerous combination was formed among the barons against him.

137 Murders his nephew.

The murder of prince Arthur rendered John still more generally detested. The young prince with his mother had fled to the court of France, where they were received with the greatest kindness, and found their interests more vigorously supported than before. Their enterprises were attended with considerable success, when Arthur himself had the misfortune to be taken prisoner. All the other captives were sent to England; but the prince was shut up in the castle of Falaise, and from that time was never heard of. It was universally believed that John had murdered him with his own hand; and this inflamed the general resentment against him to such a degree, that he soon after lost all his French provinces. In 1205, the duchy of Normandy itself was also conquered by Philip, and John was forced to fly with disgrace to England.

The king was resolved to wreak his vengeance upon the barons, who, he pretended, had deserted his standard in Normandy. For this reason, he levied large sums on their estates; in order, as he said, to undertake an expedition to the continent. This expedition however, he several times capriciously deferred; and once having ventured out to sea, returned again without making the smallest attempt. At last, he landed at Rochelle, and burnt the city of Angiers; but hearing that the enemy were preparing to oppose him, he returned without attempting any thing else.

This irresolute and cowardly behaviour of John made him contemptible in the eyes of his subjects; but the Norman princes had so far extended the prerogatives of the English crown, that the barons, however discontended, durst not yet attempt to change the form of government.

138 His contest with the pope.

John, by entering into a controversy with the church, completed his ruin. The clergy, who for some time had acted as a community totally independent of the civil power, had their elections of each other generally confirmed by the pope, to whom alone they owned subjection. The election of archbishops, however, had been a subject of continual dispute between the suffragan bishops and the Augustine monks. In the mean time the archbishop of Canterbury died; and the Augustine monks, in a very private manner, elected Reginald, their superior, in his place. The bishops exclaimed against this election, as a manifest innovation of their privileges; and a furious theological contest was likely to ensue. John very imprudently took a side in this controversy, and espoused the cause of the suffragan bishops; in consequence of which, John de Grey bishop of Norwich was chosen. The cause was appealed to Rome; and Pope Innocent III. seizing with avidity an opportunity of extending his power, commanded the monks to choose cardinal Stephen Langton, an Englishman, then at the court of Rome. The being able to nominate an archbishop of Canterbury (a person of almost equal authority with the king), was an acquisition that would effectually give the court of Rome an unlimited authority over England. John therefore was resolved not to submit to this imposition; but he had not judgment sufficient to conduct him. He violently expelled the monks from their convent, and seized upon their revenues. The pope, perceiving from this absurd conduct, that John was unequal to the task he had undertaken, after some intreaties, threatened to put the whole kingdom under an interdict. The prelates threw themselves on their knees before the king, in the most earnest manner intreated him to avoid the resentment of the holy tribunal, by receiving the primate, and restoring the monks to their convent. John, however, broke out into the most violent invectives. He swore by *God's teeth* (his usual oath), that if the kingdom was put under an interdict, he would banish the whole body of the clergy, and confiscate all their possessions. The pope at last, finding he might do it with safety, issued forth this terrible sentence so much dreaded by the whole nation.

139 The kingdom laid under an interdict.

A stop was immediately put to divine service, and the administration of all the sacraments except baptism. The church-doors, were shut, and the images of the saints laid on the ground. The dead were refused Christian burial; and were thrown into ditches and on the highways, without any funeral solemnity. Marriage was celebrated in the church-yards, and the people prohibited the use of meat as in times

times of public penance. They were debarred from all pleasure; even from shaving their beards, saluting each other, or paying any regard to their apparel. The clergy deplored the unhappy state of the nation in the most lamentable manner; while John, in revenge, imprisoned all their concubines, and treated the adherents of Langton with the utmost rigour.

140
The king excommunicated, and the kingdom given to Philip of France.

The furious and imprudent efforts of John proved totally ineffectual. He had scarce a friend left in the whole nation; and therefore, in 1209, the pope denounced a sentence of excommunication against him. This was soon followed by another still more terrible; namely, the absolving all the subjects of the king of England from their allegiance, and declaring every one to be excommunicated who had any commerce with him at his table, council, or even in private conversation. The king, rendered quite furious by these repeated indignities, wreaked his vengeance on his unhappy subjects, whose affections he ought rather to have attempted to conciliate. The pope, therefore, proceeded to execute the full measure of his wrath on this devoted prince by giving away his kingdom to Philip of France. He published a crusade all over Europe against king John; exhorting the nobility, the knights, and men of every condition, to take up arms against him, and enlist under the French banner. Philip was not less active on his part. He summoned all the vassals of the crown to attend him at Rouen; and having collected a fleet of 1700 vessels, was ready in 1213, to invade England.

The pope had now overstretched his power; and had the English nation been governed by a prince of any degree of prudence or resolution, the power of the clergy would in all probability have been totally broken. The people, however superstitious and ready to obey in matters of religion, could not tamely submit to be given away by the pope as slaves from one master to another; and therefore this consideration, added to the natural antipathy subsisting between the French and English, put John, notwithstanding all his offences, at the head of an army of 60,000 men. But the pope was too great a politician to suffer matters to be carried to extremities. He promised himself many more advantages from the submission of John than from an alliance with Philip; and therefore came over in person, or, according to some, sent over his legate to England, under pretence of conferring with the barons, but in reality to hold a conference with John. He there represented to this forlorn prince, the numbers of the enemy; the hatred of his own subjects, and the secret confederacy there was against him in England. He intimated, that there was but one way to secure him from the impending danger; namely, to put himself under the protection of the pope, who was a merciful father, and still willing to receive a repenting sinner. The abject and irresolute spirit of John submitted to this last piece of arrogance, and he took an oath to obey whatever the pope should command. In consequence of this oath, he took another, the most extraordinary mentioned in the records of history; and which, as it was taken while he commanded an army of 60,000 men, discovers a meanness of spirit almost incredible. The terms imposed by it were expressed in the following words. "I John, by the grace of God king of England and lord of Ireland, in order to expiate my sins, from my own free will, and the advice of my barons, *give* to the church of Rome, to pope Innocent and his successors, the kingdom of England, and all other prerogatives of my crown. I will hereafter hold them as the pope's vassal. I will be faithful to God, to the church of Rome, to the pope *my master*, and his successors legitimately elected. I promise to pay him a tribute of 1000 merks; to wit, 700 for the kingdom of England, and 300 for the kingdom of Ireland."

141
John's submission to the pope.

This oath was taken by the king before all the people kneeling, and with his hands held up between those of the legate. Having then agreed to reinstate Langton in the primacy, he received the crown which he had been supposed to have forfeited; while the legate, to add to his former insolence, trampled under his feet the tribute which John had consented to pay.—The king of France was enraged at this behaviour of the pope; and resolved to execute his project of conquering England, in spite of him and all his censures. His fleet, however, was attacked in their harbours by the English, who took 300 vessels, and destroyed about 100 more; while Philip, finding it impossible to prevent the rest from falling into the hands of the enemy, set fire to them himself, and thus was obliged to give up all hopes of success.

142
The barons attempt to reduce the prerogatives of the crown.

John being thus freed from all danger, continued to follow the same cruel and tyrannical measures which had hitherto rendered him odious to his subjects. His scandalous subjection to the clergy, now gave the barons an opportunity of exerting themselves, in order to reduce the enormous prerogatives of the crown. Their designs were greatly facilitated by the concurrence of Langton the primate, who on all occasions showed a sincere regard for the interests of the kingdom. At a synod of his prelates and clergy, convened in St Paul's, on pretence of examining into the losses of some bishops who had been exiled by John, he privately conferred with a number of barons, to whom he expatiated upon the vices and injustice of their sovereign. He showed them a copy of Henry the First's charter; (being the only one in the kingdom, and which had been buried in the rubbish of an obscure monastery). Langton exhorted the barons to insist on a renewal of it; and this they solemnly swore to perform. The same agreement was afterwards renewed at a more numerous meeting of barons summoned by Langton at St Edmondsbury. Here it was resolved, that at Christmas they would prefer their common petition in a body; and in the mean time they separated with a design to put themselves in a posture of defence, enlist men, and fortify their castles. In the beginning of January 1215, they repaired to London, accoutred in their military garb and equipage, and presented their petition to the king, alleging that he had promised to grant a confirmation of the laws of Edward the Confessor, at the time he was absolved from his excommunication. John resented their presumption; and required a promise under their hands and seals, that they would never demand, or attempt to extort, such privileges for the future. This they refused with such unanimity and resolution, that the king desired time to consider of their demands. He promised, that, at the festival of Easter, he would give a positive answer to their petition; and offered them the archbishop of Canterbury, the bishop of Ely, England. Ely, and the earl marefchal, as fureties for fulfilling his engagements.

The barons accepted of his fecurities, and departed peaceably; but John had no defign of complying with their defires. He had recourfe to the clergy, whofe power he had feen and felt in fo many inftances. He courted their favour, by granting them a charter eftablifhing all thofe rights of which they were already in the poffeffion, and which he now pretended to confirm when he had not the liberty to refufe. To ingratiate himfelf ftill farther with this body, he took the crofs, and appealed to the pope againft the ufurpation of the barons. The pope wrote letters to England, reproaching the primate and bifhops with favouring thefe diffenfions; and commanded them to promote peace between the two parties. He exhorted the barons to conciliate the king, not with menaces, but with humble intreaties: and promifed, upon their obedience, to interpofe his own authority in favour of fuch of their petitions as he fhould find to be juft. At the fame time he annulled their affociation, and forbad them to enter into any confederacy for the future.

The barons paid no regard to the pope's remonftrances; knowing that the fulminations of the court of Rome would be of little avail, unlefs they were feconded by the clergy of England. After waiting till Eafter, when the king promifed to return them an an anfwer, they met by agreement at Stamford. There they affembled a force of above 2000 knights, and a prodigious number of foot. Thence they marched to Brackley, about 15 miles from Oxford, the place where the court then refided. John, hearing of their approach, fent the archbifhop of Canterbury, the earl of Pembroke, and others of his council, to know the particulars of their requeft, and what thofe liberties were which they fo much importuned him to grant. The barons delivered a fchedule containing the chief articles of their demands, founded on the charters of Henry and Edward; but which were in the higheft degree difpleafing to the king. He burft into a furious paffion, afked the barons why they did not alfo demand his kingdom, and fwore that he would never comply with fuch exorbitant demands. The confederates then chofe Robert Fitzwalter for their general; whom they dignified with the title of "Marefchal of the army of God and of the holy church." They laid fiege to Northampton, took Bedford, and were joyfully received into London. They wrote letters to all the nobility and gentry who had not yet declared in their favour, threatening their eftates with devaftation in cafe of refufal or delay.

In the mean time the king was left at a place called *Odiham* in Surrey, attended only by feven knights. He vainly endeavoured to avert the ftorm by the mediation of his bifhops and minifters. He appealed to Langton againft the barons, not fufpecting that he was engaged in the confederacy; and defired him to fulminate the church-cenfures againft thofe who had made war upon their lawful prince. Langton declared that he would pafs no cenfure where he found no delinquent; but faid, that much might be done if the king would difmifs fome foreign auxiliaries which he had lately brought over. Upon this John difbanded a great body of Germans and Flemings whom he had hitherto retained in his fervice, and Langton refufed to excommunicate a fingle baron. The king, being now quite defencelefs, was obliged at laft to comply with the demands of his fubjects. A conference was accordingly appointed, and all things were adjufted for this moft important treaty.

143 They force him to fign Magna Charta.

The king's commiffioners met the barons at a place called *Runimede*, between Staines and Windfor; and which is yet held in reverence as the fpot where the ftandard of freedom was firft erected in England. Here the king figned the charter called *Magna Charta*; which continues in force to this day, and is ftill regarded as the great bulwark of Britifh liberty. See *Magna Charta*.

144 Principal articles of it.

This charter, however, at the time that it was made, fecured liberty to the clergy, barons, and gentlemen, much more than to the bulk of the people, who did not for a long time obtain any privileges of importance. Freedom of elections was fecured to the clergy; and it was determined, that fines on them for any offence fhould be laid on in proportion to their eftates, and not the value of their benefices. The privileges fecured to the barons were, either abatements in the rigour of the feudal laws, or relief from arbitrary and ambiguous decifions before the courts. It was alfo decreed, that barons fhould recover the lands of their vaffals, even though forfeited by felony, after having been in the poffeffion of the crown for a year and a day; and no tax was to be impofed without confent of the great council of the nation, excepting in cafe of the captivity of the king, the knighting of his eldeft fon, or marrying his eldeft daughter. No land belonging to any baron was to be feized for a crown debt, unlefs the poffeffor had not perfonal property enough to pay it; neither was any vaffal to be allowed to fell fo much of his land as to incapacitate him from performing the neceffary fervice to his lord. It was alfo determined, that when the great council of the nation was called, the prelates, earls, and barons, fhould be fummoned by a particular writ, and the leffer barons fhould receive a fummons from the fheriff. In favour of the people it was ftipulated, that they fhould have from the barons all the immunities and privileges granted by the king to the former. Merchants were to be allowed to carry on their bufinefs without any arbitrary tolls or impofitions, and to go out of the kingdom and return at pleafure. The goods of every freeman were to be difpofed of according to his will; or if he died inteftate, the neareft heir fhould fucceed him. No carts, horfes or wood, were to be taken by the crown officers without the confent of the owner. The king's courts were to be ftationary, and no delay to be made in doing juftice to every one; no freeman fhould be taken or imprifoned, difpoffeffed of his free tenement, outlawed, or banifhed, unlefs by the legal judgment of his peers, &c. It was likewife ftipulated, that London fhould remain in the hands of the barons, and the tower be configned to the primate, till the 15th of Auguft following; or till the articles of the charter fhould be fulfilled. To give the more fecurity for this, the king allowed them to choofe 25 of their own number, to whofe authority no limits were fet either in extent or duration. If any complaint were made of a violation of the charter, either by the king or his officers, any four of the barons might admonifh the king to redrefs the grievance; and if fatisfaction were not obtained

 obtained, they might assemble the whole council of 25; and they, in conjunction with the great council, were empowered to compel him to fulfil the charter. In case of his resistance they had liberty to levy war against him, attack his castles, and use every kind of violence, except against his person, or those of the queen or children. All men throughout the kingdom were bound under the penalty of confiscation, to swear obedience to the 25 barons; and the freeholders of each county were to choose 12 knights, whose business it was to report such evil customs as ought to be redressed in terms of Magna Charta.

But although John had thus obliged himself, by writing, to allow liberty to his subjects, he had no mind that they should enjoy it in reality. The sense of his subjection to his own vassals sunk deep in his mind. He became sullen, silent, and reserved. He shunned the society of his former friends; and retired into the Isle of Wight, as if to hide his disgrace in solitude; but, in reality, to meditate revenge against the barons. He sent to the continent to enlist a large body of mercenary troops, and made complaints to the pope of the insurrections of the barons against him. The pontiff very warmly espoused his cause; and a bull was sent over annulling the whole charter; and at the same time the foreign troops arriving, the king once more found himself in a condition to demand his own terms from his subjects.

145 The king raises an army against his barons.

The barons had made no preparations for war, not suspecting the introduction of a foreign army. The king, therefore, was for some time undisputed master of the field, and the most horrid cruelties were committed by his army. The nobility who had been most active in procuring the great charter fled with their families to Scotland, where they obtained the protection of king Alexander by doing homage to him. The barons being totally unable to raise an army capable of contending with that of John, applied to their old enemy Philip of France, offering to acknowledge his eldest son Louis for their sovereign, on condition of his protecting them from the fury of John and his mercenaries. The French king accepted their proposal with joy; and twenty-five hostages which he demanded being sent over, began to make the most diligent preparations for this expedition, regardless of the menaces of the pope, who threatened him with excommunication, and actually excommunicated his son Louis some time after.

146 They offer the kingdom to Louis the French king's son.

The first troops who came to the assistance of the barons, were only a body of 7000 men; but, soon after, Louis with a powerful army landed at Sandwich. The first effect of this invasion was, that most of John's foreign troops deserted, refusing to serve against the heir of their monarchy. Many considerable noblemen also deserted his cause, and Louis daily gained ground. This prince advanced to London, where the barons and burghers did him homage, and took the oath of allegiance, after he had sworn to confirm the liberties and privileges of the people. His imprudence, however, in preferring on all occasions his French subjects to the English, soon excited a jealousy against him, which proved very prejudicial to his cause. This jealousy was greatly increased by the death-bed confession of the count de Melun, one of his courtiers, who declared to these about him, that it was Louis's design to exterminate the English barons as traitors, and to bestow their dignities and estates upon his French subjects, on whose fidelity he could more safely rely. This caused a considerable desertion among Louis's party: so that John once more found himself in a condition to make an effort for his crown. He resolved to penetrate into the heart of the kingdom; and, for this purpose, he departed from Lynn, and took the road towards Lincolnshire at the head of a great body of troops. His road lay along the shore, which was overflowed at high water; but the king, not being apprised of this, or being ignorant of the tides of the place, lost all his carriages, treasure, and baggage by their influx. He himself escaped with the utmost difficulty, and arrived at the abbey of Swinstead; where his grief for the loss he had sustained, and the distracted state of his affairs, threw him into a fever, which soon appeared to be attended with fatal symptoms. He died at Newark in the year 1216, the 51st of his age, and 18th of his reign. He left two legitimate sons: Henry, who succeeded him on the throne, and was about nine years of age; and Richard, who was about seven. He left also three daughters; Jane, married to Alexander king of Scotland; Eleanor, married to the Earl of Pembroke; and Isabella, married to the Emperor Frederic II.

147 Death of king John.

When John died, the Earl of Pembroke was mareschal of England. By this office he was at the head of the army, and of consequence, in times of such turbulence, at the head of the state. He was a nobleman of great honour and fidelity, and had continued faithful to John in his greatest reverses of fortune. He now determined to support the authority of the infant prince Henry; and therefore carried him immediately to Gloucester, where the ceremony of coronation was performed, in presence of Gualo the legate and a very few noblemen, by the bishops of Winchester and Bath. The young prince was obliged to swear fealty to the pope, and renew the homage which his father had done for the kingdom; after which the Earl of Pembroke was chosen protector.

148 Henry III.

Till the king arrived at the years of maturity, the transactions of his reign can only be considered as the consequences of the disposition of his tutors. Pembroke caused him grant a new charter of liberties, consisting of the concessions extorted from John, with some alterations; and the next year it was renewed, with the addition of some other articles. Thus these famous charters were brought very nearly to the shape in which they have ever since stood; and they were, during many generations, esteemed the most sacred rampart to national liberty and independence. As they secured the rights of all orders of men, they were anxiously defended by all, and became in a manner the basis of the English monarchy, and a kind of original contract, which both limited the authority of the king, and ensured the conditional allegiance of his subjects. Though often violated, they were still claimed and recalled by the nobility and people; and as no precedents were supposed valid that infringed them, they rather acquired, than lost, authority, from the frequent attempts made against them, in several ages, by regal and arbitrary power.

149 He grants new charters.

These charters were made use of by Pembroke as arguments to draw off the malecontent barons from their allegiance to Louis. He represented to them, that whatever

whatever jealousy they might have entertained against the late king, a young prince, the lineal heir of their ancient monarchs, had now succeeded to the throne, without succeeding either to the resentments or principles of his predecessor: That the desperate expedient, which they had employed, of calling in a foreign potentate, had, happily for them, as well as for the nation, failed of entire success; and it was still in their power, by a quick return to their duty, to restore the independence of the kingdom, and to secure that liberty for which they so zealously contended: That, as all past offences of the barons were now buried in oblivion, they ought, on their part, to forget their complaints against their late sovereign; who, if he had been any wise blameable in his conduct, had left to his son the salutary warning to avoid his paths, which had led to such fatal extremities: And that, having now obtained a charter for their liberties, it was their interest to show, by their conduct, that the acquisition was not incompatible with their allegiance; and that the rights of the king and people, so far from being hostile and opposite, might mutually support and sustain each other.

150 Decline of prince Louis's party.

These considerations, enforced by Pembroke's known character of constancy and fidelity, had a very great influence on the barons. Most of them began to negociate with him, and many actually returned to their duty. At the same time Louis continued to disgust those of his own party by the preference which he visibly gave to the French. Though he went over to France, therefore, and brought fresh succours from thence, he found that his party was greatly weaker than before, by the desertion of his English confederates; and that the death of king John had, contrary to his expectations, occasioned the total ruin of his affairs. In a short time Pembroke was so much strengthened by deserters from Louis's party, that he ventured to invest Mount-Sorel; though upon the approach of the count de Perche with the French army, he desisted from that enterprise. The French general immediately marched to Lincoln; and, being admitted into the town, laid siege to the castle, and soon reduced it to extremity. Pembroke summoned his forces from every quarter, in order to relieve this important place; and he appeared so much superior to the French, that they shut themselves up within the city, resolving to take shelter there. But the garrison of the castle, having received a strong reinforcement, made a vigorous sally upon the besiegers, while the English army assaulted them from without. The French army was totally routed; the count de Perche with only two persons more were killed; but many of the chief commanders, and about 400 knights, were made prisoners. On the news of this fatal event, Louis raised the siege of Dover, and retired to London; where he received intelligence of a new disaster, which put an end to all his hopes. A French fleet, which carried a strong reinforcement, had appeared on the coast of Kent; where they were attacked and repulsed with considerable loss, by Philip D'Albiney. He is said to have gained the victory by the following stratagem. Having got the wind of the French, he came down upon them with violence; and throwing on their faces a great quantity of quicklime, which the purposely carried on board, they were so blinded that they were disabled from defending themselves. This misfortune so discouraged the barons who yet adhered to Louis, that they came from every quarter to make their submission to Pembroke; and Louis himself, finding his affairs totally desperate, was glad to make his escape from a country where every thing was become hostile to him. He therefore concluded a peace with the Protector: promised to evacuate the kingdom; and only stipulated in return, an indemnity to his adherents, and a restitution of their honours and fortunes, together with the free and equal enjoyment of those liberties which had been granted to the rest of the nation.

151 He leaves the kingdom.

When the king grew up, he was found to be very unfit for the government of such a turbulent people as the English at that time were. Though his temper was mild and humane, he was also very weak fickle, and irresolute. He disgusted the people by the caresses he bestowed on foreigners; and this disgust rose once to such a height, that the barons refused to assemble in the general council of the nation, or parliament, at his desire. When commanded to do so, they sent a message to Henry, desiring him to dismiss his foreigners; otherwise they would drive both him and them out of the kingdom, and put the crown on the head of one who was more worthy to wear it. The facility of Henry's temper also induced him to heap riches upon his foreign favourites in a manner which he could by no means afford: this often brought him into very great straits; and to relieve himself, he was obliged to have recourse to many arbitrary measures, which he could not otherwise have chosen. Nothing, however, of very great moment happened till the year 1255, when the Pope found means to embark Henry in a scheme for the conquest of Naples, or Sicily on this side the Fare, as it was called: an enterprise which not only brought much dishonour on the king, but involved him for some years in very great expence and trouble. The court of Rome some time before had reduced the kingdom of Sicily to the same state of feudal vassalage which she pretended to exercise over England; but Mainfroy, an usurper, under pretence of governing the kingdom for the lawful heir, had seized the crown, and was resolved to reject the Pope's authority. As the Pope found that his own force alone was not sufficient to gain his point, he had recourse to Richard the king of England's brother, who had been created Earl of Cornwall, and had such talents for amassing money, that he was reckoned the richest prince in Christendom. To him the Pope offered the kingdom of Sicily, upon the single condition of his conquering it from the usurper. Richard was too wise to accept this offer; upon which the Pope applied to Henry, and offered him the crown of Sicily for his second son Edmund. Henry, dazzled by this proposal, without reflecting on the consequences, or without consulting his brother or the parliament, gave the Pope unlimited credit to expend whatever sums he thought necessary for completing the conquest of Sicily. In consequence of this unlimited grant, his holiness determined to exert his apostolical authority to the utmost, in extorting money from the English. A crusade was published, requiring every one who had taken the cross against the infidels, or even vowed to advance money for that purpose, to support the war against Mainfroy, whom he accused as being a more terrible enemy

152 The pope undertakes the conquest of Sicily for Henry's son.

153 Intolerable extortions by his holiness.

enemy to the Christian faith than any Saracen. A tenth on all the ecclesiastical benefices in England was levied for three years; and orders were given to excommunicate the bishops who did not make punctual payment. A grant was made to the king of the goods of intestate clergymen, as well as of the revenues of vacant benefices and those of non-residents. These taxations, however grievous, were submitted to with little murmuring; but another suggested by the bishop of Hereford excited the most violent clamours. This prelate, who at that time resided at the court of Rome, drew bills on all the abbots and bishops of the kingdom, to the amount of no less than 150,540 marks, which he granted to Italian merchants in consideration of the money they had advanced or pretended to advance for the support of the Sicilian war. As it was apprehended that the English clergy would not easily submit to such an extraordinary demand, a commission was given to Rustand, the Pope's legate, to use his authority. An assembly of the prelates and abbots was accordingly summoned; who, on hearing the proposal sanctified with the names both of the Pope and King, were struck with the utmost surprise and indignation. A violent altercation took place; during which the legate told them, that all ecclesiastical benefices were the property of the Pope, and that he might dispose of them as he pleased. The affair ended, however, in the submission of the clergy: but the barons still continued refractory, and for some time answered the king's demands of supplies with expostulations; urging the king's partiality to foreigners, and the various injuries the nation had sustained from the servants of the crown. The great council of the nation, which had lately obtained the name of *parliament*, was therefore dissolved, and another called, but with as little success as before. The king, however, had involved himself in so much debt, that a large supply was become absolutely necessary; and as that could by no means be obtained from parliament, he was now reduced to the humiliating expedient of going about among such of his subjects as he thought most attached to him, and begging assistance from them at their own houses. At length his barons, perceiving the exigencies to which he was reduced, seemed willing to afford him aid; and, upon his promising to grant them a plenary redress of grievances, a very liberal supply was obtained, for which he renewed their charter with more than usual solemnity. All the prelates and abbots were assembled with burning tapers in their hands; the magna charta was read in their presence; and they denounced sentence of excommunication upon all who should infringe upon its decisions. They then put out their tapers on the ground, and exclaimed, "May every soul that proves false to this agreement so stink and corrupt in hell." The king subjoined, "So help me God, I will inviolably keep all these things, as I am a man, as I am a Christian, as I am a knight, and as I am a king crowned and anointed."

[153] Henry solemnly renews Magna Charta.

154 He breaks his engagements, which occasions a revolution.

No sooner had the king received the supplies of which he stood so much in need, than he forgot all his engagements, put his confidence entirely in foreign counsellors, and evaded or broke through in numberless instances the charters he had given. This conduct rendered him so obnoxious to the barons, that Simon Mountfort Earl of Leicester, a man of a very violent and ambitious temper, determined to attempt an innovation in the government. He formed a powerful confederacy against the king, and the designs of the conspirators were effectually put in execution in the year 1258. Henry had summoned a parliament in expectation of receiving supplies for his Sicilian project; when the barons appeared in the hall, clad in complete armour, with their swords by their sides. The king, struck with this unusual appearance, asked them what was their purpose, and whether they pretended to make him their prisoner? Roger Bigod, Earl Mareschal, answered in name of the rest, that he was not their prisoner; that they even intended to grant him large supplies, in order to fix his son on the throne of Sicily; that they only expected some return for this expence and service; and that as the king had frequently made submissions to the parliament, had acknowledged his past errors, and had still allowed himself to be carried into the same path, which gave them such reason of complaint, he must now yield to more strict regulations, and confer authority on those who were able and willing to redress the public grievances. Henry instantly assured them of his intentions to grant them all possible satisfaction; and for that purpose summoned another parliament at Oxford, to digest the new plan of government, and to elect proper persons who were to be entrusted with the chief authority. This assembled, afterwards called the *mad parliament*, went very expeditiously to work on the business of reformation. Twenty-four barons were appointed, with supreme authority, to reform the abuses of the state; and Leicester was placed at their head. Their first step was to order four knights to be chosen out of each county, who should examine into the state of their respective constituents, and should attend at the ensuing parliament to give information of their complaints. They ordained that three sessions of parliament should be regularly held every year: that a new high sheriff should be elected annually; that no wards nor castles should be entrusted to foreigners, no new forests made, nor the revenues of any counties let to farm.

155 Bad conduct of the new rulers.

These constitutions were so just, that some of them remain to this day. But the parliament having once obtained the sovereign power, took care not to part with it again. They not only protracted the time of their sitting under various pretences; but at last had the effrontery to impose an oath upon every individual of the nation, declaring an implicit obedience to all the statutes executed or to be yet executed by the barons who were thus appointed as rulers. They not only abridged the authority of the king, but the efficacy of parliament also; giving up to 12 persons the whole parliamentary power between each session.—— Their usurpations were first opposed by the knights of the shire, whom they themselves had appointed. These had for some time begun to be regularly assembled in a separate house, to consider of the national grievances; the first of which was the conduct of the 24 rulers. They represented, that though the king had performed all that was required of him, the barons had hitherto done nothing on their part that showed an equal regard for the people; that their own interest and power seemed the only aim of all their decrees; and they even called upon the king's elded son prince Edward

England. Edward to interpose his authority, and save the sinking nation.

156 Opposed by prince Edward.

The prince was at that time about 22 years of age, and by his active and resolute conduct had inspired the nation with great hopes. He told those who made the application to him, that he had sworn to the late constitutions; and, on that account, though they were contrary to his own private opinions, he was resolved not to infringe them. At the same time, however, he sent a message to the barons, requiring them to bring their undertaking to an end, or otherwise to expect the most vigorous resistance to their usurpations. On this the barons were obliged to publish a new code of laws, which, though it contained scarce any thing material, yet, it was supposed, would for a while dazzle the eyes of the people, until they could take measures to establish their authority upon surer foundations. In this manner, under various pretences, they continued their power for three years; while the whole nation loudly condemned their treachery, and the Pope himself at last absolved the king and his subjects from the oath they had taken to obey their injunctions. Soon after this, a parliament was called, and the king reinstated in his former authority. The barons were obliged to submit for a time; but the Earl of Leicester having joined the Welsh, who at this time made an irruption into England, the kingdom was reduced to the most deplorable situation. The pusillanimity of the king prevented any proper or judicious method from being pursued for extricating the people from their distresses; and at last a treaty was concluded with the barons on the most disadvantageous terms that can be imagined. They were restored to the sovereignty of the kingdom, took possession of all the royal castles and fortresses, and even named the officers of the king's household. They summoned a parliament to meet at Oxford, in order more fully to settle the plan of government; and by this assembly it was enacted, that the authority of the 24 barons should continue not only during the life of king Henry, but also during that of prince Edward.

157 Who is defeated and taken prisoner, with the king and his brother.

These scandalous conditions would have been easily complied with by king Henry; but they were utterly rejected by prince Edward, and a civil war immediately ensued. The prince was at first successful; but, through his impetuosity, occasioned the loss of a great battle, in which his father and uncle were taken prisoners, and he himself was obliged soon after to surrender to the Earl of Leceister. The king was now reduced to the most deplorable situation. His partisans were totally disarmed, while those of the Earl of Leicester still kept themselves in an offensive posture. Leicester seized the estates of no fewer than 18 barons; engrossed to himself the ransom of all the prisoners; monopolized the sale of wool to foreign markets; and at last ordained that all power should be exercised by nine persons, who were to be chosen by three others, or the majority of them; and these three were the earl of Leicester himself, the earl of Glocester, and the bishop of Chichester.

158 First House of Commons.

The miserable situation to which the kingdom was now reduced, proved at last the means of settling the government on a more proper foundation. Leicester, in order to secure himself, was obliged to have recourse to an aid, till now, entirely unknown in England, namely, that of the body of the people. He called a parliament, where, besides the barons of his own party, and several ecclesiastics who were not proper tenants of the crown, he ordered returns to be made of two knights from every shire; and also deputies from the boroughs, which had been hitherto considered as too inconsiderable to be allowed any share in the legislation. This parliament was called on the 20th of January 1265: and here we find the first outline of an English House of Commons; an institution which has ever since been considered as the bulwark of British liberty.

The new parliament was far from being so compliant to Leicester as he had desired or expected. Many of the barons who had hitherto stedfastly adhered to his party, were disgusted with his boundless ambition; and the people, who found that a change of masters was not a change from misery to happiness, began to wish for the re-establishment of royal authority. Leicester at last, to make a merit of what he could not prevent, released prince Edward from his confinement, and had him introduced at Westminster-hall, where his freedom was confirmed by the unanimous voice of the barons. But though Leicester had all the popularity of restoring the prince, he was yet politic enough to keep him guarded by his emissaries, who watched all his actions. At last, however, he found means to make his escape in the following manner. The Duke of Glocester, being disgusted with Leicester, retired from court, and went to his estates on the borders of Wales. His antagonist pursued him thither; and to give the greater authority to his arms, carried the king and prince of Wales along with him. This furnished young Edward with the opportunity he had so long desired. Being furnished by the Earl of Glocester with an horse of extraordinary swiftness, he took leave of his attendants, who were in fact his guards, but were not able to come up with him. They pursued him, however, for some time; but the appearance of a body of troops belonging to Glocestor soon put an end to their pursuit.

159 Prince Edward recovers his liberty.

The prince no sooner recovered his liberty, than the royalists joined him from all quarters, and an army was soon procured which Leicester could not withstand. This nobleman now found himself in a remote quarter of the kingdom; surrounded by his enemies; and debarred from all communication with his friends by the river Severn, whose bridges Edward had broken down. In this extremity, he wrote to his son to hasten to his assistance from London, with a considerable army which he had under his command. With this view his son advanced to Kenilworth; but here he was surprised, and his army entirely dispersed by prince Edward. The young prince, immediately after this victory, advanced against Leicester himself; who, ignorant of the fate of his son's army, had passed the Severn in boats. He was by no means able to cope with the royalists; his men being inferior both in numbers and resolution to their antagonists. His army was defeated with great slaughter. Leicester himself was slain, though he called out for quarter, together with his eldest son Henry, and about 160 knights and other gentlemen. The old king had been purposely placed by the rebels in the front of the battle, where he was wounded, and in great danger of being killed; but, crying out, "I am Henry of Winchester your king," he was saved and put in a place of security by his son, who

160 Earl of Leicester defeated and killed.

England. who had flown to his assistance. The body of Leicester being found among the dead, was barborously mangled by one Roger Mortimer; and then sent to his widow, as a testimony of the royal party's barbarity and success.

This victory, gained at Evesham, proved decisive in favour of the royal party. Almost all the castles, garrisoned by the barons, hastened to make their submissions, and opened their gates to the king. The Isle of Axholme alone, and that of Ely, trusting to the strength of their situation, ventured to make resistance; but were at last reduced, as well as the castle of Dover, by the valour and activity of prince Edward. Adam de Gourdon, a courageous baron, maintained himself some time in the forests of Hampshire, committing depredations in the neighbourhood; and obliged the prince to lead a body of troops into that country aganst him. Edward attacked the camp of the rebels; and being transported by the ardour of action, leaped over the trench with a few followers, and encountered Gourdon himself in a single combat. The victory was long disputed between these two valiant combatants; but ended at last in the prince's favour, who wounded his antagonist, threw him from his horse, and took him prisoner. He not only granted him his life; but introduced him that very night to the queen at Guildford, procured his pardon, and was ever after faithfully served by him.

In 1271, prince Edward, having settled the affairs of the kingdom, undertook an expedition to the Holy Land, where he signalized himself by many acts of valour. The king's health declined visibly after the de-
161 Death of Henry III. parture of his son; and at last worn out with cares and the infirmities of age, he expired at St Edmonsbury on the 16th of November 1272, in the 64th year of his age and the 56th of his reign.

Prince Edward had reached Sicily in his return from the Holy Land, when he received an account of his father's death; at which he expressed much concern. As he knew that England was at that time in a state of perfect tranquillity, he was in no haste to return,
162 Edward I. but spent near a year in France before he made his appearance in England. He was received by his subjects with the utmost joy, and crowned at Westminster by Robert archbishop of Canterbury on the 19th of August 1274. He immediately applied himself to the correcting of those disorders which the civil commotions, and weak administration of his father, had introduced. A system of strict justice, bordering on severity, was introduced and kept up through the whole of this reign. The Jews were the only part of his subjects whom Edward oppressed. Many arbitrary taxes were levied upon them; 280 of them were hanged at once for adulterating the coin; the goods of the rest were confiscated, and all of them banished the
163 kingdom.

Conquers Wales. In 1276, the king undertook an expedition against Lewellyn prince of Wales, who had refused to do homage for his crown. The conquest of that country was not fully accomplished till the year 1284; after which the principality of Wales was annexed to the crown of England, and thenceforth gave a title to the king's eldest son*.—In 1286, the settlement of Wales appeared so complete, that the king went abroad in order to make peace between Alfonso king of Arragon and Philip le Bel king of France, who had a difference about the kingdom of Sicily. He succeeded in his negociations; but, staying abroad three years, he found that many disorders had been introduced in his absence. Many instances of robbery and violence had broke out in all parts of England; but the corruption of the judges, by which the fountains of justice were poisoned, was of still more dangerous consequence. Edward, in order to remedy this prevailing abuse, summoned a parliament, and brought the judges to a trial; where all of them except two, who were clergymen, were convicted of this flagrant iniquity, were fined, and deposed from their office. The amount of the fines levied upon them is of itself a sufficient proof of their guilt, being above 100,000 marks; an immense sum in those days, sufficient to defray the expences of a war betwixt two great nations. The king afterwards made all the new judges swear they would take no bribes; but the deposing and fining the old ones was the more effectual remedy. 164

* See *Wales*.

Attempts the conquest of Scotland. In 1291, king Edward began to meditate the conquest of Scotland, which employed him during the rest of his life; but which, though the kingdom was by him reduced to the greatest distress, he was never able to accomplish*. At the same time, he was engaged in expensive contests with France; and these multiplied wars and preparations for war, by obliging him to have frequent recourse to parliamentary supplies, became the remote causes of great and important changes in the government. The parliament was 165
New models the parliament. modelled into the form which has continued ever since. As a great part of the property of the kingdom, by the introduction of commerce and improvements in agriculture, was transferred from the barons to the lower class of people, so their consent was thought necessary for raising the supplies. For this reason, the king issued writs to the sheriffs, enjoining them to send to parliament, along with two knights of the shire, two deputies from each borough within their county; and these provided with sufficient powers from their constituents to grant such demands as they should think reasonable for the safety of the state. The charges of these deputies were to be borne by the boroughs which sent them; and so far were they from considering this deputation as an honour, that nothing could be more displeasing to any borough than to be thus obliged to send a deputy, or to any individual than to be thus chosen. The authority of these commoners, however, increased through time. Their union gave them weight; and it became customary among them in return for the supplies which they granted, to prefer petitions to the crown for the redress of these grievances under which the nation was supposed to labour. The more the king's necessities increased, the more he found it necessary to give them an early redress; till, from requesting, the commons proceeded to requiring; and having all the property of the nation, they by degrees began also to be possessed of the power. 166

* See *Scotland*.

Dies, and is succeeded by Edw. II. Edward I. died of a dysentery at Carlisle on the 7th of July 1307, as he was leading a great army into Scotland, against the inhabitants of which he had vowed the most dreadful vengeance. He was succeeded by his son Edward II. whom he had charged with his dying breadth to prosecute the war against Scotland, and never to desist till he had finally subdued the king-

England. kingdom. But the new king was of a very different disposition from his father. The Scots gradually recovered their power; and in 1314 gave the English such a terrible defeat at Bannockburn, that for many years no superiority of numbers could encourage them to look the Scots in the face. See SCOTLAND.

167 Discontents of his subjects.

The reign of Edward II. affords no particulars of great moment. Being a prince of a weak understanding, though endued with no remarkable bad qualities, his reign was one continued series of quarrels with his turbulent subjects. His favourites were the most general causes of discontent. The first of these was one Piers Gaveston, the son of a Gascon knight of some distinction, who had honourably served the late king, and who, in reward for his services, had obtained an establishment for his son in the family of the prince of Wales.—To be the favourite of any king whatever, is no doubt in itself a sufficient offence to the rest of the courtiers. Numberless faults were therefore found with Gaveston by the English barons. When the king went over to France to espouse the princess Isabella, to whom he had been long contracted, Gaveston was left guardian of the realm, with more ample powers than had usually been conferred in such a case. But when the queen, who was of an imperious and intriguing spirit, arrived, Gaveston had the misfortune to fall under her displeasure also, on account of the ascendency he had acquired over the king. A conspiracy was therefore soon formed against the favourite; at the head of which were, the queen, and the Earl of Lancaster cousin-german to the king, and the most opulent and powerful nobleman in England. The king, unable to resist such a combination, was at last obliged to banish Gaveston; but recalled him some time after. This was sufficient to spread an alarm over the whole kingdom: a civil war ensued; and the nobility having got Gaveston into their hands, soon freed themselves of any farther apprehensions from him, by putting him to death.

After the unfortunate defeat at Bannockburn, king Edward chose a new favourite named *Hugh Le Despenser*. He was a young man of noble English family; some merit, and very engaging accomplishments. His father was a person of a much more respectable character than the son; but the being admitted to a share of king Edward's favour was a sufficient crime. The king imprudently dispossessed some lords of their estates, in order to bestow them upon this favourite; and this was a sufficient pretence for openly attacking both the father and son. The earls of Lancaster and Hereford flew to arms. Sentence was procured from parliament of perpetual exile against the two Spensers, with a forfeiture of all their estates. At last the king took the field at the head of 30,000 men, and pressed the Earl of Lancaster so closely, that he had not time to collect his forces together; and, flying from one place to another, he was at last stopped in his way towards Scotland, and made prisoner. He was immediately condemned by a court-martial; and executed on an eminence near Pomfret, with circumstances of the greatest indignity.

Spenser now triumphed for some time over his enemies; most of the forfeitures were seized for his use, and he is said to have been guilty of many acts of rapine and injustice. But he was soon opposed by a more formidable enemy. Queen Isabella fled to France, and refused to return to England till Spenser was removed from the royal presence, and banished the kingdom. Thus she made herself popular in England, where Spenser was universally disliked; and she had the pleasure of enjoying the company of a young nobleman named *Mortimer*, upon whom she had lately placed her affections. The queen's court, therefore, became a sanctuary for all the malecontents who were banished their own country, or who chose to come over. When she thought matters were ripe for her purpose, she set sail from Dort harbour, accompanied by 3000 armed men. She landed without opposition on the coast of Suffolk, on the 24th of September 1326; and she no sooner appeared, than there seemed to be a general revolt in her favour. The unfortunate king found the spirit of disloyalty spread over the whole kingdom. He had placed some dependence on the garrison of Bristol, which was under the command of the elder Spenser: but they mutinied against their governor; and that unfortunate favourite was delivered up, and condemned by the tumultuous barons to the most ignominious death. He was hanged on a gibbet in his armour; his body was cut in pieces and thrown to the dogs; and his head was sent to Winchester, where it was set on a pole, and exposed to the insults of the populace. Young Spenser did not long survive his father. He was taken, with some others who had followed the fortunes of the wretched king, in an obscure convent in Wales. The queen had not patience to wait the formality of a trial; but ordered him to be immediately led forth before the insulting populace, and seemed to take a savage pleasure in beholding his distress. He was executed on a gibbet 50 feet high; his head was sent to London, where it was received by the citizens with brutal triumph, and fixed on the bridge.

England. 168 Insurrection against him by the queen.

In the mean time the king, who hoped to find refuge in Wales, was quickly discovered, and delivered up to his adversaries, who insulted him in the grossest manner. He was conducted to the capital amidst the insults and reproaches of the people, and confined in the tower. A charge was soon exhibited against him; in which no other crimes but his incapacity to govern, his indolence, his love of pleasure, and his being swayed by evil counsellors, were objected against him. 169
His deposition, however, was quickly voted by parliament; he was assigned a pension for his support; his son Edward, a youth of 14, was chosen to succeed him, and the queen was appointed regent during the minority. The deposed monarch did not long survive the loss of his crown. He was at first consigned to the custody of the Earl of Lancaster; but this nobleman showing some marks of respect and pity, he was taken out of his hands, and delivered over to the lords Berkeley, Mautravers, and Gournay, who were entrusted alternately each for a month, with the charge of guarding him. While he was in Berkeley's custody, he was still used with some degree of humanity; but when the turn of Mautravers and Gournay came, every species of indignity was practised upon him, as if they had designed to accelerate his death by the bitterness of his sufferings. It is reported, that one day when Ed-

Edward deposed

England.

Edward was to be shaved, they ordered cold and dirty water to be brought from a ditch for that purpose; and when he desired it to be changed, and was still denied his request, he burst into tears and exclaimed, That in spite of their insolence he would be shaved with clean and warm water. As his persecutors, however, saw that his death might not arrive, even under every cruelty they could practise, and were daily afraid of a revolution in his favour, they determined to rid themselves of their fears by destroying him at once. Mortimer, therefore, secretly gave orders to the two keepers, who were at his devotion, instantly to dispatch the king; and these ruffians contrived to make the manner of his death as cruel and barbarous as possible. Taking advantage of Berkeley's sickness, in whose custody he then was, and who was thereby incapacitated from attending his charge, they came to Berkeley-castle, and put themselves in possession of the king's person. They threw him on a bed, and held him down with a table which they had placed over him. They then ran a horn pipe up his body, through which they conveyed a red-hot iron; and thus burnt his bowels without disfiguring his body. By this infernal contrivance they expected to have their crime concealed: but the horrid shrieks of the king, which were heard at a distance from the castle, gave a suspicion of the murder; and the whole was soon after divulged by the confession of one of the accomplices. Gournay and Mautravers were held in detestation by all mankind; and when the ensuing revolution deprived their protectors of power, they found it necessary to fly the kingdom. Gournay was afterwards seized at Marseilles, delivered over to the seneschal of Guienne, and put on board a ship with a view of carrying him over to England; but he was beheaded at sea, by secret orders, as was supposed, of some nobles and prelates in England, anxious to prevent any discovery which he might make of his accomplices. Mautravers concealed himself for some years in Germany; but having found means of rendering some services to Edward III. he ventured to approach his person, threw himself on his knees before him, and received a pardon.

170 And cruelly murdered.

171 Sovereign power assumed by the queen and Mortimer.

By the death of Edward II. the government fell entirely into the hands of the queen and her paramour Mortimer. The parliament, which raised young Edward to the throne, had indeed appointed 12 persons as his privy-council, to direct the operations of government. Mortimer excluded himself, under a show of moderation; but at the same time secretly influenced all the measures that came under their deliberation. As this influence began very soon to be perceived, and the queen's criminal attachment to Mortimer was universally known, these governors soon became very obnoxious to the people. The first stroke given to Mortimer's power was during an irruption of the Scots, when the favourite prevented the young king from attacking the enemy. Though it is very probable that the English army would have been destroyed by making an attack on an army situated in such an advantageous post as the Scots at that time occupied. Mortimer incurred great blame on that account. He was accused of having allowed the Scots to make their escape; and the general disgust on this account was increased by his concluding a peace with that kingdom, wherein the English renounced all title to the sovereignty of Scotland for the sum of 30,000 merks. Soon after Mortimer seized and executed the earl of Kent, brother to the late king; who, supposing Edward II. to be still alive, had formed a design of reinstating him in his kingdom. The execution was so sudden, that the young king had not time even to interpose in his behalf; and Mortimer soon after seized this nobleman's estate for his own use, as he did also the immense fortunes of the Spensers.

Edward, finding the power of Mortimer a continual restraint upon himself, resolved to shake off an authority that was likewise grown odious to the whole nation. The queen and Mortimer had for some time chosen the castle of Nottingham for their residence. It was strictly guarded, the gates were locked every night, and the keys carried to the queen. It was therefore agreed between the king and some of the barons, who secretly entered into his designs, to seize upon them in this fortress. Sir William Eland the governor was induced to admit them through a subterraneous passage, which had been formerly contrived for an outlet, but was now choked up with rubbish, and known only to one or two. Through this passage the noblemen in the king's interest entered the castle in the night-time; and Mortimer, without having it in his power to make any resistance, was seized in an apartment adjoining to that of the queen. The parliament, which was then sitting, condemned him without either permitting him to make his defence, or examining a single witness against him. He was hanged on a gibbet at a place called *Elmes*, about a mile from London. A similar sentence was passed against some of his adherents, particularly Gournay and Mautravers, who found an opportunity of escaping as abovementioned. The queen, who perhaps was the most culpable of the whole, was screened by the dignity of her station. She was, howevea, deposed from all share of power; and confined for life to the castle of Risings, with a pension of 3000 pounds a-year. From this confinement she was never set free, though the king paid her an annual visit of ceremony. She lived 25 years after her deposition.

172 Mortimer executed.

Edward III. proved the greatest warrior that ever sat on the English throne. He first attempted to raise Edward Baliol to the sovereignty of Scotland; but this he found impossible fully to accomplish. Edward next formed a project of invading and conquering France, to the sovereignty of which he pretended a right. His first expectations were attended with so little success, that on his return to England he found the nation very much discontented, and himself harassed by his numerous creditors without any sufficient resource for paying them. Being determined, however, not to bear any blame himself if he could throw it any where else, he took the first opportunity of wreaking his vengeance upon his subjects. Finding therefore the tower of London negligently guarded on his arrival, he imprisoned the constable and all his inferior officers, treating them with the greatest severity. He then fell upon the sheriffs and collectors of the revenue, whom he dismissed from their employments, and appointed an inquiry into their conduct to be made by persons who, knowing the king's humour, were sure to find every one guilty who came before them. The keeper of the privy-seal, the chief justice, the mayor of London, the

173 Edward invades France unsuccessfully.

174 His arbitrary behaviour on his return.

the biſhops of Chicheſter and Litchfield, with the chancellor and treaſurer, were depoſed and impriſoned.

175 Is oppoſed by the archbiſhop of Canterbury.

In this career of reſentment and cruelty, however, he found himſelf oppoſed by the archbiſhop of Canterbury, whom he had appointed to collect the taxes laid on for the ſupport of the French war. That prelate happening to be abſent at the time of the king's arrival, did not immediately feel the effects of his reſentment. Being informed, however, of the humour in which his ſovereign was, he iſſued a ſentence of excommunication againſt all who, on any pretence whatever, would exerciſe violence againſt the perſons or eſtates of clergymen, or who infringed thoſe privileges ſecured by the great charter, or who accuſed a prelate of treaſon, or any other crime, in order to bring him under the king's diſpleaſure. A regular combination was formed againſt the king by the clergy, with the primate at their head; who, to excite the indignation of the people as much as poſſible, reported, that the king intended to recal the general pardon and the remiſſion to old debts which had been granted, and to impoſe new and arbitrary taxes without conſent of parliament. The archbiſhop alſo, in a letter to the king, informed him, that there were two powers by which the world was governed, *viz.* the holy pontifical apoſtolical dignity and the regal authority; of which the clerical power was evidently the ſupreme, as the prieſts were to anſwer even for the conduct of kings at the laſt judgment; and were beſides the ſpiritual fathers of all the faithful, kings and princes not excepted; having, beſides, a heavenly charter, intitling them to direct their wills and actions, and to cenſure their tranſgreſſions. On this the king reſolved to mortify him, by ſending no ſummons to him when the parliament was called: but the prelate, undaunted by this mark of reſentment, appeared before the gates of the parliament-houſe with his croſier in his hand, demanding admittance as the firſt peer of the realm. This application was rejected for two days, but at laſt complied with; and the parliament now ſeemed inclined to abridge the king's authority conſiderably.

176 And obliged at laſt to ſubmit.

They began with obſerving, that as the great charter had been violated in many points, particularly by the illegal impriſonment of many freemen and the ſeizure of their goods, it was neceſſary to confirm it anew, and to oblige all the chief officers of the law and others to ſwear to the obſervance of it. It was alſo required, that whenever any of the great offices became vacant, the king ſhould fill them up by the advice of his council and the conſent of ſuch barons as ſhould at the time be found to reſide in the neighbourhood of the court. They enacted alſo, that on the third day of every ſeſſion the king ſhould reſume all ſuch offices into his own hand, excepting thoſe of the juſtices of the two benches and the barons of exchequer; that the miniſters ſhould for the time be reduced to private perſons; that they ſhould in that condition anſwer before parliament to any accuſation preferred againſt them; and that, if they were found in any reſpect guilty, they ſhould be finally deprived of their offices, and others appointed in their ſtead. In return for ſuch ample conceſſions, the king was offered a grant of 20,000 ſacks of wool; and ſuch was his urgent neceſſity, that he was compelled to accept of it even upon theſe terms. Still, however, he determined to adhere to his engagements no longer than till this neceſſity was removed. Though the agreement therefore was ratified in full parliament, he ſecretly entered a proteſt, that, as ſoon as his convenience permitted, he would from his own authority revoke what had been extorted from him. This proteſt was afterwards confirmed by a public edict; in which he aſſerted, that that ſtatute had been made contrary to law; that it was prejudicial to the prerogatives of the crown, which he had only diſſembled when he ſeemed to ratify it; and that in his own breaſt he had never aſſented to it: and declared, that from thenceforth it had no force or authority.

177 But regains his power.

This exertion of arbitrary power, which it might have been imagined would have occaſioned a prodigious clamour, was not taken notice of by any of the ſubſequent parliaments; ſo that in the courſe of two years Edward had entirely regained his authority, and obtained a repeal of the obnoxious ſtatute juſt mentioned.

178 performs great exploits in France.

Having thus ſettled matters to his ſatisfaction, the king reſumed his expedition againſt France, where he gained great advantages. In his abſence the Scots invaded England; but were entirely defeated at Durham, and their king himſelf taken priſoner. The Engliſh king in the mean time continued his victories on the continent; in which he was greatly aſſiſted by Edward ſurnamed the *Black Prince*, the greateſt hero recorded in the Engliſh annals. But for the wars of Edward III. and the exploits of this famous prince, ſee the articles SCOTLAND and FRANCE. The Black Prince died on the 8th of June 1376, and the king ſurvived only about a year.

179 Richard II.

He expired on the 21ſt of June 1377, and was ſucceeeded by his ſecond ſon Richard.

As the new king was only eleven years old when he aſcended the throne, the government was veſted in the hands of his three uncles the dukes of Lancaſter, York, and Gloceſter. The different diſpoſitions of theſe noblemen, it was thought, would cauſe them to check the deſigns of each other. Lancaſter was neither popular nor enterpriſing; York was indolent and weak; and Gloceſter turbulent, popular, and ambitious. Diſcontents firſt aroſe among the common people. They had now acquired a ſhare of liberty ſufficient to inſpire them with a deſire for more, and this deſire was greatly encreaſed by the diſcourſes of one John Ball a ſeditious preacher. He went about the country, and inculcated on his audience, that mankind were all derived from one common ſtock; and that all of them had equal right to liberty and the goods of nature, of which they had been deprived by the ambition of a few inſolent rulers.

Theſe doctrines were greedily ſwallowed by the populace, who were farther inflamed by a new impoſition of three groats a-head upon every perſon in the kingdom above 15 years of age. This had been granted as a ſupply by parliament, and was no doubt neceſſary on account of the many expenſive wars in which the kingdom was engaged; but its apparent injuſtice, in laying no more burden upon the rich than the poor, excited the utmoſt reſentment of the people. The manner, too, of collecting this tax, ſoon furniſhed them with an occaſion of revolt. It began in Eſſex, where a report was induſtriouſly ſpread that the peaſants were to be deſtroyed, their houſes burned, and their farms plundered. A blackſmith, well known by the name of

180 Dangerous insurrection by Wat Tyler.

of *Wat Tyler*, was the first that excited them to arms. The tax-gatherers coming to this man's house while he was at work, demanded payment for his daughter. This he refused, alledging that she was under the age mentioned in the act. One of these fellows offered to produce a very indecent proof to the contrary; and at the same time laid hold of the maid. This the father resenting, immediately knocked out the ruffian's brains with his hammer. The bystanders applauded the action; and exclaimed that it was high for the people to take vengeance on their tyrants, and to vindicate their native liberty. The whole country immediately took arms, and the insurgents soon amounted to about 100,000 men. They advanced to Blackheath where they sent a message to the king, who had taken shelter in the tower, desiring a conference with him. The king was desirous of complying with their demands, but was intimidated by their fierce behaviour. In the mean time they entered the city, burning and plundering the houses, of such as were obnoxious for their power or riches. Their animosity was particularly levelled against the lawyers, to whom they showed no mercy. The king at last, knowing that the tower was not able to resist their assaults, went out among them, and desired to know their demands. To this they made a very humble remonstrance; requiring a general pardon, the abolition of slavery, freedom of commerce in the market-towns, and a fixed rent instead of those services required by the tenure of villenage. The king granted all these requests; and charters were made out by which the grant was ratified. In the mean time, however, another body of these insurgents had broke into the tower, and murdered the chancellor, the primate, and the treasurer, with some other officers of distinction. They then divided themselves into bodies, and took up their quarters in different parts of the city. At the head of one of these was Wat Tyler, who led his men into Smithfield, where he was met by the king, who invited him to a conference under pretence of hearing and redressing his grievances. Tyler ordered his companions to retire till he should give them a signal, and boldly ventured to begin a conference with the king in the midst of his retinue. His demands were. That all slaves should be set free; that all commonages should be open to the poor as well as to the rich; and that a general pardon should be passed for the late outrages. Whilst he made these demands, he now and then lifted up his sword in a menacing manner: which insolence so raised the indignation of William Walworth lord mayor

181 He is killed.

of London, that, without considering the danger to which he exposed his majesty, he stunned Tyler with a blow of his mace; while one of the king's knights riding up, dispatched him with his sword. The mutineers, seeing their leader fall, prepared themselves to take revenge. Their bows were already bent for execution; when Richard, though not yet 16 years of age, rode up to the rebels, and with admirable presence of mind cried out; "What, my people, will you kill your king? Be not concerned for the loss of your leader. I myself will now be your general. Follow me into the field, and you shall have whatever you desire." The multitude immediately desisted, and followed the king into the fields, where he granted them the same charters that he had before granted to their companions. These charters, however, were soon after revoked, and the common people reduced to the same situation in which they had formerly been.

The courage, address, and presence of mind, which the king had discovered in quelling such a dangerous tumult, gave great hopes to the nation; but, in proportion as Richard advanced in years, these hopes were blasted; and his want of capacity, or at least of solid judgment, appeared in every enterprise he attempted.

182 The king loses the favour of the people.

The king had unluckily lost the favour of the common people after the insurrection just mentioned. He allowed the parliament to revoke the charters of enfranchisement and pardon which had been granted; some of the ringleaders in the late disorders had been severely punished, and some even put to death without any form of process or trial. Thus the popular leaders were greatly exasperated by this cruelty, though probably the king did not follow the dictates of his own mind so much in it as the advice of his counsellors. But having thus lost the favour of one party, he quickly after fell under the displeasure of the other also. Supposing himself to be in too great subjection to his uncles, particularly the Duke of Glocester, he attempted to shake off the yoke, by raising others to such a degree of power as might enable

183 His excessive favour for the Earl of Oxford.

them to rival them. His first favourite was Robert de Vere Earl of Oxford, a young man of an agreeable person, but dissolute in his behaviour, who soon acquired an absolute ascendant over him. So much was he determined to show his attachment to this nobleman, that he first created him Marquis of Dublin, a title never known in England before; then Duke of Ireland; transferring to him the entire sovereignty of that island by patent for life. He gave him in marriage his cousin-german, the daughter of the Earl of Bedford; but soon after permitted him to divorce her for another lady with whom he had fallen

184 A conspiracy against the king.

in love. This nobleman soon became the dispenser of all the king's favours to such a degree, that a conspiracy was formed against him. At the head of which were, Mowbray Earl of Nottingham, Fitz Alan Earl of Arundel, Percy Earl of Northumberland, Montague Earl of Salisbury, and Beauchamp Earl of Warwick. Vere was impeached in parliament; and tho' nothing of moment was even alledged against him, he was condemned and deprived of his office. They next proceeded to attack the royal authority itself. Under pretence that the king was yet unable to govern the kingdom, though at that time 21 years of age, they appointed a commission of 14 persons to whom the sovereignty was to be transferred for a year. This measure was driven forward by the Duke of Glocester, and none but his own faction were admitted as members of the committee. The king could not without regret perceive himself thus totally deprived of authority. He first endeavoured to gain over the parliament to his interests, by influencing the sheriffs of each county, who were then the only returning officers. This measure failing, he next applied to the judges. They declared, that the commission which had deprived the king of his authority was unlawful, and that those who procured or advised it were punishable with death. Their sentence was quickly opposed by declarations from the lords. The Duke of Glocester armed his partisans; and appeared at Haringay park near Highgate,

Highgate, at the head of a body of men sufficient to intimidate the king and all his adherents. These insurgents, sensible of their own power, began by demanding of the king the names of those who had advised him to his late rash measures. A few days afterwards they appeared armed in his presence, and accused by name the Archbishop of York, the Duke of Ireland, the earl of Suffolk, and Sir Robert Tresilian, one of the judges who had declared in his favour, together with Sir Nicholas Bamber, as public and dangerous enemies to the state. The duke of Ireland fled into Cheshire, where he attempted to raise a body of forces; but was quickly obliged to fly into Flanders, on the arrival of the Duke of Glocester with a superior army. Soon after, the king was obliged to summon a parliament, where an accusation was drawn up against five of his counsellors. Of these only Sir Nicholas Bember was present; and he was quickly found guilty, condemned, and executed, together with Sir Robert Tresilian, who had been discovered and taken during the interval. Lord Beauchamp of Holt was soon after condemned and executed; and Sir Simon Burley, who had been appointed the king's governor, shared the same fate, though the queen continued for three hours on her knees before the Duke of Glocester, imploring his pardon.

Such unparalleled insolence and barbarity in a subject could not go unpunished. In 1389, the king, at an extraordinary council of the nobility assembled after Easter, to the astonishment of all present, desired to
185 The king takes the power into his own hands.
know his age. Being told that he was turned of two and twenty, he alledged that it was then time for him to govern without help; and that there was no reason why he should be deprived of those rights which the meanest of his subjects enjoyed. The lords answered in some confusion, that he had certainly an undisputed right to take upon himself the government of the kingdom. "Yes (replied the king), I have long been under the government of tutors; and I will now first show my right to power by their removal." He then ordered Thomas Arundel, whom the commissioners had lately appointed chancellor, to give up the seals; which he next day delivered to William Wickham bishop of Winchester. He next removed the Duke of Glocester, the Earl of Warwick, and other lords of the opposition, from the council; and all the great officers of the household, as well as the judges, were changed.

The king being thus left at liberty to govern as he thought proper, for some time behaved in such a manner as to gain the affections of the people. It does not appear indeed that he ever gave much cause of complaint; but it was impossible for any prince in those days to keep himself secure on the throne but by a very severe and vigorous administration. The Duke of Glocester, perceiving that Richard was not of a warlike disposition, frequently spoke with contempt of his person and government, and deliberated concerning the lawfulness of throwing off all allegiance to him. The king being informed of his conduct by spies appointed for that purpose, at last formed a resolution of ridding himself of Glocester and his faction at once. He therefore ordered that nobleman to be immediately arrested and sent over to Calais, where there was no danger of his being rescued by his numerous adherents. The earls of Arundel and Warwick were seized at the same time; and a new parliament, which the king knew would be perfectly obedient to his will, was summoned to Westminster. Here the commission of 14, who had usurped on the royal authority, was annulled for ever; all those acts which had condemned his former ministers were repealed; and the general pardon which the king had formerly given when he assumed the government into his own hands, was revoked. Several of Glocester's party were condemned and executed, and at last that nobleman himself was called for to take his trial as well as the rest; but he had before been privately dispatched in prison.

186 Duke of Glocester murdered.

After the destruction of the Duke of Glocester and the heads of his party, a misunderstanding arose among the noblemen who had joined in the prosecution. The Duke of Hereford appeared in parliament, and accused the Duke of Norfolk of having spoken seditious words against his majesty in a private conversation. Norfolk denied the charge, gave Hereford the lie, and offered to prove his innocence by single combat. The challenge was accepted; but on the day appointed for the duel, the king would not suffer the combatants to engage, but commanded both of them to leave the kingdom. The duke of Norfolk he banished for life, but the Duke of Hereford only for ten years. The former retired to Venice, where in a short time he died of a broken heart. Hereford behaved in a resigned and submissive manner; which so pleased the king, that he consented to shorten the time of his banishment four years: he also granted him letters patent, ensuring him of the enjoyment of any inheritance which should fall to him during his absence; but upon the death of his father the Duke of Lancaster, which happened shortly after, Richard revoked those letters, and kept the estate to himself.

187 Dukes of Hereford and Norfolk banished

This last injury inflamed the resentment of Hereford to such a degree, that he formed a design of dethroning the king. He was a great favourite both with the army and people; he was immensely rich, and connected by blood or alliance with all the great families of the nation. The king at the same time, it is said gave himself up to an idle, effeminate life; and his ministers following his example, the national honour was lost. The number of malecontents daily increased, and only waited for the absence of the king, in order to put their schemes in execution; and this opportunity soon offered.

188 Hereford forms a scheme of dethroning the king.

The Earl of March, presumptive heir to the crown, having been appointed the king's lieutenant in Ireland, was slain in a skirmish with the natives of that country; which so incensed Richard, that, unmindful of his precarious situation at home, he went over to Ireland with a considerable army, in order to revenge his death in person. The Duke of Lancaster (for that was the title which Hereford assumed on the death of his father) hearing of the king's absence, instantly embarked at Nantz; and with a retinue only of 60 persons in three small vessels, landed at Ravenspur in Yorkshire. The Earl of Northumberland, who had long been a malecontent, together with Henry Percy his son, who from his ardent valour was surnamed *Hotspur*, immediately joined him with their forces; and the people flocked to him in such numbers, that in a few days his army amounted to 60,000 men

Richard,

England.

Richard, in the mean time, continued in perfect security in Ireland for some time. Contrary winds for three weeks together prevented his receiving any news of the rebellion which was begun in his native dominions. He landed therefore at Milford Haven without suspicion, attended by a body of 20,000 men; but immediately found himself opposed by a power which he could by no means resist. His army gradually deserted him, till at last he was obliged to acquaint the duke, that he would submit to whatever terms he pleased to prescribe. The duke did not think proper to enter into any treaty with the king; but carried him to London, where he was confined close prisoner in the Tower, formally deposed by parliament, or rather by the Duke of Lancaster, and at last put to death. The manner of his death is variously related. According to some, eight or nine ruffians were sent to the castle of Pomfret, whither the unhappy prince had been removed, in order to dispatch him. They rushed unexpectedly into his apartment; but Richard, knowing their design, resolved to sell his life as dear as possible. He wrested a pole-ax from one of the murderers, with which he killed four of them; but was at length overpowered and killed. Others relate that he was starved in prison; and that, after he was denied all nourishment, he prolonged his life 14 days, by feeding on the flocks of his bed. He died in the year 1399, in the 34th year of his age, and 23d of his reign.—It was during the reign of Richard II. that Wickliff, the noted reformer, published his doctrines in England. See WICKLIFF.

189 Richard deposed and murdered.

190 Duke of Lancaster's claim to the crown.

After sentence of deposition had been pronounced on Richard by both houses of parliament, the throne being then vacant, the Duke of Lancaster stepped forth; and having crossed himself on the forehead and on the breast, and called on the name of Christ, gave in his claim to the throne in the following words, which we shall give in the original language. "In the name of Fadher, Son, and Holy Ghost, I Henry of Lancaster, challenge this rewme of Ynglonde, and the croun, with all the membres and the appurtenances; als I that am descendit by right line of the blode, coming fro the gude King Henry therde, and throge that right that God of his grace hath sent me, with help of kyn, and of my frendes to recover it; the which rewme was in poynt to be ondone by defaut of governance, and ondoying of the gude laws."

The right which the duke here claimed by descent from Henry III. proceeded on a false story that Edmond Earl of Lancaster, son of Henry III. was really the elder brother of Edward I.; but that, by reason of some deformity in his person, he had been postponed in the succession, and Edward the younger brother imposed on the nation in his stead. The present Duke of Lancaster inherited from Edmund, by his mother, the right which he now pretended to the crown; though the falsehood of the story was so generally known, that he thought proper to mention it only in general terms.—No opposition, however, was made to the validity of this title in parliament; and thus commenced the differences between the houses of York and Lancaster, which were not terminated but by many bloody and ruinous wars.

191 Henry IV.

The reign of Henry IV. was little else than a continued series of insurrections. In the very first parliament he called, no fewer than 40 challenges were given and accepted by different barons; and though Henry had ability and address enough to prevent these duels from being fought, it was not in his power to prevent continual insurrections and combinations against himself. The most formidable one was conducted by the Earl of Northumberland, and commenced A. D. 1402. The occasion of it was, that Henry denied the Earl liberty to ransom the Scots prisoners which had been taken in a skirmish with that nation. The king was desirous of detaining them in order to increase his demands upon Scotland in making peace; but as the ransom of prisoners was in that age looked upon as a right belonging to those who had taken them, the earl thought himself grievously injured. The injury appeared still the greater, because Northumberland considered the king as indebted to him both for his life and crown. He resolved therefore to dethrone Henry; and to raise to the throne young Mortimer, who was the true heir to the crown, as being the son of Roger Mortimer Earl of March, whom Richard II. had declared his successor. For this purpose he entered into an alliance with the Scots and Welsh, who were to make an irruption into England at the same time that he himself was to raise what forces he could in order to join them. But when all things were prepared for this insurrection, the Earl found himself unable to lead on the troops, by a sudden fit of illness with which he was seized at Berwick. On this, young Piercy (surnamed *Hotspur*) took the command; and marched towards Shrewsbury, in order to join the Welsh. But the king had happily a small army with which he intended to have acted against the Scots; and knowing the importance of celerity in civil wars, instantly hurried down, that he might give battle to the rebels. He approached Shrewsbury before a junction with the Welsh could be effected; and the impatience of Piercy urged him on to an engagement, which at that time he ought to have declined. The evening before the battle, he sent a manifesto to Henry; in which he renounced his allegiance, set the king at defiance, and enumerated all the grievances of which he imagined the nation might justly complain. He reproached him (and very justly) with his perjury; for Henry, on his first landing in England, had sworn upon the gospels, before the Earl of Northumberland, that he had no other intention but to recover possession of the duchy of Lancaster, and that he would ever remain a faithful subject to King Richard. He aggravated his guilt, in first dethroning and then murdering that prince; and in usurping on the title of the house of Mortimer; to whom, both by lineal succession and by declarations of parliament, the throne, then vacant by Richard's death, did of right belong. Several other heavy charges were brought against him; which, at that time, could be productive of no other effect than to irritate the king and his adherents to the utmost.

England.

192 Insurrection of the earl of Northumberland.

193 His son defeated and killed at Shrewsbury.

The armies on each side were in number about 12,000; so that they were not unmanageable by their commanders; and as both leaders were men of known bravery, an obstinate engagement was expected. The battle was fought on the 20th of July 1403; and we can scarce find in those ages any other in which the shock was so terrible and constant. At last Piercy being killed by an unknown hand, the victory was decided

England. cided in favour of the royalists. There are said to have fallen on that day near 2300 gentlemen, and 6000 private men, of whom near two thirds were of Piercy's army.

The Earl of Northumberland having recovered from his sickness, and levied an army, was on his march to join his son; but being opposed by the Earl of Westmoreland, and hearing of the defeat at Shrewsbury, he dismissed his forces, and came with a small retinue to the king at York. He pretended that his sole intention was to mediate between the contending parties; and the king thought proper to accept of his apology, and grant him a pardon for his offence. The other rebels were treated with equal lenity; and none of them, except the Earl of Worcester and Sir Richard Vernon, who were regarded as the chief authors of the insurrection, perished by the hands of the executioner. This lenity, however, was not sufficient to keep the kingdom quiet; one insurrection followed another almost during the whole of this reign; but either through Henry's vigilance, or the bad management of the conspirators, they never could unite their forces in such a manner as was necessary for bringing their projects to bear.

194 Archbishop of York executed.

This reign is remarkable for the first capital punishment inflicted on a clergyman of high rank. The Archbishop of York having been concerned in an insurrection against the king, and happening to be taken prisoner, was beheaded without either indictment, trial, or defence; nor was any disturbance occasioned by this summary execution. But the most remarkable transaction of this reign was, the introduction of that absurd and cruel practice of burning people on account of their religion. Henry, while a subject, was thought to have been very favourable to the doctrines of Wickliffe; but when he came to the throne, finding his possession of it very insecure, he thought superstition a necessary implement of his authority, and therefore determined by all means to pay court to the clergy.

195 Burning of Heretics introduced.

There were hitherto no penal laws against heresy; not indeed through the toleration of the court of Rome, but through the stupidity of the people, who could not perceive the absurdities of the established religion. But when the learning and genius of Wickliffe had once broken the fetters of prejudice, the ecclesiastics called aloud for the punishment of his disciples; and Henry, who was very little scrupulous in his conduct, resolved to gratify them. He engaged parliament to pass a law for this purpose: it was enacted, that when any heretic, who relapsed, or refused to abjure his opinions, was delivered over the secular arm by the bishop or his commissaries, he should be committed to the flames before the whole people. This weapon did not remain long unemployed in the hands of the clergy. William Sautré, rector of St. Osithes in London, had been condemned by the convocation of Canterbury; his sentence was ratified by the house of Peers; the king issued his writ for the execution; and the unhappy man was burnt alive in the year 1401. The doctrines of Wickliffe, however, seem to have already gained ground very considerably in England. In 1405, the commons, who had been required to grant supplies, proposed in plain terms to the king to seize all the temporalities of the church, and employ them as a perpetual fund to serve the exigencies of the state. They insisted that the clergy possessed a third of the lands of the kingdom; and they contributed nothing to the public burdens; and that their exorbitant riches tended only to disqualify them from performing their ministerial functions with proper zeal and attention. When this address was presented, the Archbishop of Canterbury, who then attended the king, objected that the clergy, though they went not in person to the wars, sent their vassals and tenants in all cases of necessity; while at the same time, they themselves who staid at home were employed night and day in offering up their prayers for the happiness and prosperity of the state. The speaker answered with a smile, that he thought the prayers of the church but a very slender supply. Their archbishop, however, prevailed in the dispute; the king discouraged the application of the commons; and the lords rejected the bill which the lower house had framed for despoiling the church of her revenues. The commons were not discouraged by this repulse. In 1410, they returned to the charge with more zeal than before. They made a calculation of all the ecclesiastical revenues, which, by their account, amounted to 485,000 marks a year, and included 18,400 ploughs of land. They proposed to divide this property among 15 new earls, 1500 knights, 6000 esquires, and 100 hospitals; besides 20,000 pounds a-year, which the king might keep for his own use: and they insisted that the clerical functions would be better performed than at present, by 15,000 parish-priests, at the rate of 7 marks a-piece of yearly stipend. This application was accompanied with an address for mitigating the statutes enacted against the Wickliffites or Lollards, so that the king knew very well from what source it came. He gave the commons, however, a severe reply; and further to satisfy the church that he was in earnest, ordered a Lollard to be burnt before the dissolution of parliament.

The king had been for some time subject to fits, which continued to increase, and gradually brought him to his end. He expired at Westminster in 1413, in the 46th year of his age, and the 13th of his reign. 196 Henry V.

He was succeeded by his son Henry V. whose martial talents and character had at first occasioned unreasonable jealousies in the mind of his father, so that he thought proper to exclude him from all share of public business. The active spirit of Henry being thus restrained from its proper exercise, broke out in every kind of extravagance and dissipation. It is even reported, that, when heated with liquor, he scrupled not to accompany his riotous associates in attacking the passengers on the streets and highways, and robbing them of their goods. No sooner, however, did he ascend the throne, than he called together his former companions, acquainted them with his intended reformation, exhorted them to imitate his example; but strictly prohibited them, till they had given proofs of their sincerity in this particular, to appear any more in his presence: after which, he dismissed them with liberal presents. His father's wise ministers, who had checked his riots, found that they had, unknown to themselves, been paying the highest court to their sovereign; and were received with all the marks of favour and confidence. The chief justice, who had formerly imprisoned the prince himself, and therefore trembled to approach the royal presence, met with praises

England. praises instead of reproaches for his past conduct, and was exhorted to persevere in the same rigorous and impartial execution of the laws. The king was not only anxious to repair his own misconduct, but also to make amends for those iniquities into which policy or necessity of affairs had betrayed his father. He expressed the deepest sorrow for the fate of the unhappy King Richard, and even performed his funeral obsequies with pomp and solemnity, and heaped favours upon all those who had shewn themselves attached to him. He took into favour the young earl of March, though his competitor for the throne; and gained so far on his gentle and unambitious nature, that he remained ever after sincerely attached to him. The family of Piercy was restored to its fortune and honours; and the king seemed desirous to bury all distinctions in oblivion. Men of merit were preferred, whatever party they had been of; all men were unanimous in their attachment to Henry; and the defects of his title were forgot amidst the personal regard which was universally paid him.

197 Enforces the law against heretics.

The only party which Henry was not able to overcome was the new sect of Lollards, or reformers of religion. These were now gaining such ground in England, that the Romish clergy were greatly alarmed, and Henry was determined to execute the laws upon them. The head of that party at present was Sir John Oldcastle, Lord Cobham; a nobleman who had distinguished himself by his valour and military talents on many occasions, and acquired the esteem both of the late and present king. His high character and zeal for the new sect pointed him out to Arundel Archbishop of Canterbury as a proper object of ecclesiastical fury, and therefore he applied to Henry for permission to indict him. The king desired him first to try gentle methods, and undertook to converse with Lord Cobham himself upon religious subjects. He did so, but could not prevail, and therefore abandoned Cobham to his enemies. He was immediately condemned to the flames: but having found means to make his escape, he raised an insurrection; which was soon suppressed, without any other consequence than that of bringing a stain on the sect to which he belonged. Cobham himself made his escape, but four years afterwards was taken and executed as a traitor. Immediately after, the most severe laws were enacted against the Lollards. It was enacted, that whoever was convicted of Lollardy, besides suffering capital punishments according to the laws formerly established, should also forfeit his lands and goods to the king; and that the chancellor, treasurer, justices of the two benches, sheriffs, justices of the peace, and all the chief magistrates in every city and borough, should take an oath to use their utmost endeavours for the extirpation of heresy.

Notwithstanding these terrible laws, the very parliament which enacted them, namely that of 1414, when the king demanded a supply, renewed the offer formerly pressed upon Henry IV. and intreated the king to seize all the ecclesiastical revenues, and convert them to the use of the crown. The clergy were greatly alarmed. They could offer the king nothing of equal value. They agreed, however, to confer on him all the priories alien, which depended on capital abbeys in Normandy, and which had been bequeathed to them when that province was united to England. The most effectual method, however, of warding off the blow at present was by persuading the king to undertake a war with France, in order to recover the provinces in that kingdom which had formerly belonged to England. This was agreeable to the dying injunction of Henry IV. He advised his son never to let the English remain long in peace, which was apt to breed intestine commotions; but to employ them in foreign expeditions, by which the prince might acquire honour, the nobility in sharing his dangers might attach themselves to his person, and all the restless spirits find occupation for their inquietude. The natural disposition of Henry sufficiently inclined him to follow this advice, and the civil disorders of France gave him the fairest prospect of success. Accordingly in 1415, the king invaded France at the head of 30,000 men. The great progress he made there is related at length under the article FRANCE. He had espoused the king's daughter, and conquered the greatest part of the kingdom. His queen was delivered of a son named *Henry*, whose birth was celebrated by the greatest rejoicings both at London and Paris; and the infant prince seemed to be universally regarded as heir to both monarchies. But Henry's glory, when it seemed to be approaching the summit, was blasted at once by death, and all his mighty projects vanished. He was seized with a fistula, a distemper which at that time the physicians had not skill enough to cure; and he expired on the 31st of August 1422, in the 34th year of his age, and the 10th of his reign.

198 France invaded.

199 Death of Henry V.

200 Henry VI.

Henry VI. succeeded to the throne before he was quite a year old, and his reign affords only the most dismal accounts of misfortunes and civil wars. His relations very soon began to dispute about the administration during the minority. The duke of Bedford, one of the most accomplished princes of the age, was appointed by parliament protector of England, defender of the church, and first counsellor to the king. His brother, the duke of Glocester, was fixed upon to govern in his absence, while he conducted the war in France; and in order to limit the power of both brothers, a council was named, without whose advice and approbation no measure could be carried into execution.

The kingdom of France was now in the most desperate situation. The English were masters of almost the whole of it. Henry VI. though but an infant, was solemnly invested with regal power by legates from Paris; so that Charles VII. of France succeeded only to a nominal kingdom. With all these great advantages, however, the English daily lost ground; and in the year 1450 were totally expelled from France†. It may easily be imagined, that such a train of bad success would produce discontents among the rulers at home. The duke of Glocester was envied by many on account of his high station. Among these was Henry Beaufort, bishop of Winchester, great uncle to the king, and the legitimate son of John of Gaunt brother to Richard II. The prelate, to whom the care of the king's education had been committed, was a man of great capacity and experience, but of an intriguing and dangerous disposition. He had frequent disputes with the Duke of Glocester, over whom he gained several advantages on account of his open temper. The duke of Bedford

† See *France*.

England. ford employed both his own authority and that of parliament to reconcile them, but in vain; their mutual animosities served for several years to embarrass government, and to give its enemies every advantage. The sentiments of the two leaders were particularly divided with regard to France. The bishop laid hold of every prospect of accommodation with that country; and the Duke of Glocester was for maintaining the honour of the English arms, and regaining whatever had been lost by defeats or delay. Both parties called in all the auxiliaries they could. The bishop resolved to strengthen himself by procuring a proper match for Henry, at that time 23 years old; and then bringing over the queen to his interests. Accordingly, the Earl of Suffolk, a nobleman whom he knew to be stedfast in his attachments, was sent over to France, apparently to settle the terms of a truce which had then been begun, but in reality to procure a suitable match for the king.

201 Married to Margaret of Anjou.

The bishop and his friends had cast their eye on Margaret of Anjou, daughter of Regnier, titular king of Sicily, Naples, and Jerusalem; but without either real power or possessions. She was considered as the most accomplished princess of the age, both in mind and person; and it was thought would, by her own abilities be able to supply the defects of her husband, who appeared weak, timid, and superstitious. The treaty was therefore hastened on by Suffolk, and soon after ratified in England. The queen came immediately into the bishop's measures: Glocester was deprived of all real power, and every method taken to render him odious to the public. One step taken for this purpose was to accuse his duchess of witchcraft. She was charged with conversing with one Roger Bolingbroke, a priest and reputed necromancer; and also with one Mary Goudermain, who was said to be a witch. It was asserted that these three in conjunction had made an image of the king in wax, which was placed before a gentle fire; and as the wax dissolved, the King's strength was expected to waste; and upon its total dissolution, his life was to be at an end. This accusation was readily believed in that superstitious age. The prisoners were pronounced guilty; the duchess was condemned to do penance and suffer perpetual imprisonment; Bolingbroke the priest was hanged, and the woman burnt in Smithfield.

The bishop, called also the *Cardinal* of Winchester, was resolved to carry his resentment against Glocester to the utmost. He procured a parliament to be summoned, not at London, which was too well affected to the duke, but at St Edmondsbury, where his adherents were sufficiently numerous to overawe every opponent. As soon as Glocester appeared, he was accused of treason and thrown into prison; and on the day on which he was to make his defence, he was found dead in his bed, though without any signs of violence upon his body.

202 Duke of Glocester murdered.

The death of the duke of Glocester was universally ascribed to the Cardinal of Winchester, who himself died six weeks after, testifying the utmost remorse for the bloody scene he had acted. What share the queen had in this transaction, is uncertain; but most people believed that without her knowledge the duke's enemies durst not have ventured to take away his life. The king himself shared in the general ill-will, and he never had the art to remove the suspicion. His incapacity also began every day to appear more clearly, and a pretender to the throne soon made his appearance.

203 Duke of York's title to the crown.

In the year 1450, Richard Duke of York began to think of preferring his claims to the crown. All the males of the house of Mortimer were extinct; but Anne, the sister of the last Earl of March, having espoused the Earl of Cambridge, who had been beheaded for treason in the reign of Henry V. had transmitted her latent, but not yet forgotten claim, to her son Richard. This prince, descended by his mother from Philippa only daughter of the duke of Clarence, second son of Edward III. stood plainly in order of succession before the King; who derived his descent from the duke of Lancaster, third son of that monarch. The duke was a man of valour and abilities, as well as of some ambition; and he thought the weakness and unpopularity of the present reign afforded a favourable opportunity to assert his title. The ensign of Richard was a white rose, that of Henry a red one; and this gave names to the two factions, who were now about to drench the kingdom in blood.

204 Duke of Suffolk banished,

After the Cardinal of Winchester's death, the Duke of Suffolk, who also had been concerned in the assassination of Glocester, governed every thing with uncontrollable sway. His conduct soon excited the jealousy of the other nobility, and every odious and unsuccessful measure was attributed to him. The duke, however, imagining that his crimes were of such a nature as could not be proved, boldly called upon his enemies to show an instance of his guilt. The house of commons immediately opened against him a charge of corruption, tyranny, and treason. He was accused of being the cause of the loss of France; of persuading the French king, with an armed force, to invade England; and of betraying the secrets of state. The popular resentment against him was so strong, that Henry, in order to secure him as much as possible, sentenced him to five years banishment. This was considered by his enemies as an escape from justice. The captain of a ship was therefore employed to intercept him in his passage to France. He was seized near Dover, his head struck off on the side of a long-boat, and his body thrown into the sea.

205 And murdered.

206 Insurrection of John Cade.

The complaints against Henry's government were heightened by an insurrection headed by one John Cade, a native of Ireland. He had been obliged to fly over into France for his crimes: but, on his return, seeing the people prepared for violent measures, he assumed the name of *Mortimer*; and, at the head of 20,000 Kentish men, advanced towards Blackheath. The king sent a message to demand the cause of their rising in arms. Cade in the name of the community answered, That their only aim was to punish evil ministers, and procure a redress of grievances for the people. On this a body of 15,000 troops were levied, and Henry marched with them in person against Cade, who retired upon his approach, as if he had been afraid of coming to an engagement. He lay in ambush, however, in a wood; not doubting but he should be pursued by the king's whole army: but Henry was content with sending a detachment after the fugitives, and returning to London himself; upon which Cade issued from his ambuscade, and cut the detachment in pieces.

Soon

England. Soon after, the citizens of London opened their gates to the victor; and Cade, for some time maintained great order and regularity among his followers. He always led them out into the fields in the night-time, and published several edicts against plunder and violence, of any kind. He was not, however, long able to keep his people in subjection. He beheaded the treasurer Lord Say, without any trial; and soon after, his troops committing some irregularities, the citizens resolved to shut their gates against him. Cade endeavouring to force his way, a battle ensued, which lasted all day, and was ended only by the approach of night. The Archbishop of Canterbury, and the chancellor, who had taken refuge in the Tower, being informed of the situation of affairs, drew up, during the night, an act of amnesty, which was privately dispersed among the rebels. This had such an effect, that in the morning Cade found himself abandoned by his followers; and retreating to Rochester, was obliged to fly alone into the woods. A price being set on his head by proclamation, he was discovered and slain by one Alexander Eden; who, in recompence for his service, was made governor of Dover castle.

207 Duke of York suspected by the court.

The court now began to entertain suspicions that the insurrection of John Cade had not happened merely in consequence of his own machinations and ambition, but that he had been instigated thereto by the Duke of York, who, as we have already seen, pretended a right to the crown. As he was about this time expected to return from Ireland, and a report took place that he was now to assert his supposed right by force of arms, orders were issued in the king's name to deny him entrance into England. This was prevented by his appearing with no more than his ordinary attendants; but though he thus escaped the danger for the present, he instantly saw the necessity of proceeding in support of his claim. His partizans were instructed to distinguish between his right by succession and by the laws of the kingdom. The adherents of Lancaster maintained, that though the advancement of Henry IV. might be looked upon as irregular, yet it was founded upon general consent; or even allowing it to have been at first invalid, it had now been for a long time established, and acquired solidity of consequence; nor could the right of succession at any rate be pleaded for the purpose of overthrowing the general peace and tranquillity of the kingdom. The principles of liberty as well as the maxims of true policy had been injured by the house of York; while the public were bound to those of Lancaster, no less by political than moral duty, in consequence of the oaths of fealty that had been so often sworn to them; the Duke of York himself having repeatedly sworn allegiance to them, and thus indirectly renounced those claims which he now brought forward to disturb the public tranquillity. On the part of the Duke of York, it was replied, that the good of the people required the maintenance of order in the succession of princes; that, by adhering constantly to this rule, a number of inconveniences would be prevented which must otherwise ensue; and though that order had been broken through in the case of Henry IV. it was never too late to remedy any pernicious precedent. It would indeed be a great encouragement to usurpers, if the immediate possession of power, or their continuance in it for a few years, could convert them into legal princes; and the people must be in a very miserable situation, if all restraints on violence and ambition were taken off, and full liberty given to every innovator to make what attempts he pleased. They did not indeed deny that time might confer solidity on a government originally founded in usurpation; but a very long course of years was not only required for this purpose, but a total extinction of those who had any just title. The deposition of Richard II. and advancement of Henry IV. were not legal acts, but the effects of mere levity in the people; in which the house of York had acquiesced from necessity, and not from any belief of the justice of their cause; nor could this be ever interpreted into any renunciation of their pretensions; neither could the restoration of the true order of succession be considered as an encouragement to rebellion and turbulence, but the correction of a former abuse by which rebellion had been encouraged. Besides, the original title of Henry IV. was founded entirely on present convenience; and even this was now entirely shifted to the house of York. The present prince was evidently incapable of governing the kingdom by reason of his imbecillity; so that every thing was governed either by corrupt ministers or an imperious queen, who engaged the nation in foreign connections entirely contrary to its interests; while on the other hand, the true heir of the crown was a prince of approved judgment and experience, and a native of England, who, by his restoration, would undoubtedly correct all those abuses of which there was now such just reason to complain.

108 Arguments for and against the houses of York and Lancaster.

In this dispute it was evident that the house of York had the better in point of argument: nevertheless, as a prince of the house of Lancaster was in immediate possession of the throne, and could by no means be charged with any crime, the cause of the former was less generally interesting; especially as it must always have been uncertain, *a priori*, whether the Duke of York would have governed any better than King Henry. After his return from Ireland, however, the former used all his power and influence to foment the discontents which had for some time prevailed in the kingdom; and the conduct of the next parliament manifested the success of his intrigues. A violent attack was made upon such nobleman as were known to be most in favour with the king. The house of commons presented a petition against the Duke of Somerset, the Duchess of Suffolk, the Bishop of Chester, Lord Dudley, and several others of inferior rank; praying not only that the king would remove them from his council, but that he would prohibit them from coming within twelve miles of the court. Henry not daring to refuse this petition altogether, consented to banish all those of inferior rank, whom the commons had specified, but only for a year; and this too on condition that he had no use for their assistance in quelling any rebellion. But he rejected a bill for attainting the late Duke of Suffolk, and proposed some other measures which seemed to militate against the court, though it had passed both the house of lords and the house of commons.

209 The Duke of York foments dissentions between the king and parliament.

Encouraged by this disagreement between Henry and

England.

210 Richard raises an army;

211 But is obliged to retire.

and his parliament, the Duke of York raised an army of 10,000 men, with whom he marched towards London, demanding a reformation in matters of government, and the removal of the Duke of Somerset. This first enterprise, however, proved unsuccessful; the gates of the city were shut against him, and he was pursued by the king at the head of a superior army. On this he retired into Kent; and as there was a number of his own friends in the army of the king, a conference took place, in which Richard still insisted upon the removal of the Duke of Somerset, and his submitting to be tried in parliament. This request was in appearance complied with, and Somerset arrested: the Duke of York was then persuaded to wait upon the king in his royal pavilion; but, on repeating his charge against the duke, he was surprised to see the latter come out from behind the curtain, and offer to maintain his innocence. Richard perceiving that he had not sufficient interest to ruin his adversary, pretended to be satisfied, and retired to his seat at Wigmore in Wales; and during the time he resided there, a better opportunity was given him of accomplishing his designs than he could have hoped for. The king fell into a kind of lethargic disorder, which increased his natural imbecillity to such a degree, that he could no longer retain a shadow of royalty. Richard now had interest enough to get himself appointed protector, with power to hold parliaments at pleasure; with which high office he was no sooner invested, than he turned out all the Lancastrian party from their offices, and sent the Duke of Somerset to the Tower: but on the recovery of the king, which happened in no long time after, he himself was dismissed from his employment, the Duke of Somerset released, and the administration once more put into his hands. On this the duke of York levied an army, merely, as he pretended, to enforce the reformation of government and the removal of the Duke of Somerset. Thus Henry, though sore against his will, was obliged to face him in the field. A battle ensued at St Alban's; in which the royalists were defeated, and the Duke of Somerset, the chief partisan of their cause, killed in the action. The king himself was wounded, and took shelter in a cottage near the field of battle; where he was taken prisoner, but was afterwards treated with great respect and kindness by the Duke of York.

212 He is appointed protector in consequence of the king's illness.

213 Is desposed and levies an army.

214 History of the civil war between Henry and the Duke of York.

Henry, though he was now only a prisoner treated with the forms of royalty, was nevertheless pleased with his situation; but his queen was a woman of a bold and masculine spirit, could not bear to have only the appearance of authority, while others enjoyed all the real power. She therefore excited the king once more to assert his right by force of arms; and after several manoeuvres, the Duke of York was obliged to retire from court. A negociation for peace was at first set on foot, but the mutual distrusts of both parties soon broke it off. The armies met at Bloreheath on the borders of Staffordshire, on the 23d of September 1459; and the Yorkists at first gained some advantages. But when a more general engagement was about to ensue, a body of veterans who served under the duke of York deserted to the king; and this so intimidated the duke's party, that they separated the next day without striking a blow. The Duke of York fled to Ireland; and the Earl of Warwick, one of his ablest and best supporters, escaped to Calais, with the government of which he had been entrusted during the protectorship.

The York party, though thus in appearance suppressed, only waited a favourable opportunity of retrieving their affairs. Nor was this opportunity long wanting. Warwick having met with some successes at sea, landed in Kent; and being there joined by other barons, marched up to London amidst the acclamations of the people. The city immediately opened its gates to him, and he soon found him himself in a condition to face the royal army. An engagement ensued at Northampton on the 10th of July 1460; in which the royalists were entirely defeated, and the king again taken prisoner. The Duke of York then openly laid claim to the crown; and on this occasion the first instance of a spirit of national liberty is said to have appeared in the House of Lords. The cause of Henry and the Duke of York was solemnly debated: and the latter, though a conqueror, did not absolutely gain his cause. It was determined that Henry should possess the throne during his life; and that the duke of York should be appointed his successor, to the utter exclusion of the Prince of Wales, who was then a child.

Though the royal party now seemed destitute of every resource, the queen still retained her intrepidity. She fled into Wales, where she endeavoured to raise another army. The northern barons, provoked at the southern ones for settling the government and succession to the crown without their consent, soon furnished her with an army of 20,000 men. Another battle was fought near Wakefield Green, on the 24th of December 1460. The Yorkists were defeated, and the duke himself was killed in the action. His head was afterwards cut off by the queen's orders, and fixed on one of the gates of York, with a paper-crown, in derision of his pretended title. His son the Earl of Rutland, a youth of 17, was taken prisoner, and killed in cold blood by Lord Clifford; in revenge for his father's death, who had fallen in the battle of St Alban's.

211 Duke of York killed.

After this victory, Margaret marched towards London, in order to set the king at liberty; but the Earl of Warwick, who now put himself at the head of the Yorkists, led about the captive king, in order to give a sanction to his proceedings. He engaged the queen's forces at St Alban's: but through the treachery of Lord Lovelace, who deserted during the heat of the engagement with a considerable body of forces, Warwick was defeated, and the king fell once more into the hands of his own party.

The submission of the city of London seemed now to be the only thing wanting to complete the queen's success; but Warwick had secured it in his interests, and the citizens refused to open their gates to the queen. In the mean time, young Edward, eldest son of the late Duke of York, put himself at the head of his father's party. He was now in the bloom of youth, remarkable for the beauty of his person and his bravery, and was a great favourite of the people. He defeated Jasper Tudor Earl of Pembroke, at Mortimer's cross in Herefordshire. The earl himself was taken prisoner, and immediately beheaded by Edward's orders,

England.

ders. After this, he advanced to London; and being joined by the remainder of Warwick's army, he soon obliged Margaret to retire, entered the city amidst the acclamations of the people, and was crowned king on the 5th of March 1461.

216 Edward IV.

217 Affairs of the queen totally ruined.

Notwithstanding all her misfortunes, however, Margaret still continued undaunted. She retired to the north, where she was soon joined by such numbers, that her army amounted to 60,000 men. She was opposed by young Edward and Warwick at the head of 40,000; and both armies met near Touton in the county of York, on the 29th of March 1461. A bloody battle ensued, in which the queen's army was totally defeated; and as Edward, prompted by his natural cruelty, had ordered no quarter to be given, 40,000 of the Lancastrians were slain in the field or in the pursuit. Edward is said to have gained this victory by means of a violent storm of snow, which blew full in the face of the queen's army, and so blinded them that they could scarce make any use of their arms. After this disaster the queen fled to Scotland with her husband and son; and notwithstanding all the misfortunes she had already met with, resolved once more to enter England at the head of 5000 men granted her by the king of France. But even here she was attended by her usual bad fortune. Her little fleet was dispersed by a tempest, and she herself escaped with the utmost difficulty by entering the mouth of the Tweed. Soon after, a defeat, which her few forces sustained at Hexham, seemed to render her cause entirely desperate; and the cruelties practised upon all her adherents rendered it very dangerous to befriend her.

218 Adventures of the king and queen.

By these repeated misfortunes the house of Lancaster was so effectually ruined, that Margaret was obliged to separate from her husband, and both of them to shift for themselves the best way they could. The king was still protected by some of his friends, who conveyed him to Lancashire, where he remained in safety for a twelvemonth; but being at last discovered, he was thrown into the Tower and kept close prisoner. The queen fled with her son to a forest, where she was set upon by robbers, who stripped her of her rings and jewels, treating her otherwise with the utmost indignity. A quarrel which happened among them about the division of the spoil afforded her an opportunity of escaping from their hands into another part of the forest, where she wandered for some time without knowing what to do. At last, when quite spent with hunger and fatigue, she saw a robber coming up to her with a drawn sword in his hand. Finding it altogether impossible to escape, she suddenly took the resolution of putting herself under his protection. Advancing towards him therefore, and presenting the young prince, "Here (says she), my friend, I commit to your care the safety of your king's son." This address so much surprised the robber, that, instead of offering her any injury, he professed himself entirely devoted to her service. After living for some time concealed in the forest, she was at last conducted to the sea-side, where she found a ship which conveyed her to Flanders. On her arrival there, she went to her father's house, who, though very poor, gave her such entertainment as he could afford; and in this retreat she staid some years in expectation of finding an opportunity of retrieving her affairs.

219 The queen retires to Flanders.

Edward, in the mean time thinking himself securely fixed on the throne, gave a loose to his favourite passions; one of which was an immoderate love of women. To divert him from this, the Earl of Warwick, to whom he was indebted for his crown, advised him to marry. Edward consented, and sent him over to the continent to negociate a match with the princess of Savoy. The negociation proved unsuccessful; but, in the mean time, the king had privately espoused Elizabeth Woodville, daughter of Sir Philip Woodville, who had married the duchess of Bedford after the death of her first husband. Edward had employed his arts of seduction against his lady in vain before he married her; but unfortunately the match was concludrd just at the time that the earl of Warwick had proved successful in his negociation with the princess of Savoy. The minister therefore returned full of indignation against his sovereign: and Edward, forgetting how great cause he had to be offended, determined to remove him entirely from his councils. Warwick was likewise disgusted by the favour shown to the queen's party; which, though certainly a piece of very commendable policy in Edward, was entirely disagreeable to the ambitious disposition of that nobleman. A plan of revenge was therefore thought of; and a most powerful combination was formed against Edward; to accomplish which, Warwick not only employed his own influence, which was very extensive, but likewise that of the Duke of Clarence, Edward's brother, to whom the earl had allied himself by giving his daughter in marriage; after which he persuaded him to embrace his cause. Some circumstances which took place about this time also favoured the scheme. The inhabitant's about St Leonard's in Yorkshire complained, that the duties levied for that institution, and which had been originally appointed for pious purposes, were secreted by the managers, who refused to contribute their part. As the clergy were concerned in this affair, they attempted to silence their antagonists by ecclesiastical fulminations against them; upon which the latter took up arms, fell upon the officers of the hospital, and having massacred them, proceeded towards York, to the number of 15,000. In the first skirmish they had the misfortune to lose their leader, who was instantly executed. The rebels, however, still continued in arms, and a short time appeared in such numbers as to become formidable to government. Henry Earl of Pembroke was sent against them with a body of 5000 men; and having taken Sir Henry Nevil, one of the leaders of the insurgents, prisoner, instantly put him to death; but this was soon revenged by a similar execution on himself, who happened to be defeated and taken prisoner a short time after. This defeat had been occasioned by a disagreement betwixt the Earls of Pembroke and Devonshire; in consequence of which the latter had gone off with his troops, leaving Pembroke to shift for himself the best way he could. The king, enraged at this, caused Devonshire to be executed in a like summary manner; but this was of no service to his cause; a new body of insurgents appeared under Sir Robert Welles, son to a nobleman of that name. The latter, in order to secure himself from all suspicions of disloyalty, fled to a monastery; but he was soon enticed from thence and put to death by the insidious promises of king Edward, whose treachery was equal to his cruelty. His son

220 Warwick disgusted by Edward.

221 The king's brother joins in the conspiracy against him.

222 An insurrection in Yorkshire.

England.

son soon after shared the same fate, being defeated and taken prisoner by Edward, who instantly ordered him to be beheaded, along with Sir Thomas Launde and other persons of distinction.

223 Warwick and Clarence join the insurgents.

Notwithstanding such an appearance of a general insurrection, the king had so little suspicion of the loyalty of Warwick and Clarence, that he employed them in raising troops to quell the insurgents. Instead of executing their commission with fidelity, however, they joined the malecontents with all the forces they could raise; but being quite disconcerted by the defeat and death of Sir Robert Welles, they retired to Lancashire, in hopes of being joined by Lord Stanley, who had married the Earl of Warwick's sister. Being disappointed in this, they were obliged to disband their army, and fly into Devonshire, whence they set sail for Calais. Upon their arrival on the continent, matters seemed not to be much mended: the deputy-governor, whom Warwick had left, refused him admittance; nor would he even allow the Duchess of Clarence to land, though she had been delivered of a son on board, only a very few days before, and was at that time extremely ill. Being well acquainted, however, with the uncertainty of the affairs of England at that time, he afterwards made an apology to Warwick for his behaviour. The latter pretended to be easily reconciled; but immediately left the place, having seized some Flemish vessels which he found lying in the neighbourhood.

224 Reconciliation betwixt Warwick and the queen.

As a very close alliance subsisted between Warwick and the Duke of Burgundy, the king of France became uneasy; and therefore, as soon as the earl landed on his dominions, received him with the greatest marks of esteem. The reconciliation between him and the unfortunate Queen Margaret now seemed to be natural, though considering all circumstances, this must have formerly appeared in a manner impossible. The earl's father had been put to death by the orders of Margaret; and Warwick, in return, had twice taken prisoner King Henry, banished the queen, and put to death almost all her faithful adherents. By the mediation of the French monarch, however, all differences were accommodated. A fleet was prepared to reconduct them to England; and seizing a proper opportunity, they landed at Dartmouth with a small body of troops, while Edward was in the north suppressing an insurrection which had lately appeared there. Warwick was attended with astonishing success on his arrival in England, and in less than six days saw himself at the head of 60,000 men. Edward was now obliged in his turn to fly the kingdom. Having narrowly escaped an attempt made upon his person by the Marquis of Montague, he embarked on board a small fleet which lay off Lynn in Norfolk. While at sea he was chased by some ships belonging to the Hans Towns that were then at war both with France and England; but at length, having escaped all dangers, Edward landed safely in Holland, where he met with but an indifferent reception from the duke of Burgundy, with whom he had lately entered into an alliance.

225 He lands in England.

Warwick in the mean time advanced to London, and once more released and placed on the throne the miserable king Henry VI. A parliament was called, which very solemnly confirmed Henry's title to the throne, and Warwick himself was dignified by the people with the title of the *king-maker*. All the attainders of the Lancastrians were reversed; and every one was restored who had lost either honours or fortune by his former adherence to Henry's cause. All the adherents of Edward fled to the continent, or took shelter in monasteries, where they were protected by the ecclesiastical privileges. But Edward's party was not yet destroyed. After an absence of nine months, being seconded by a small body of troops granted him by the Duke of Burgundy, he made a descent at Ravenspur in Yorkshire. At first he met with litttle success; but his army increasing on his march, he was soon in a condition to appear before the capital, which immediately opened its gates.

England.

The unfortunate Henry was thus again plucked from the throne; and the hopes of Warwick were almost totally blasted by the defection of Clarence, Edward's brother. Nothing now remained but to come to an engagement as soon as possible. Warwich knew his forces to be inferior to those of Edward, but placed great dependence on his own generalship. He therefore advanced to Barnet, within ten miles of London, where he resolved to wait the coming of Edward. The latter soon came up with him, and on the 14th of April 1471, a most obstinate and bloody battle was fought. Edward, according to custom, had ordered no quarter to be given; and obtained the victory through a mistake of a body of Warwick's forces, who fell with fury on their own party instead of the enemy. The earl himself was slain, together with his brother, and 10,000 of his bravest followers.

The queen was just then returned with her son from France, where she had been soliciting supplies. She had scarce time to refresh herself from the fatigues of the voyage, when she received the fatal news of the death of Warwick, and the total destruction of her party. All her resolution was not able to support her under such a terrible disaster. Her grief now for the first time, it is said, manifested itself by her tears; and she immediately took sanctuary in the abbey of Beaulieu in Hampshire. Here she still found some friends willing to assist her. Tudor Earl of Pembroke, Courtney earl of Devonshire, the lords Wenlock and St John, with some other men of rank, encouraged her yet to hope for success, and promised to stand by her to the last. On this assurance, she resumed her courage; and advancing through the counties of Devon, Somerset, and Glocester, increased her army every day. At last, however, she was overtaken by Edward with his victorious army at Tewkesbury, on the banks of the Severne. The queen's army was totally defeated; the Earl of Devonshire and Lord Wenlock were killed in the field; the Duke of Somerset, and about 20 other persons of distinction, who had taken shelter in a church, were surrounded, dragged out, and immediately beheaded; about 3000 of their party fell in battle, and the army was entirely dispersed. Queen Margaret and her son were taken prisoners, and brought to the king, who asked the prince in an insulting manner, how he dared to invade his dominions? The young prince replied, that he came thither to claim his just inheritance; upon which Edward struck him on the face with his gauntlet. The Dukes of Clarence and Glocester, Lord Hastings, and Sir Thomas Gray, taking this blow as a signal for farther violence, hurried the prince into the next apartment, and there dispatched him with their

226 Total destruction of the queen's party.

England. their daggers. Margaret was thrown into the Tower along with her husband Henry, who expired in that confinement a few days after. It was universally believed that he was murdered by the Duke of Glocester, though of this there was no direct evidence. Margaret was was ransomed by the king of France for 50,000 crowns, and died a few years after in a most miserable situation.

Edward being now freed from all his enemies, began to inflict punishment on those who had formerly appeared against him. Among the cruelties he committed, that on his brother the Duke of Clarence was the most remarkable. The king happening to be one day hunting in the park of Thomas Burdet, a servant of the duke killed a white buck which was a great favourite of the owner. Burdet, vexed at the loss, broke out into a passion, and wished the horns of the deer in the belly of the person who advised the king to that insult. For this exclamation Burdet was tried for his life, and executed at Tyburn. The duke of Clarence exclaimed against the iniquity of this sentence; upon which he was arraigned before the house of peers, found guilty, and condemned to death. The only favour granted him was to have the choice of his death; and his choice was a very singular one, namely, to be drowned in a butt of Malmsey wine; which was accordingly done.—The rest of this reign affords little else than any history of the king's amours. Among his many mistresses, Jane Shore was the most remarkable; (see SHORE.) The king died on the 9th of April 1482, in the 42d year of his age, and 21st of his reign, counting from his first assuming the crown. Besides five daughters, he left two sons; Edward prince of Wales, his successor, then in his 13th year; and Richard duke of York in his 9th.

228 Edward V.

On the death of Edward IV. the kingdom was divided into two new factions. The queen's family, which during the last reign had come into power, was become obnoxious to the old nobility, who considered them as their inferiors. The king had endeavoured to prevent these animosities from coming to a height, by desiring on his death-bed that his brother Richard duke of Glocester should be intrusted with the regency; and recommended peace and unanimity during the minority of his son. But the king was no sooner dead than the former resentment between these parties broke out with violence; and the duke of Glocester, who was endued with almost every bad quality, resolved to profit by their contentions. His first step was to get himself declared protector of the realm; and having arrested the earl of Rivers, the king's uncle and guardian, he met young Edward in his way from Ludlow castle, where the late king had resided during the latter part of his reign, and respectfully offered to conduct him to London. Having thus secured the person of the king, he next got possession of his brother's person also. The queen had retired with this child into Westminster abbey; and it was not without extreme regret that she delivered him up at the intercession of the primate and archbishop of York.

229 Duke of Glocester declared protector.

In a few days after Glocester had made himself master of the persons of the two princes, he had them confined in the Tower, under pretence of guarding them from danger; and soon after spread reports of their illegitimacy, and by pretended obstacles put off the young king's coronation. Lord Stanley first began to suspect his designs; and communicated his suspicions to lord Hastings, who had long been firmly attached to the king's family. Lord Hastings would not at first give credit to this surmise; but he very soon had a fatal proof of the truth of what had been communicated to him. On the 13th of June 1483, he was hurried out of the council-room in the Tower by Glocester's order, and beheaded on a log of timber. The soldiers who carried him off made a bustle as though an attempt had been made to rescue him, and one of them discharged a blow at Lord Stanley's head with a pole-ax; but he happily escaped by shrinking under the table. The same day were executed the Earl Rivers, and some others, who had committed no other crime than being faithful to the young king.

The protector now thought he might with safety lay claim to the throne. He had previously gained over the duke of Buckingham, a nobleman of great influence among the people. He used his utmost endeavours to inspire the people with a notion of the illegitimate birth of the late king, and consequently of his children. Dr Shaw, a popular preacher, was also hired to harrangue the people to the same purpose from St Paul's cross. Having expatiated on the incontinence of the queen, and the illegality of the young king's title, he then made a panegyric on the virtues of the protector. "It is the protector (continued he) who carries in his face the image of virtue, and the marks of a true descent. He alone can restore the lost glory and honour of the nation." It was hoped that upon this occasion some of the populace would have cried out, "Long live King Richard!" but the audience remaining silent, the duke of Buckingham undertook in his turn to persuade them. Having expatiated on the calamities of the last reign and the illegitimacy of the present race, he told the people, that he saw only one method of warding off the miseries which threatened the state, which was by electing the protector; but he seemed apprehensive that he would never be prevailed upon to accept a crown accompanied with such difficulty and danger. He next asked his auditors, whether they would have the protector for their king? but was mortified to find that a total silence ensued. The mayor, who was in the secret, willing to relieve him in this embarrassed situation, observed, that the citizens were not accustomed to be harrangued by a man of his quality, and would only give an answer to their recorder. This officer therefore, repeated the duke's speech; but the people continuing still silent, "This is strange obstinacy (cried the duke): we only require of you, in plain terms, to declare, whether or not you will have the duke of Glocester for your king; as the lords and commons have sufficient power without your concurrence?" At this, some of the meanest apprentices, incited by the servants of the protector and Buckingham, raised a feeble cry of "God save King Richard!" The mob at the door repeated the cry; and throwing up their caps into the air, cried out, "A Richard! A Richard!" After this farce was acted, Buckingham, on the 24th of June 1483, waited on Richard with offers of the crown: but the protector, with hypocritical modesty, at first declined the offer; till being told, that the people, in case of his refusal, must look out for one that would be more compliant, he

England.

he accepted the government of England and France, with a resolution, as he said, to defend the one and subdue the other.

230 RichardIII.

The first step taken by the new king was to send orders to Sir Robert Brackenbury governor of the Tower, to put the young princes to death. But this he refused; and submissively answered, that he knew not how to embrue his hands in innocent blood. A fit instrument for this purpose, however, was not long wanting. Sir James Tyrrel readily undertook the office; and Brackenbury was ordered to resign the keys to him for one night. Tyrrel choosing three associates, Slater, Deighton, and Forest, came in the night-time to the door of the chamber where the princes were lodged; and sending in the assassins, bid them execute their commission, while he himself staid without. They found the young princes in bed, and fallen into a sound sleep. The assassins smothered them with the bolster and pillows; after which they showed their naked bodies to Tyrrel, who ordered them to be buried at the stair-foot under an heap of stones (c.)

231 Edward V. and his brother murdered.

Richard having thus secured himself on the throne by the most iniquitous methods, attempted to strengthen his interest by foreign alliances, and procuring the favour of the clergy at home by great indulgences; but he found his power threatened from a quarter where he least expected an attack. The duke of Buckingham, who had been so instrumental in raising him to the throne, did not think himself properly rewarded. He made a demand of some confiscated lands in Hereford, to which his family had an ancient claim. Richard either reluctantly complied with his request, or only granted it in part; so that a coolness soon ensued between them, and in a little time Buckingham came to a resolution of dethroning the monarch whom he had just raised. For some time he remained in doubt, whether he should assume the crown himself or set up another. At length he determined on the latter; and resolved to declare for Henry earl of Richmond, who was at that time an exile in Brittany, and was considered as the only surviving branch of the house of Lancaster. He was one of those who had the good fortune to escape the numerous massacres of the former reigns; but as he was a descendant of John of Gaunt by the female line, he was for that reason obnoxious to those in power. He had long lived in exile, and was once delivered over to the ambassadors of Edward IV. who were preparing to carry him to England; when the duke of Brittany, who delivered him, repented of what he had done, and took him from the ambassadors just as they were carrying him on shipboard. His right to the crown by succession was very doubtful: but the cruel behaviour of Richard inclined the people in general greatly to favour him; and, to give an additional strength to his title, a match was projected betwixt him and the princess Elizabeth, the eldest daughter of Edward IV. which, by uniting the two rival families, would put an end to those dissensions which had so long filled the kingdom with bloodshed and confusion. Richard, in the mean time, from some reasons which have not been particularized by historians, began to entertain doubts of the fidelity of Buckingham, and determined to cut him off. For this purpose he sent for him to court: but Buckingham, instead of obeying the summons, fled into Wales, where he raised a considerable army, and forthwith set out to the eastward with a design to invade England. Richard hastened to meet him with what forces he could raise; but the march of Buckingham being retarded by a most uncommon inundation of the Severn which lasted 10 days, his troops were so disheartened at this event, that they almost all deserted him. The duke was therefore obliged to fly in distress, and Richard instantly set a price upon his head. Buckingham was now obliged to trust his life in the hands of an old servant of his own, named *Banister*; but this man, tempted by the greatness of the reward, betrayed him to the sheriff of Shropshire, by whom he was seized and conducted to Richard at Salisbury, who caused him to be executed without delay. The earl of Richmond, in the mean time, had set sail from St Maloes with a body of 5000 men: but after his arrival in England, receiving the disagreeable news of Buckingham's misfortune, he set sail again for Bretagne; while Richard, emboldened by the bad success of his enemies, determined to confirm his title to the throne by calling a parliament, which till this time he had not ventured to do. At present, matters were so circumstanced, that the parliament had no other resource than to comply with his desires, and acknowledge his right to the crown. An act was passed confirming the illegitimacy of Edward's children; and an attainder was also confirmed against the earl of Richmond; the duties of tonnage and poundage were granted to the king for life; and his only son Edward, then about 12 years of age, was created Prince of Wales. In return for these concessions, Richard passed several popular laws, particularly against the extorting of money by benevolences, and some others calculated to gain the good will of the opposite party. He paid his court also to the queen-dowager with such assiduity and success, that she left her sanctuary, and put herself and her daughters into his hands. The ambition and cruelty of this man indeed are said to have extinguished every sentiment of natural affection as well as humanity. He had married Anne, the second daughter of the earl of Warwick, and widow of Edward prince of Wales, whom he himself had murdered; but having born him but one son, who died about this time, he considered her as an invincible obstacle to the accomplishment of his desires; for which reason it was thought he put an end to her life by poison: and as he knew that the projected match between the earl of Richmond and the Princess Elizabeth could only make the rivalship of the former any way formidable, he resolved to obtain a dispensation

232 Buckingham determines to support the claim of the earl of Richmond to the throne.

England.

233 He takes up arms, but is abandoned by his army and put to death.

234 Richmond lands in England, but is obliged to return.

235 Richard's title confirmed by parliament.

(c) These circumstances are said to have been confessed in the succeeding reign, though the perpetrators escaped punishment. The bodies of the two princes were sought for without any success under the reign of Henry VIII. but in the time of Charles V. the bones of two persons answering to their age were found in the spot where they were said to have been buried; which, being supposed to be the remains of these two unfortunate youths, they were buried under a marble monument in Westminster abbey.

England. tion from the pope for marrying her himself. The queen-dowager is even said to have come into this scheme with a view to recover her power; but the princess herself always rejected his addresses with abhorrence. The refusal of the princess occasioned no small perplexity in Richard; and before he could determine on any proper method of accomplishing his purpose, he received news of Richmond's preparations for landing in England. These being soon accomplished, Henry set sail from Harfleur in Normandy, and landed without opposition, on the 17th of August, 1485, at Milford-haven in Wales. Richard in the mean time, not knowing where the invasion was to take place, had posted himself at Nottingham; which being almost in the centre of the kingdom, was therefore proper for resisting any invader. Sir Rice ap Thomas and Sir Walter Herbert were commissioned by Richard to oppose his rival in Wales; but the former immediately deserted to him, and the latter made but a very feeble resistance. Richard instantly resolved to meet his antagonist, and to risk every thing on the event of a battle. Richmond, though he had not above 6000 men, and the king near double that number, did not decline the combat; being chiefly encouraged by the promises of Lord Stanley to join him with a body of 7000 men, and with whom he hovered at a little distance from the intended field of battle, seemingly indetermined to join either side.

236 Richmond lands in England a second time.

237 Richard defeated and killed.

The king having commanded his army to form themselves in order of battle, intrusted the van to the duke of Norfolk, while he himself, with the crown on his head, took the command of the main body. Lord Stanley in the mean time posted himself on one flank between the two armies, while his brother Sir William took his station directly opposite. As his intention of either joining the enemy or keeping neutral during the time of the engagement was now far from being doubtful, Richard sent him orders to join the main body; which not being complied with, the tyrant determined to put to death Stanley's son, who had been left with him as a pledge of his father's fidelity. He was persuaded, however, to defer the execution till after the engagement, that Stanley might thereby be induced to delay his purpose in joining the enemy. This, however, did not answer the expectation. Soon after the engagement was begun, Stanley deserted Richard's party, and joining Richmond entirely decided the fortune of the day. The tyrant perceiving his situation to be quite desperate, and seeing his rival at no great distance from him, drove up against him with fury, in hopes that either Henry's death or his own would decide the victory between them. He killed Sir William Brandon the earl's standard-bearer; he dismounted Sir John Cheyney; and was within reach of Richmond, when Sir William Stanley breaking in with his troops, Richard was surrounded and overwhelmed by numbers. His body was found in the field, covered with dead enemies, and besmeared with blood. It was thrown carelessly across a horse, carried to Leicester amidst the shouts of insulting spectators, and interred in the Gray-Friar's church of that place.

The usurper's crown being found on the field of battle, was placed on the head of the conqueror, while the whole army cried out, "Long live king Henry!" Two days after the battle, Henry gave orders to confine Edward Plantagenet earl of Warwick, and son of the unfortunate duke of Clarence; and to release the Princess Elizabeth, who had been confined in the tower. He then advanced by slow and gradual marches to the city of London, where he was received with the greatest demonstrations of joy. He was crowned king of England on the 30th of October 1485; and, to heighten the splendor on that occasion, he bestowed the rank of knights-banneret on 12 persons, and conferred peerages on three. Jasper earl of Pembroke, his uncle, he created duke of Bedford; Thomas Lord Stanley, his father-in-law, earl of Derby; and Edward Courtenay, earl of Devonshire. At the coronation likewise appeared a new institution, which the king had established for personal security as well as pomp; a band of 50 archers, who were denominated Yeomen of the Guard. But lest the people should take umbrage at this step, as if it implied a diffidence of his subjects, he declared the institution to be perpetual. The ceremony of the coronation was performed by cardinal Bourchier, archbishop of Canterbury.—On the 18th of January 1486, he was married to the Princess Elizabeth; and his marriage was celebrated at London with greater appearance of joy than either his first entry or his coronation had been. Henry remarked, with much displeasure, this general favour borne to the house of York; and the suspicions arising from it, not only disturbed his tranquillity during the whole of his reign, but bred disgust towards his consort herself, and poisoned all his domestic enjoyments.

238 Henry VII.

The reign of Henry VII. was for several years disturbed by plots and insurrections. The people, by a long course of civil war, had become so turbulent and factious, that no governor could rule, nor could any king please them. The violent animosity expressed by this monarch, however, against the house of York, may justly be considered as one of the causes of the extreme proneness to rebellion manifested by his subjects. Instead of endeavouring to conciliate the affections of the opposite party, he always strove to quell them by absolute force and violence. For this purpose he took a journey, soon after his accession, to the north of England, where the Yorkists were very numerous; hoping to get the better of them by his presence. In his journey thither, he received intelligence of an insurrection against him by Viscount Lovel, with Sir Henry Stafford, and Thomas his brother, who had raised an army, and were marching to besiege the city of Worcester, while Lovel approached to assist them with a body of three or four thousand men. They were dispersed, however, by the offer of a general pardon; which induced Lovel to withdraw from his troops, who were thereupon obliged to submit to the king's mercy. The Staffords took sanctuary in the church of Colnham near Abingdon; but as it was found that this church had not the privilege of protecting rebels, they were taken from thence: the elder was executed at Tyburn; but the younger pleading that he had been missed by his brother, received a pardon.

239 His reign disturbed by frequent rebellions.

240 Lovel and Stafford's insurrection suppressed.

This success was soon after followed by the birth of a prince; whom Henry named in honour of the celebrated king Arthur, who is said to have been the direct ancestor of the house of Tudor. All this success, however, as well as the general satisfaction which the birth of a prince descended from the houses both of York

241 Prince Arthur born.

England.

242 Discontents of the people.

York and Lancaster necessarily occasioned, were not sufficient to reconcile the hearts of the English to their sovereign. His extreme severity towards the house of York still continued; and unfortunately this was much more beloved by the generality of the nation, than that of Lancaster. Many of the Yorkists had been treated with great cruelty, and deprived of their fortunes under pretence of treason; a general resumption had likewise been made of the grants made by the princes of the House of York. It was likewise universally believed that the queen herself met with harsh treatment, on account of her being one of that unfortunate house; and, from all these circumstances, it was not unreasonably imagined that his enmity was inveterate and invincible. Hence, notwithstanding his politic and vigorous administration, people made no scruple of openly expressing their disapprobation of his conduct and government; and one rebellion seemed to be extinguished only to give birth to another. The king had, at the commencement of his reign, confined the duke of Clarence's son, as has already been mentioned. This unfortunate youth, who had obtained the title of the earl of Warwick, was, through long confinement, entirely unacquainted with the affairs of the world. Simple as he was, however, he was now made use of to disturb the public tranquillity. The queen-dowager was with great reason suspected to be at the bottom of this conspiracy; but not choosing to interfere openly in the matter herself, she employed one Simon a priest of Oxford to execute her purposes. This man cast his eyes upon one Lambert Simnel a baker's son in the same place, a youth of only 15 years of age; but who from his graceful appearance and accomplishments, seemed proper for personating a man of quality. A report had been spread among the people, that Richard duke of York, second son of Edward IV. had secretly made his escape from the cruelty of his uncle, and lay somewhere concealed in England. Simon had at first instructed his pupil to assume that name, which he found to be much the object of public affection; but hearing afterwards a new report, that Warwick had escaped from the Tower, and observing that this news was attended with no less general satisfaction, he changed the plan of his imposture, and made Simnel personate that unfortunate Prince. The pliant youth was therefore directed by his instructor to talk upon many occurrences as happening to him in the court of Edward. But as the impostor was not calculated to bear a close examination, he was removed to Ireland; and so well had he profited by the lessons given him, that he no sooner presented himself to the earl of Kildare the deputy, claiming his protection as the unfortunate earl of Warwick, than he began to consult with several other noblemen with regard to him. These expressed even a stronger belief in Simnel's story than the deputy himself had done; and in proportion as the story was spread abroad, the more credit it obtained. The impostor was lodged in the castle of Dublin; the inhabitants universally took an oath of allegiance to him, as the true descendant of the Plantagenets; he was crowned with a diadem taken from the statue of the blessed virgin, and proclaimed king by the title of Edward VI.; and the whole kingdom followed the example of the capital.

243 Imposture of Lambert Simnel.

Such an unexpected event alarmed Henry so much, that he would have gone over to Ireland on purpose to quell the rebellion in person, had he not been afraid of the machinations of the queen-dowager in his absence. To prevent any thing of this kind, it was resolved to confine her for life in a monastery; under pretence, however, that it was done on account of her having formerly delivered up the princess her daughter to King Richard. The queen murmured against the severity of her treatment; but the king persisted in his resolution, and she remained in confinement till the time of her death, which happened some years after.

244 The queen-dowager confined.

The next measure was to show Warwick to the people. He was taken from the Tower, and led thro' the principal streets of London; after which he was conducted in solemn procession to St Paul's, where great numbers were assembled to see him. Still, however, they proceeded in Dublin to honour their pretended monarch; and he was crowned with great solemnity in the presence of the earl of Kildare, the chancellor, and the other officers of state. At last, being furnished by the duchess of Burgundy with a body of 2000 veteran Germans under the command of Martin Swart, a brave and experienced officer, he resolved to invade England. He landed in Lancashire, from whence he marched to York, expecting that the country-people would rise and join him on his march. But in this he was deceived: the people were unwilling to join a body of foreigners; and were besides kept in awe by the great reputation of Henry. Lord Lincoln, therefore, who commanded the rebel army, determined to bring the matter to a speedy issue. Accordingly he met the royal army at Stoke in the county of Nottingham. An obstinate engagement ensued, but at length King Henry obtained a complete victory. Lord Lincoln, with 4000 private men, perished in the battle; and Simnel, with his tutor Simon were taken prisoners. Simon being a priest, could not be tried by the civil power, and was only committed to close confinement. Simnel was pardoned, and made a scullion in the king's kitchen, whence he was afterwards advanced to the rank of falconer, in which employment he died. 245

245 Henry punishes his enemies.

Henry being now freed from all danger from that quarter, determined to take ample vengeance on his enemies. For this pupose he took a journey into the north: but though he found many delinquents, his natural avarice prompted him to exact heavy fines from them rather than to put them to death. His proceedings, however, were extremely arbitrary; the criminals being tried, not by the ordinary judges, but either by commissioners appointed for the occasion, or suffering punishment by sentence of a court-martial. Having thus fully established his authority as far as it could be done by suppressing and punishing domestic enemies, he next determined to recommend himself to his subjects by a report of his military disposition; hoping, that by undertaking, or pretending to undertake, some martial enterprises, he would thus gain the favour of a people naturally turbulent, and unaccustomed to live long at peace with their neighbours. He certainly had not, however, the least intention of prosecuting foreign conquests; though, to please the people, he frequently gave out that he designed to invade France, and lay waste the whole country, rather than not recover his continental possessions. Under these pretences particularly, that of assisting the Bretons whom the king

246 Pretends a desire of atchieving martial exploits.

England.

247
Obtains a subsidy on pretence of assisting the inhabitants of Bretagne.

king of France had lately subdued, and who had applied to him for relief, he persuaded his parliament to grant him a considerable supply; but this involved him in some difficulties. The counties of Durham and York, who had always been discontented with Henry's government, and still farther provoked by the oppressions under which they had laboured after the extinction of Simnel's rebellion, opposed the commissioners sent by the king to levy the tax. The latter applied to the earl of Northumberland, requesting his advice and assistance in the execution of their office; but instead of being able to enforce the levying of the tax, he himself was attacked and put to death by the insurgents. This act of violence committed by themselves, seemed to render the insurgents desperate, so that without more ado they prepared to resist the royal power, under the conduct of one Sir John Egremond; but in this ill-conducted and precipitate scheme they met with no success. Henry instantly levied a considerable force, which he committed to the charge of the earl of Surrey; by whom the rebels were quickly defeated, and one of their leaders taken prisoner. Sir John Egremond fled to the duchess of Burgundy, who afforded him protection.

248
An insurrection suppressed.

Thus Henry obtained the subsidy which he had solicited under pretence of invading France, though he would willingly have avoided any expence in preparations for that purpose in order to keep the money in his possession; but as the Bretons had applied to him for assistance, and their distresses became every day more urgent, he found himself obliged to attempt something. With this view he set sail for Calais with an army of 25,000 foot and 1600 horse, of which he gave the command to the duke of Bedford and the earl of Oxford: but notwithstanding this apparent hostile disposition, negociations for peace had been secretly begun, and commissioners even appointed to consider of the terms, three months before King Henry set out for the continent. As the love of money was the prevailing passion of the English monarch, and the possession of Bretange was a great object to France, an accommodation soon took place betwixt the contending parties. The king of France engaged to pay Henry near L.200,000 as a reimbursement for the expences of his expedition, and stipulated at the same time to pay him and his heirs an annual pension of 25,000 crowns more.

249
Henry makes a feigned invasion of France.

250
Obtains a sum of money and annual pension.

Thus the authority of Henry seemed to be so firmly established, as to leave no reason to dread any rival in time to come; but still he found himself mistaken. The duchess of Burgundy, resenting the depression of her family, and exasperated by her frequent miscarriages in the attempts already made, resolved to make a final effort against Henry, whom she greatly hated. For this purpose, she propagated a report that her nephew Richard Plantagenet, duke of York, had escaped from the Tower where his eldest brother was murdered, and that he still lay somewhere concealed. Finding this report eagerly received, she soon found a young man who assumed both his name and character. The person chosen to act this part was the son of one Osbeck, or Warbeck, a converted Jew, who had been in England during the reign of Edward IV. His name was *Peter*; but it had been corrupted after the Flemish manner into *Peterkin* or *Perkin*. It was by some believed, that Edward, among his other amorous adventures, had a secret correspondence with Warbeck's wife, which might account for the great similarity of features between Perkin and that monarch. The duchess of Burgundy found this youth entirely suited to her purposes. The lessons she gave him were easily learned and strongly retained. His graceful air, his courtly address, his easy manners, and elegant conversation, were capable of imposing upon all but those who were privy to the imposture. The kingdom of Ireland was pitched upon for Perkin's first appearance, as it had been before for that of Simnel. He landed at Cork; and immediately assuming the name of *Richard Plantagenet*, was followed by great numbers of credulous people. He wrote letters to the earls of Desmond and Kildare, inviting them to join his party; he dispersed every where the strange intelligence of his escape from his uncle Richard's cruelty; and his story meeting with general credit he soon became an object of the public favour. All those who were disgusted with the king, prepared to join Perkin; but particularly those who formerly were Henry's favourites, and had contributed to place him on the throne. These, thinking their services had not been sufficiently repaid, now became heads of the conspiracy. Their attempts, however, were all frustrated by the vigilance of the king, and most of the conspirators of any note were publicly executed.

251
Imposture of Perkin Warbeck.

England.

Perkin finding it was in vain to attempt any thing in England, went to the court of James IV. of Scotland. Here he was received with great cordiality; and James carried his confidence in him so far, that he even gave him in marriage lady Catherine Gordon, daughter to the earl of Huntly, and a near kinswoman of his own. But when he attempted to set him on the throne of England, he found himself totally disappointed; and on the conclusion of peace between the two kingdoms, Perkin was obliged to leave Scotland. From thence he went to Flanders; and meeting with but a cool reception there, he resolved to try the affections of the people Cornwall, who had lately risen against the king on account of a new tax which had been levied upon them. On his first appearance, Perkin was joined by about 3000 of these people, with which force he laid siege to Exeter. Henry, however, having marched against him with a considerable army, Perkin's heart failed him, though his followers now amounted to 7000; and he took shelter in a monastery. His wife fell into the conqueror's hands; who placed her in a respectable situation near the queen's person, with a suitable pension, which she enjoyed till her death. Perkin being persuaded to deliver himself into the king's hand, was compelled to sign a confession of his former life and conduct; but this was so defective and contradictory, that very little regard was paid to it. His life was granted him; though he was still detained in custody, and keepers were appointed to watch his conduct. From these, however, he broke loose; and flying to the sanctuary of Shyne, put himself into the prior's hands. He was once more prevailed upon to trust himself in the king's hands, and was committed to the Tower; but having here entered into a correspondence with the earl of Warwick in order to make their escape, both of them were condemned and executed.

To Henry VII. in a great measure is owing the pre-

England.

[25] English nation civilized by Henry.

present civilized state of the English nation. He had all along two points principally in view; the one to depress the nobility and clergy, and the other to exalt and humanize the populace. In the feudal times every nobleman was possessed of a certain number of vassals, over whom he had by various methods, acquired an almost absolute power; and, therefore, upon every slight disgust, he was able to influence them to join him in his revolt or disobedience. Henry considered, that the giving of his barons a power to sell their estates, which were before unalienable, must greatly weaken their interest. This liberty therefore he gave them; and it proved highly pleasing to the commons, nor was it disagreeable to the nobles themselves. His next scheme was to prevent their giving liveries to many hundreds of their dependants, who were thus kept like the soldiers of a standing army to be ready at the command of their lord. By an act passed in this reign, none but menial servants were allowed to wear a livery; and this law was enforced under severe penalties.

With the clergy, Henry was not so successful. The number of criminals of all kinds who found protection in monasteries and other places appointed for religious worship, seemed to indicate little less than an absolute toleration of all kinds of vice. Henry used all his interest with the pope to get these sanctuaries abolished, but to no purpose. All that he could procure was, that if thieves, murderers, or robbers, registered as sanctuary men, should sally out and commit fresh offences, and retreat again, in such cases they might be taken out of the sanctuary and delivered up to justice.

In 1500, the king's eldest son Arthur was married to the Infanta Catharine of Spain, which marriage had been projected and negociated seven years. But the prince dying in a few months after marriage, the princess was obliged to marry his younger brother Henry who was created Prince of Wales in his room. Henry himself made all the opposition which a youth of 12 years of age is capable of; but as the king persisted in his resolution, the marriage was by the pope's dispensation shortly after solemnized.—In the latter part of this king's reign, his economy, which had always been exact, degenerated into avarice, and he oppressed the people in a very arbitrary manner. He had two ministers, Empson and Dudley, perfectly qualified to second his avaricious intentions. They were both lawyers, and usually committed to prison by indictment such persons as they intended to oppress; from whence they seldom got free but by paying heavy fines, which were called mitigations and compositions: but by degrees the very forms of law were omitted; and they determined in a summary way upon the properties of the subjects, and confiscated their effects to the

252 Death of Henry VII.

royal treasury.—Henry VII. died of the gout in his stomach, in the year 1509, having lived 52 years, and reigned 23; and was succeeded by his son Henry VIII. In Henry VII.'s reign was built a large ship of war called the *Great Harry*, which cost. L. 14,000. This was, properly speaking, the first ship in the English navy. Before this period, when the king wanted a fleet, he had no other expedient than to hire ships from the merchants.

253 Henry VIII.

Henry VIII. ascended the throne when he was about 18 years of age, and had almost every advantage which a prince can have on his accession. He had a well-stored treasury, an indisputed title, and was at peace with all the powers in Europe. Commerce and arts had been some time introduced into England, where they met with a favourable reception. The young prince himself was beautiful in his person, expert in all polite exercises, open and liberal in his air, and loved by all his subjects. The old king, who was himself a scholar, had instructed him in all the learning of the times, so that he was an adept in school-divinity before the age of 18.

All these advantages, however, seemed to have been lost upon the new king. Being destitute of a good heart and solid understanding, he proved a tyrant. Being always actuated not by reason but the passion which happened to be uppermost in his mind, he behaved in the most absurd and contradictory manner; and however fortunate some of his measures proved at last, it is impossible that either his motives, or the means he took for the accomplishment of his purposes, can be approved of by any good man.

One of Henry's first actions in his royal capacity was to punish Empson and Dudley, who were obnoxious to the populace on account of their having been the instruments of the late king's rapacity. As they could not be impeached merely on account of their having strictly executed the will of the king, they were accused of having entered into a treasonable conspiracy, and of having designed to seize by force the administration of government; and though nothing could be more improbable than such a charge, the general prejudice against them was so great, that they were both condemned and executed.

In 1510, the king entered into a league with pope Julius II. and Ferdinand king of Spain, against Louis XII. of France. In this alliance Henry was the only disinterested person. He expected nothing besides the glory which he hoped would attend his arms, and the title of *Most Christian King*, which the pope assured him would soon be taken from the king of France to be conferred upon him. The pope was desirous of wresting from Louis some valuable provinces which he possessed in Italy, and Ferdinand was desirous of sharing in the spoil. Henry summoned his parliament; who very readily granted him supplies, as he gave out that his design was to conquer the kingdom of France, and annex it to the crown of England. It was in vain that one of his old prudent counsellors objected, that conquests on the continent would only drain the kingdom without enriching it; and that England, from its situation, was not fitted to enjoy extensive empire. The young king, deaf to all remonstrances, and hurried away by his military ardour, resolved immediately to begin the war. But after several attempts, which were rendered unsuccessful only by the mismanagement of those who conducted them, a peace was concluded with France on the 7th of August 1514.

Henry's arms were attended with more success in Scotland; where King James IV. with the greatest part of the Scots nobility, and 10,000 of the common people, were cut off in the battle of Flowden*. Henry in the mean time, puffed up with his imaginary successes against France, and his real ones against Scotland,

* See *Scotland.*

England. land, continued to lavish his treasures by expensive pleasures and no less expensive preparations for war. The old ministers who had been appointed by his father to direct him were now disregarded; and the king's confidence was entirely placed in Thomas afterwards Cardinal Wolsey, who seconded him in all his favourite pursuits, and who, being son of a private gentleman at Ipswich, had gradually raised himself to the first employments of the state*. He doth not seem to have had many bad qualities besides his excessive pride, which disgusted all the nobility; but the great share he possessed in the favour of such an absolute prince as Henry VIII. put him quite out of the reach of his enemies.

254 Cardinal Wolsey minister.

* See *Wolsey*.

255 Arbitrary behaviour of the king.

The king having soon exhausted all the treasures left him by his father, as well as the supplies which he could by fair means obtain from his parliament, applied to Wolsey for new methods of replenishing his coffers. The minister's first scheme was to get a large sum from the people under the title of *benevolence*; though no title could be more improperly applied, as it was not granted without the greatest murmurings and complaints. Wolsey even met with opposition in the levying of it. In the first place, having exacted a considerable sum from the clergy, he next applied himself to the house of commons; but they only granted him half the sum he demanded. The minister at first was highly offended, and desired to be heard in the house; but they replied, that none could be permitted to sit and argue there except such as were members. Soon after, the king having occasion for new supplies, by Wolsey's advice attempted to procure them by his prerogative alone without consulting his parliament. He issued out commissions to all the counties of England for levying four shillings in the pound from the clergy, and three shillings and fourpence from the laity. This stretch of royal power was soon opposed by the people, and a general insurrection seemed ready to ensue. Henry endeavoured to pacify them by circular letters: in which he declared, that what he demanded was only by way of benevolence. The city of London, however, still hesitated on the demand; and in some parts of the country insurrections were actually begun. These were happily suppressed by the duke of Suffolk; but the cardinal lost somewhat of the king's favour on account of the improper advice he had given him. To reinstate himself in his good graces, Wolsey made the king a present of a noble palace called *York-place*, at Westminster, assuring him that from the first he had intended it for the king's use. In order to have a pretence for amassing more wealth, Wolsey next undertook to found two new colleges at Oxford; and for this purpose he received every day fresh grants from the pope and the king. The former imprudently gave him liberty to suppress some monasteries, and make use of the revenues for the erection of his new colleges; but this was a fatal precedent for the pontiff's interest's as it taught the king to seize on the monastic revenues whenever he stood in need of money.

For a considerable time Wolsey continued to enjoy the king's favour in an extreme degree; and as no monarch was ever more despotic than Henry VIII. no minister was ever more powerful than Wolsey. This extraordinary elevation served only to render his fall the more conspicuous, and himself the more miserable, when it took place; and what was worse he had long foreseen, from what he knew of the king's capricious and obstinate temper, that it certainly would happen one time or other. The cause of his final overthrow was the desire King Henry began to entertain of having his Queen Catharine divorced. The doctrines of the reformation, propagated by Luther in 1517, had gained considerable ground in England, and many professed a belief in them, notwithstanding the severe persecution which had been carried on against heretics during some of the preceding reigns. The clergy had become so exceedingly corrupt, and were immersed in such monstrous ignorance, that they were universally hated even by their own party, while no regard at all was paid to their decisions, or rather they were looked upon with the utmost abhorrence, by the reformers. Even the papal authority, though still very great, had, in no greater a space of time than ten years (viz. from 1517, when Luther first began to attack it, to the present year 1527), declined very sensibly. The marriage of King Henry therefore being in itself looked upon by all parties as illegal in itself, and only sanctified by a dispensation from the pope, had been frequently objected to on different occasions. We are informed by some authors, that when Henry VII. bethrothed his son, at that time only 12 years of age, he evidently showed an intention of taking afterwards a proper opportunity to annul the contract; and that he ordered prince Henry, as soon as he should come of age, to enter a protestation against the marriage; charging him on his death-bed not to finish an alliance so unusual, and liable to such insuperable objections. Some members of the privy council, particularly Warham the primate, afterwards declared against the completion of the marriage; and even after it was completed, some incidents which in a short time took place were sufficient to make him sensible of the general sentiments of the public on that subject. The states of Castile had opposed a marriage betwixt the emperor Charles and the English princess Mary, Henry's daughter, urging among other things the illegitimacy of her birth. The same objection afterwards occurred on opening a negociation with France for a marriage with the duke of Orleans.

England.

256 Cause of Wolsey's disgrace.

257 Scruples concerning the legality of Henry's marriage.

258 Other reasons for Henry's desire for a divorce.

If these accounts are to be depended upon as authentic, we can scarce conceive it possible but Henry himself must have been somewhat staggered by them; though it is by no means probable that they were his only motives. The queen was six years older than the king, her personal charms were decayed, and his affection lessened in proportion. All her children had died in infancy except one daughter, the Princess Mary abovementioned; and Henry was, or pretended to be, greatly struck with this, as it seemed something like the curse of being childless, pronounced in the Mosaic law against some evil-doers. Another point of the utmost importance was the succession to the crown, which any question concerning the legitimacy of the king's marriage would involve in confusion. It was also supposed, with great reason, that should any obstacles of this kind occur, the king of Scotland would step in as the next heir, and advance his pretensions to the crown of England. But above all, it is probable that he was influenced by the love he had now contracted for Anne Boleyn, who had

259 His love for Anne Boleyn.

lately

lately been appointed maid of honour to the queen. In this ſtation Henry had frequent opportunities of ſeeing her, and ſoon became deeply enamoured; and finding that his paſſion could not be gratified but by a marriage, it is not to be doubted that he was thus obſtinately ſet upon the divorce; for which purpoſe he ſent his ſecretary to Rome to obtain from Clement a bull for diſſolving his marriage with Catharine. That he might not ſeem to entertain any doubt of the pope's prerogative, he inſiſted only on ſome grounds of nullity in the bull granted by his predeceſſor Julius for the accompliſhment of the marriage. In the preamble to this bull, it had been ſaid, that it was granted only upon the ſolicitation of Henry himſelf; though it was known that he was then a youth under 12 years of age: it was likewiſe aſſerted, that the bull was neceſſary for maintaining the peace between the two crowns; though otherwiſe it was certain that there was no appearance of a quarrel betwixt them. Theſe falſe premiſes ſeemed to afford a very good pretence for diſſolving it; but, as matters then ſtood, the pope was involved in the utmoſt perplexity. Queen Catharine was aunt to the emperor, who had lately made Clement himſelf a priſoner, and whoſe reſentment he ſtill dreaded: and beſides, he could not with any degree of prudence declare the bull of the former pope illicit, as this would give a mortal blow to the doctrine of papal infallibility. On the other hand, Henry was his protector and friend; the dominions of England were the chief reſource from whence his finances were ſupplied; and the King of France, ſome time before, had got a bull of divorce in circumſtances nearly ſimilar. In this exigence he thought the wiſeſt method would be to ſpin out the affair by negociation; and in the mean time he ſent over a commiſſion to Wolſey, in conjunction with the archbiſhop of Canterbury or any other Engliſh prelate, to examine the validity of the king's marriage and of the former diſpenſation; granting them alſo a proviſional diſpenſation for the king's marriage with any other perſon.

260 Sends to Rome to obtain a divorce.

261 Extreme perplexity of the Pope.

The pope's meſſage was laid before the council in England: but they conſidered, that an advice given by the pope in this ſecret manner might very eaſily be diſavowed in public; and that a clandeſtine marriage would totally invalidate the legitimacy of any iſſue the king might have by ſuch a match. In conſequence of this, freſh meſſengers were diſpatched to Rome, and evaſive anſwers returned; the pope never imagining that Henry's paſſion would hold out during the tedious courſe of an eccleſiaſtical controverſy. But in this he was miſtaken. The king of England had been taught to diſpute as well as the pope, and valued himſelf not a little on his knowledge in theology: and to his arguments he added threats; telling him, that the Engliſh were but too well diſpoſed to withdraw from the holy ſee; and that if he continued uncomplying, the whole country would readily follow the example of their monarch, who ſhould always deny obedience to a pontiff who had treated him with ſuch falſehood and duplicity. The king even propoſed to his holineſs, whether, if he were not permitted to divorce his preſent queen, he might not have a diſpenſation for having two wives at once?

262 Henry's controverſy with him.

The pope, perceiving the king's eagerneſs, at laſt ſent Cardinal Campegio his legate to London; who, with Wolſey, opened a court for trying the legitimacy of the king's marriage with Catharine, and cited the king and queen to appear before them. The trial commenced the 31ſt of May 1529; and both parties preſented themſelves. The king anſwered to his name when called: but the queen, inſtead of anſwering to hers, roſe from her ſeat, and throwing herſelf at the king's feet, made a very pathetic harangue; which her dignity, her virtue and miſfortunes, rendered ſtill more affecting. She told her huſband, "That ſhe was a ſtranger in his dominions, without protection, without counſel, and without aſſiſtance; expoſed to all the injuſtice which her enemies were pleaſed to impoſe upon her: That ſhe had quitted her native country, without any other reſource than her connections with him and his family; and that, inſtead of ſuffering thence any violence or iniquity, ſhe had been aſſured of having in them a ſafeguard againſt every misfortune: That ſhe had been his wife during 20 years; and would here appeal to himſelf, whether her affectionate ſubmiſſion to his will had not merited other treatment than to be thus, after ſo long a time, thrown from him with indignity: That ſhe was conſcious,—he himſelf was aſſured,—that her virgin honour was yet unſtained when he received her into his bed; and that her connections with his brother had been carried no farther than the mere ceremony of marriage: That their parents, the kings of England and Spain, were eſteemed the wiſeſt princes of their time, and had undoubtedly acted by the beſt advice when they formed the agreement for that marriage, which was now repreſented as ſo criminal and unnatural: And that ſhe acquieſced in their judgment, and would not ſubmit her cauſe to be tried by a court whoſe dependence on her enemies was too viſible ever to allow her any hopes of obtaining from them an equitable or impartial deciſion." Having ſpoken theſe words, the queen roſe, and, making the king a low reverence, left the court; nor would ſhe ever again appear in it. The legate having again ſummoned the queen to appear before them, on her refuſal, declared her contumacious, and the trial proceeded in her abſence. But when the buſineſs ſeemed to be nearly decided, Campegio, on ſome very frivolous pretences, prorogued the court, and at laſt transferred the cauſe before the ſee of Rome.

263 Trial of the king and queen before the popes legate.

264 Embarraſſment of Cardinal Wolſey.

All this time Cardinal Wolſey ſeemed to be in the ſame dilemma with the pope, and indeed much worſe; as he could not boaſt of the ſame independence which his holineſs poſſeſſed. On the one hand, he was very ſolicitous to gratify the king his maſter, who had diſtinguiſhed him by ſo many extraordinary marks of favour; on the other, he feared to offend the pope, whoſe ſervant he more immediately was, and who likewiſe had power to puniſh his diſobedience. He had long known that this affair was certainly to end in his ruin; and by attempting to pleaſe all parties, he fell under the diſpleaſure of every one; ſo that he was at laſt left without a ſingle friend in the world. The king was diſpleaſed on account of his not entering into his cauſe with the warmth he thought he had reaſon to expect; Anne Boleyn imputed to him the diſappointment of her hopes; while even queen Catharine and her friends expreſſed the greateſt indignation againſt him on account of the part he had openly taken in the affair of her divorce. In this miſerable ſituation the king

265 Is disgraced and persecuted.

king sent him a message by the dukes of Norfolk and Suffolk, demanding the great seal: the cardinal refused to deliver it without a more express warrant; upon which Henry wrote him a letter, and on receipt of this it was instantly given up. The seal was bestowed on Sir Thomas More; a man who, besides elegant literary talents, was possessed of the highest capacity, integrity, and virtue. Wolsey was next commanded to depart from York-place palace which he had built in London; and which, though it belonged to the see of York, was now seized by the king, and afterwards became the residence of the British sovereigns, under the name of *Whitehall*. All his furniture and plate, the richness of which seemed rather proper for a monarch than a subject, was seized for the king's use. He was then commanded to retire to Esher, a country-seat which he possessed near Hampton court, and there to wait the king's pleasure. One disgrace followed another; and his fall was at length completed by a summons to London to answer a charge of high-treason. This summons he at first refused to answer, as being a cardinal. However, being at length persuaded, he set out on his journey; but was taken ill, and died by the way. See the article Wolsey.

266 All the universities of Europe consulted about the legality of the king's marriage.

After the death of Wolsey, the king, by the advice of Cranmer*, had the legality of his marriage debated in all the universities of Europe; and the votes of these were obtained in his favour by dint of money. The debursements made on the occasion have even been preserved to this day. To a subdeacon he gave a crown, to a deacon two crowns, and so to the rest in proportion to the importance of their station or opinion.—Being thus fortified by the opinions of the universities, and even of the Jewish rabbies (for them also he had consulted), Henry began to think he might safely oppose the pope himself. He began by reviving in parliament an old law against the clergy, by which all those who had submitted to the authority of the pope's legate were condemned to severe penalties. The clergy, to conciliate the king's favour, were obliged to pay a fine of 118,000 pounds. A confession was likewise extorted from them, that the king, and not the pope, was the supreme head of the church and clergy of England. An act was soon after passed against levying the first-fruits, or a year's rent of all the bishoprics that fell vacant. After this the king privately married his beloved Anne Boleyn; and she proving with child soon after marriage, he publicly owned her for his wife, and passed with her through London, with a greater magnificence than had ever been known before. The streets were strewed with flowers, the walls of the houses hung with tapestry, and an universal joy seemed to be diffused among the people. The unfortunate queen Catharine, perceiving all further opposition to be vain, retired to Amphthill near Dunstable, where she continued the rest of her days in privacy and peace. Her marriage with Henry was at last declared invalid, but not till after the latter had been married to Anne Boleyn, though this declaration ought undoubtedly to have preceded it. See Boleyn.

* See *Cranmer*.

267 Henry's final quarrel with the pope.

The pope was no sooner informed of these proceedings, than he passed a sentence, declaring Catharine to be the king's only lawful wife; requiring him to take her again, and denouncing his censures against him in case of a refusal. Henry, on the other hand, knowing that his subjects were entirely at his command, resolved to separate totally from the church of Rome. In the year 1534, he was declared head of the church by parliament; the authority of the pope was completely abolished in England; all tributes formerly paid to the holy see were declared illegal; and the king was entrusted with the collation to all ecclesiastical benefices. The nation came into the king's measures with joy, and took an oath called the *oath of supremacy*: all the credit which the popes had maintained over England for ages, was now overthrown at once; and none seemed to repine at the change, except those who were immediately interested by their dependence on Rome.

268 Is declared head of the church.

But though the king thus separated from the church of Rome, he by no means adhered to the doctrines of Luther which had been lately published. He had written a book against this celebrated reformer, which the pope pretended greatly to admire; and honoured King Henry, on its account, with the title of "Defender of the faith." This character he seemed to be determined to maintain, and therefore persecuted the reformers most violently. Many were burnt for denying the popish doctrines, and some also were executed for maintaining the supremacy of the pope. The courtiers knew not which side to take, as both the new and old religions were equally persecuted; and as both parties equally courted the favour of the king, he was by that means enabled to assume an absolute authority over the nation. As the monks had all along shown the greatest resistance to Henry's ecclesiastical character, he resolved at once to deprive them of the power of injuring him. He accordingly empowered Cromwell, secretary of state, to send commissioners into the several counties of England to inspect the monasteries; and to report, with rigorous exactness, the conduct and deportment of such as were found there. This employment was readily undertaken by some creatures of the court, whose names were Layton, London, Price, Gage, Petre, and Belasis. They are said to have discovered monstrous disorders in many of the religious houses; whole convents of women abandoned to all manner of lewdness; friars accomplices in their crimes; pious frauds every where committed, to increase the devotion and liberality of the people; and cruel and inveterate factions maintained between the inhabitants. Thus a general horror was excited against these communities; and therefore the king, in 1536, suppressed the lesser monasteries, amounting to 376 in number. Their revenues, computed at 32,000 pounds a-year, were confiscated to the king's use; besides their plate and other goods, computed at 100,000 pounds more. In 1538, the greater monasteries also were demolished. The better to reconcile the people to this great innovation, stories were published, perhaps with aggravations, of the detestable lives which the friars led in their convents. The reliques also, and other objects of superstitious veneration, were now brought forth, and became objects of derision to the reformers. A great number of these are enumerated by Protestant writers; such as the parings of St Edmund's toes; some of the coals that roasted St Laurence; the girdle of the Virgin Mary, shown in no fewer than eleven different places; two or three heads of St Ursula; the felt of St Thomas of Lancaster, an infallible cure for the headach; part of St Thomas of Canterbury's shirt, much

269 Suppression of the monasteries.

England. much reverenced among big-bellied women; some reliques, an excellent preservative against rain, others against weeds in corn; &c. Some impostures, however, were discovered, which displayed a little more ingenuity in the contrivance. At Hales in the county of Glocester had been shown, during several ages, the blood of Christ brought from Jerusalem. The veneration for this precious relique may easily be imagined; but it was attended with a most remarkable circumstance not observed in any other reliques. The sacred blood was not visible to any one in mortal sin, even when set before him; nor could it be discovered till he had performed good works sufficient for his absolution. At the dissolution of the monastery, the whole contrivance was discovered. Two of the monks who were let into the secret, had taken the blood of a duck, which they renewed every week: they put it into a phial, one side of which was thin and transparent crystal, the other thick and opaque. When any rich pilgrim arrived, they were sure to show him the dark side, till masses and offerings had expiated his offences; after which they made him happy, by turning the phial. —A miraculous crucifix had been kept at Boxely in Kent, and bore the appellation of the *rood of grace*. The lips, eyes, and head of the image, moved on the approach of its votaries. Helsey bishop of Rochester broke the crucifix at St Paul's cross, and showed to all the people the springs and wheels by which it had been secretly moved. A great wooden idol, called *Darvel Gatherin*, was also brought to London and cut in pieces: and, by a cruel refinement of vengeance, it was employed as fuel to burn Friar Forest; who was punished for denying the king's supremacy, and for some pretended heresies. A finger of St Andrew, covered with a thin plate of silver, had been pawned for a debt of 40 pounds; but as the king's commissioners refused to release the pawn, people made themselves very merry with the poor creditor on account of his security. On this occasion also was demolished the noted shrine of Thomas a Becket, commonly called *St Thomas of Canterbury**. The riches of it were inconceiveable when broken down; the gold with which it was adorned filled two large chests that eight strong men could scarce carry out of the church. The king, on the whole, suppressed 645 monasteries, of which 28 had abbots who enjoyed a seat in parliament. Ninety colleges were demolished in several counties; 2374 chantries and free chapels, and 110 hospitals. The whole revenue of these establishments amounted to 161,100 pounds.

* See *Becket*.

It is easy to imagine the indignation which such an uninterrupted course of sacrilege and violence would accasion at Rome. In 1535, the king had executed Bishop Fisher, who was created a cardinal while in prison, and Sir Thomas More, for denying or speaking ambiguously about his supremacy. When this was reported in Italy, numerous libels were published all over the country, comparing the king of England to Nero, Domitian, Caligula, and the most wicked tyrants of antiquity. Clement VII. died about six months after he had threatened the king with a sentence of excommunication; and Paul III. who succeeded him in the Papal throne, entertained some hopes of an accommodation. But Henry was so much accustomed to domineering, that the quarrel was soon rendered totally incurable. The execution of Fisher was reckoned such a capital injury, that at last the pope passed all his censures against the king, citing him and all his adherents to appear in Rome within 90 days, in order to answer for their crimes. If they failed, he excommunicated them; deprived the king of his realm; subjected the kingdom to an interdict; declared his issue by Anne Boleyn illegitimate; dissolved all leagues which any Catholic princes had made with him; gave his kingdom to any invader; commanded the nobility to take up arms against him; freed his subjects from all oaths of allegiance; cut off their commerce with foreign states; and declared it lawful for any one to seize them, to make slaves of their persons, and to convert their effects to his own use. But though these censures were then passed, they were not openly denounced. The pope delayed the publication till he should find an agreement with England totally desperate, and till the emperor, who was then hard pressed by the Turks and the Protestant princes of Germany, should be in a condition to carry the sentence into execution. But in 1538, when news arrived at Rome that Henry had proceeded with the monasteries as above related, the pope was at last provoked to publish the censures against him. Libels were again dispersed, in which he was anew compared to the most furious persecutors of antiquity, and the preference was now given on their side. Henry, it was said, had declared war with the dead, whom the Pagans themselves respected; was at open enmity with heaven; and had engaged in professed hostility with all the saints and angels. Above all, he was reproached with his resemblance to the emperor Julian, whom (it was said) he imitated in his apostacy and learning, though he fell short of him in his morals. But these terrible fulminations had now lost their effect. Henry had long ago denied the supremacy of the Pope, and therefore had appealed from him to a general council; but now, when a general council was summoned at Mantua, he refused to be subject to it, because it was called by the pope, and lay entirely under subjection to that spiritual usurper. He engaged his clergy to make a declaration to the like purpose, and prescribed to them many other alterations with regard to their ancient tenets and practices. It was expected that the spirit of opposition to the church of Rome would have at last made him fall in with the doctrines of the reformed; but though he had been gradually changing the theological system in which he was educated, ever since he came to the years of maturity, he was equally positive and dogmatical in the few articles he retained, as tho' the whole fabric had continued entire and unshaken: and though he stood alone in his opinion, the flattery of courtiers had so much inflamed his tyrannical arrogance, that he thought himself intitled to regulate by his own particular standard, the religious faith of the whole nation. The point on which he chiefly rested his orthodoxy was the most absurd in the whole Popish doctrine, namely, that of transubstantiation. All departure from this he held to be a damnable error; and nothing, he thought, could be more honourable for him, than, while he broke off all connections with the Roman pontiff, to maintain, in this essential article, the purity of the Catholic faith.

England.

170 The king excommunicated.

271 His absurd and tyrannical conduct.

In 1539, a parliament was called, which met on the 28th day of April. The chancellor opened this par-

England. parliament by informing the House of Lords, that it was his majesty's earnest desire to extirpate from his kingdom all diversity of opinions with regard to religion; and as this enterprise was, he owned, difficult and important, he desired them to choose a committee from among themselves, who might frame certain articles, and communicate them afterwards to parliament. The lords named the vicar-general Cromwell, now created a peer, the archbishops of Canterbury and York, the bishops of Durham, Carlisle, Worcester, Bath and Wells, Bangor and Ely. This small committee itself was agitated with such diversity of opinions, that it could come to no conclusion. The Duke of Norfolk then moved, that since there was no hope of having a report from the committee, the articles of faith proposed to be established should be reduced to six, and a new committee be appointed to frame an act with regard to them. As this peer was understood to speak the king's mind, his motion was immediately complied with; and after a short prorogation, the bill of the six articles, or the *bloody bill*, as the Protestants justly termed it, was introduced: and having passed the two houses, received the king's assent. By this law the doctrine of the real presence was established; the communion in one kind; the perpetual obligation of vows of chastity; the utility of private masses; the celibacy of the clergy; and the necessity of auricular confession. The denial of the real presence subjected the person to death by fire, and to the same forfeiture as in cases of treason; and admitted not the privilege of abjuring: an unheard-of cruelty, unknown even to the inquisition itself. The denial of any of the other articles, even though recanted, was punishable by the forfeiture of goods and chattels, and imprisonment during the king's pleasure: an obstinate adherence to error, or a relapse, was adjudged to be felony, and punishable by death. The marriage of priests was subjected to the same punishment. Their commerce with women, was, for the first offence, forfeiture and imprisonment; and for the second, death. Abstaining from confession, and from receiving the eucharist at the accustomed times, subjected the person to fine, and to imprisonment during the king's pleasure; and if the criminal persevered after conviction, he was punishable by death and forfeiture, as in cases of felony. Commissioners were to be appointed by the king for enquiring into these heresies and irregular practices, and the criminals were to be tried by a jury.

272 Law of the six articles framed.

The parliament having thus surrendered their ecclesiastical privileges, next proceeded to surrender their civil ones also. They gave to the king's proclamations the same force as to statutes enacted by parliament, and thus by one blow made a total subversion of the English constitution; and to render the matter worse, if possible, they framed this law as if it were only declaratory, and intended to explain the natural extent of the royal authority.—Notwithstanding this, however, they afterwards pretended to make some limitations in the regal power; and they enacted, that no proclamation should deprive any person of his lawful possessions, liberties, inheritances, &c. nor yet infringe any common law or laudable custom of the realm.

As soon as the act of the six articles had passed, the Catholics were extremely vigilant to inform against offenders; and, in a short time, no fewer than 500 persons were thrown into prison. But some of the chief officers of state remonstrating against the cruelty of punishing such a number of delinquents, they were all of them set at liberty; and soon after this, Henry, as if he had resolved to give each party the advantage by turns, granted every one permission to have a translation of the Bible, which had been newly made, in his family. England.

In 1540, the king again complained to parliament of the great diversity of religious tenets which prevailed among his subjects; a grievance, he affirmed, which ought the less to be endured, because the scriptures were now published in England, and ought universally to be the standard of belief to mankind. But he had appointed, he said, some bishops and divines to draw up a list of tenets; and he was determined that Christ and the truth should have the victory; whence he seems to have expected more from this new book of his doctors, than had ensued from the publication of the scriptures. Cromwell, as vicar-general, also made a speech in the upper house; and the peers in return told him, that he deserved to be vicar-general to the universe: To such a degree of mean and servile submission was the English parliament at this time reduced.

273 Suppression of the knights of Malta.

This year also the king suppressed the only religious order remaining in England; namely, the knights of St John of Jerusalem, or the *knights of Malta*, as they are commonly called. This order had by their valour done great service to Christendom; and had very much retarded, at Jerusalem, Rhodes, and Malta, the rapid progress of the barbarians. During the general surrender of the religious houses in England, they had obstinately refused to give up their revenues to the king; and Henry, who would endure no society that professed obedience to the pope, was obliged to have recourse to parliament for the dissolution of this order. Their revenues were large, and formed a considerable addition to the acquisitions which the king had already made. But he had been such a bad economist, that, notwithstanding the immense plunder afforded him by the church, he now demanded from parliament a very considerable supply. The commons, however, though lavish of the blood of their fellow-subjects, were extremely frugal of their money; and it was not without murmuring that the grant could be obtained, even by this absolute and dreaded monarch.

The king all this time continued to punish with unrelenting severity the Protestants who offended against the law of the six articles, and the Papists who denied his supremacy; which gave occasion to a foreigner at that time to say, that those who were against the Pope were burned, and those who were for him were hanged. The king even seemed to display in an ostentatious manner his tyrannical justice and impartiality which reduced both parties to subjection. This year he executed three Protestants and three Papists coupled together. The latter declared, that the most grievous part of their punishment was the being coupled to such heretical miscreants as suffered with them.

274 And of many colleges, hospitals, &c.

In 1542, Henry proceeded to the further dissolution of colleges, hospitals, and other foundations of that nature. The courtiers had been dealing with the presidents and governors to make a surrender of their

 revenues

revenues to the king; and they had succeeded with eight. But there was an obstacle to their farther progress; it had been provided by the local statutes of most of these foundations, that no president nor any fellows could make such a deed without the unanimous consent of all the fellows. This consent would not have been easily obtained; but the parliament proceeded in a summary manner to annul all these statutes; by which means the revenues of those houses were exposed to the rapacity of the king and his favourites. Henry also now extorted from many bishops a surrender of their chapter-lands; by which means he pillaged the sees of Canterbury, York, and London, and enriched his favourites with their spoils. He engaged the parliament to mitigate the penalties of the six articles, as far as regarded the marriage of priests which was only now subjected to a forfeiture of goods, chattels, and lands during life: he was still equally bent on maintaining a rigid purity in speculative principles. He had appointed a commission consisting of two archbishops and several bishops of both provinces, together with a considerable number of doctors of divinity; and by virtue of his ecclesiastical supremacy he had charged them to choose a religion for his people. Before the commissioners, however, had made any progress in this arduous undertaking, the parliament had passed a law by which they ratified all the tenets which these divines should establish with the king's consent; and thus they were not ashamed of declaring expressly that they took their religion upon trust, and had no other rule either in religious or temporal concerns than the arbitrary will of their master. One clause of the statute, however, seems to favour somewhat of the spirit of liberty. It was enacted, that the ecclesiastical commissioners should establish nothing repugnant to the laws and statutes of the realm. But in reality this proviso was inserted by the king, to serve his own purposes. By introducing a confusion and contradiction into the laws, he became more the master of every one's life and property; and as the ancient independence of the church still gave him jealousy, he was well pleased, under colour of such a clause, to introduce appeals from spiritual to civil courts. For the same reason he would never promulgate a body of canon law: and he encouraged the judges on all occasions to enterpose in ecclesiastical causes, wherever they thought the law or the perrogative concerned. Being thus armed by authority of parliament, or rather by their acknowledgement of his spiritual supremacy, the king employed his commissioners to select a system of tenets for the assent and belief of the nation. A small volume was published under the title of *The Institution of a Christian Man*, which was received by the convocation, and made the infallible standard of orthodoxy. In this book the points of justification, faith, free-will, good works, and grace, were discussed in a manner somewhat favourable to the opinions of the reformers. The sacraments, which a few years before were only allowed to be three, were now encreased to seven, conformably to the sentiments of the Catholics. Throughout the whole of this book the king's caprice is very discernible; and the book is in reality to be regarded as his composition. For Henry, while he made his opinion a rule for the nation, would himself submit to no authority whatever; not even to any which he had formerly established. The

275
Extreme absurdity of the king's conduct.

same year the people had a farther instance of the king's inconsistency. He ordered a new book to be composed, called the *Erudition of a Christian Man*; and without asking the consent of the convocation, he published by his own outhority this new model of orthodoxy. He was no less positive in his new creed than he had been in the old one; but though he required the faith of the nation to veer about at his signal, he was particularly careful to inculcate the doctrine of passive obedience in all his books, and he was no less careful to retain the nation in the practice.

But while the king was thus spreading his own books among the people, both he and the clergy seem to have been very much perplexed with regard to the scriptures. A review had been made by the ecclesiastical synod of the new translation of the Bible: and Bishop Gardiner had proposed, that instead of employing English expressions throughout, several Latin words should still be preserved, because they contained, as he pretended, such peculiar energy and significance, that they had no correspondent terms in the English tongue. Amon these were *ecclesia*, *pœnitentia*, *pontifex*, *contritus*, &c. But as this mixture would appear extremely barbarous, and was plainly calculated for no other purpose than to retain the people in their ancient ignorance, the proposal was rejected. The knowledge of the people, however, seemed to be still more dangerous than their ignorance; and the king and parliament, soon after the publication of the scriptures, retracted the concession which they had formerly made, and prohibited all but gentlemen and merchants to peruse them. Even that liberty was not granted without an apparent hesitation, and dread of the consequences. These persons were allowed to read, *so it be done quietly and with good order*. And the preamble to the act sets forth, "That many seditious and ignorant persons had abused the liberty granted them of reading the Bible; and that great diversity of opinion, animosities, tumults, and schisms, had been occasioned by perverting the sense of the scriptures." The mass-book also passed under the king's examination; but little alteration was yet made in it. Some doubtful or fictitious saints only were struck out; and the name of the pope was erased. The latter precaution was also used with every new book that was printed, and even every old one that was sold. The word *pope* was carefully omitted or blotted out; as if that precaution could abolish the term from the language, or cause the people forget that such a person existed. About this time also, the king prohibited the acting of plays, interludes, and farces, in derision of the Popish superstitions; which the Protestants had been in use to practise: and this prohibition was in the highest degree pleasing to the Roman Catholics.

In this tyrannical and headstrong manner Henry proceeded with regard to ecclesiastical affairs. In other respects his conduct was equally violent. With regard to his domestic concerns, history scarce affords his parallel. We have already taken notice of his extreme love for Anne Boleyn, whom he married, contrary even to his own principles, before the marriage with Catharine was dissolved. His affection for the former was carried to such an height, that he even procured an act excluding from the succession the issue of Queen Catharine, in favour of the children of Anne

England.

276 The succession settled on the children of Anne Boleyn.

Anne Boleyn; and failing them to the king's heirs for ever. An oath to this purpose was likewise enjoined, under penalty of imprisonment during the king's pleasure, and forfeiture of goods and chattels. All slander against the king and his new queen or their issue, was subjected to the penalty of treason or misprision of treason. The reason given for this extreme severity towards his own child was, that her mother had obstinately refused to quit the kingdom, notwithstanding all the methods he could take to induce her to do so. The oath was generally taken throughout the kingdom; Sir Thomas More the chancellor, and Fisher bishop of Rochester, being the only persons who refused; for which both of them were imprisoned, and soon after executed. The unfortunate queen Catharine died, in her retreat at Amphthill, in the year 1536. On her death-bed she wrote a most pathetic letter to the king, in which she forgave him all the injuries she had received, and recommended to him in the strongest terms their daughter

277 Indecent behaviour of the new queen on hearing of the death of Catharine.

the princess Mary. This letter affected Henry so much, that he could not read it without tears; but the new queen is said to have exulted in such a manner on hearing of the death of her rival, as was quite inconsistent with either decency or humanity. Her triumph, however, was of short duration. Henry had

278 The king's affection declines.

no sooner possessed her, secure from every disquieting thought by the death of queen Catherine, than his passion began to decline; and to this her delivery of a dead son did not a little contribute; for so impetuous and absurd were his passions, and such was his desire for male issue, that the disappointment in this respect alone was sufficient to alienate his affection from his wife. The levity of her temper, and her extreme gaiety of behaviour bordering upon licentiousness, as related under the article BOLEYN, also gave an opportunity to her enemies of enflaming the king's jealousy

279 She is accused of infidelity to the king.

against her. The viscountess of Rocheford, in particular, a woman of profligate manners, and who was married to the queen's brother, had the cruelty to report to the king that her husband committed incest with his own sister; and, not content with this, she interpreted every instance of favour shown by her to a man, as a proof of a criminal intercourse between them.

280 Henry's love for Jane Seymour the true cause of Anne Boleyn's death.

At the same time it must not be forgot, that he who insisted on such rigid fidelity from his wives, was himself the most faithless of mankind. He had doubts, it may be allowed, about the legality of his marriage with Queen Catharine, but his doubts were evidently confirmed by the charms of Anne Boleyn. After being satiated with the possession of her for six years, perhaps he really doubted her fidelity; but here again his doubts were confirmed by the beauty of Jane Seymour, with whom he now fallen in love. It may easily be believed, that from this consideration alone there was no reason to hope that ever the unfortunate Anne would be able to exculpate herself. Had she really been guilty, her monster of a husband might have allowed her to live; but his cruelty was as unbounded and insatiable as his other perverse passions. She was condemned; and the sentence pronounced against her was, that she should be burned or beheaded at the king's pleasure. On hearing this dreadful denunciation, she exclaimed, "O Father! O Creator! thou who art the way, the truth, and the life! thou knowest that I have not deserved this fate." She then made the most solemn protestations of innocence before her judges; but these, as they had been from the beginning ineffectual, so it was not to be supposed that they could now avail any thing.

281 Execution of Anne Boleyn, and third marriage of Henry.

Anne was beheaded by the executioner of Calais, who was reckoned more expert than any in England; and Henry enjoyed the pleasure of marrying his beloved Jane Seymour. His satisfaction, however, was of no long continuance: for the queen, becoming pregnant imme-

282 Queen Jane dies in child-bed of Edward VI.

diately after marriage, died in two days after the birth of the child; who being a son, was baptised by the name of Edward VI. As this lady had been more beloved by Henry than any of his other wives, his grief for the loss of her was extreme. However, it did

283 Extravagant behaviour of the king concerning his fourth marriage.

not hinder him from entering very soon afterwards into a new matrimonial scheme; in which he met with many difficulties. His first proposals were made to the duchess dowager of Milan, niece to the emperor and to Catharine his own former queen; but as he had behaved so indifferently to the aunt, it is scarce to be supposed that his addresses could prove agreeable to the niece. On this he demanded the duchess dowager of Longueville, daughter of the duke of Guise; but on making the proposal to the French monarch, Francis I. he was informed that the princess had been already betrothed to the king of Scotland. Henry, however, would take no refusal. He had learned that the object of his affection was endowed with many accomplishments, was very beautiful, and of a large size, which last property he looked upon to be necessary for him who was now become somewhat corpulent himself. Francis, to prevent any more solicitations on this subject, sent the princess to Scotland, but at the same time made Henry an offer of Mary of Bourbon, daughter of the Duke of Vendosme. This princess was rejected by Henry, because he had heard of her being formerly refused by the king of Scotland. He was then offered his choice of the two younger sisters of the queen of Scotland, both of them being equal in merit as well as size to the one whom he had desired: but Henry, unwilling to trust to any reports concerning the beauty of these ladies, or even to their pictures, proposed to Francis, that they should have a conference at Calais under pretence of business, and that the latter should bring with him the two princesses of Guise with the finest ladies of quality in France, that he might make a choice. This indelicate proposal shocked Francis: he returned for answer, that he was too much impressed with regard for the fair-sex to carry ladies of the first quality, like geldings, to a market, to be chosen or rejected according to the humour of the purchaser. Henry remonstrated and stormed as usual; but though Francis at this time earnestly wished to oblige him, he

284 Marriage with Anne of Cleves.

at last totally rejected the proposal. Negociations were then entered into for a German match; and the princess of Cleves was proposed by Cromwell, on account of the great interest her father had with the Protestant princes of Germany. Henry had also become enamoured of her person from a picture of her he had seen: but this, tho' drawn by an eminent artist, was unluckily done so much to the advantage, that when the negociation was quite finished, and the bride arrived in England, he lost all patience, swearing that she was a great Flanders mare, and that he could never bear her the smallest affection. The matter was still worse, when he found that she could

England.

could ſpeak no language but Dutch, of which he was entirely ignorant. Notwithſtanding all theſe objections, however, he reſolved to complete the marriage, telling Cromwell, that ſince he had gone ſo far, he muſt now put his neck into the yoke. The reaſon of this was, that the friendſhip of the German princes was now more than ever neceſſary for Henry; and it was ſuppoſed that the affront of ſending the princeſs back to her own country might be reſented. Cromwell, who knew that his own life depended on the event of the matter, was very anxious to learn from the king how he liked his ſpouſe after having paſſed a night with her; but was ſtruck with terror when he replied that he now hated her more than ever; that he was reſolved not to cohabit with her, and even ſuſpected that ſhe was not a virgin; a matter in which he pretended to be a *connoiſſeur*, and about which he was extremely ſcrupulous. In a little time his averſion increaſed to ſuch a degree, that he determined at any rate to get rid of his queen and prime miniſter both at once. Cromwell had long been an object of averſion to the nobility, who hated him on account of his obſcure birth; his father being no other than a blackſmith, though the ſon had obtained the firſt employments in the kingdom. By his office of vicar-general, he had an almoſt abſolute authority over the clergy; he was alſo lord privy-ſeal, lord chamberlain, and maſter of the wards. He had alſo been inveſted with the order of the garter, and was created earl of Eſſex. This was ſufficient to raiſe the envy of the courtiers: but he had alſo the misfortune to fall under the diſpleaſure of both Proteſtants and Papiſts; the former hating him on account of his concurrence with Henry in their perſecution, and the latter looking upon him as the greateſt enemy of their religion. To theſe unfortunate circumſtances on the part of Cromwell, was added the uſual ſituation of Henry himſelf, who had now fallen in love with Catharine Howard, niece to the duke of Norfolk; to enjoy whom, he now determined to divorce Anne of Cleves. By the inſinuations of this lady and her uncle, Cromwell's ruin was accompliſhed; and he was condemned, not only without any trial, but even without examination. The charge was of hereſy and high treaſon; but the inſtances of the latter were quite abſurd and ridiculous He ſubmitted, however, to his ſentence without murmuring, as knowing that his complaints on this ſubject would be revenged on his ſon. He was terribly mangled by the executioner before his head could be ſtruck off. His death was ſoon followed by the diſſolution of the marriage with the princeſs of Cleves, which was annulled by the conſent of both parties. The princeſs parted from him with great indifference; and accepted of L.3000 a-year as a compenſation, but refuſed to return to her own country after the affront ſhe had received.

285 The marriage annulled and Cromwell put to death.

286 Henry falls in love with Catherine Howard.

287 Infidelity and death of the new queen.

The king's marriage with Catherine Howard ſoon followed the diſſolution of that with Anne of Cleves; but the event may ſurely be regarded as a providential puniſhment upon this tyrant, whoſe cruelty, luſt, and other bad qualities, can ſcarcely be matched in hiſtory. We have already mentioned his inſinuations againſt the virtue of the unfortunate princeſs of Cleves, were amply repaid by the actual infidelities of his new queen, whom we muſt ſuppoſe he believed to be a pure and perfect virgin at the time he married her. So happy indeed did he imagine himſelf in this new marriage, that he publicly returned thanks for his conjugal felicity, when a moſt unfortunate information concerning the queen's incontinence was given to Cranmer by one of the name of Laſcelles, whoſe ſiſter had been ſervant to the ducheſs dowager of Norfolk. He not only gave intelligence of her amours before marriage, but affirmed that ſhe had continued the ſame criminal practices ever ſince. Two of her paramours were arreſted, and confeſſed their crimes: the queen herſelf alſo confeſſed guilt before marriage, but denied having ever been falſe to the king's bed; which, however, had very little probability. She was beheaded on Tower-hill, along with the viſcounteſs of Rochford, who had been a confident in her amours. The latter, as has already been obſerved, was a principal inſtrument in procuring the deſtruction of the unhappy Anne Boleyn, and therefore died unpitied; while the virtuous character of that unfortunate lady received an additional confirmation from the diſcovery of this woman's guilt.

288 Abſurdity of the king.

Th ſecure himſelf from any farther diſaſters of this kind, Henry paſſed a moſt extraordinary law, enacting that any one who ſhould know, or ſtrongly ſuſpect any guilt in the queen, might, within 20 days, diſcloſe it to the king or council, without incurring the penalty of any former law againſt defaming the queen; though at the ſame time every one was prohibited from ſpreading the matter abroad, or even privately whiſpering it to others. It was alſo enacted, that if the king married any woman who had been incontinent, taking her for a true maid, ſhe ſhould be guilty of treaſon if ſhe did not previouſly reveal her guilt to him.

These laws afforded diverſion to the people, who now ſaid that the king muſt look out for a widow; as no reputed maid would ever be perſuaded to incur the penalty of the ſtatute. This in truth happened to be the caſe at laſt; for about a year after the death of Catharine Howard, he married for his ſixth wife, Catharine Parr, widow of Nevil Lord Latimer. This lady, being ſomewhat inclined to the doctrines of the reformation, and having the boldneſs to tell her huſband her mind upon the ſubject, had like to have ſhared the fate of the reſt. This furious monarch, incapable of bearing the leaſt contradiction, inſtantly complained to biſhop Gardiner, who inflamed the quarrel as much as poſſible; ſo that at laſt the King conſented that articles of impeachment ſhould be drawn up againſt her. But theſe were rendered abortive by the prudence and addreſs of the queen, as related under the article Parr.

289 Sixth marriage with Catharine Parr, whom he intends alſo to put to death.

290 Monſtrous cruelty of the king.

All this time Henry had tyrannized over his nobility in the moſt cruel manner. The old counteſs of Saliſbury, the laſt of the houſe of Plantagenet, was executed with circumſtances of great cruelty. She had been condemned, as uſual, without any trial; and when ſhe was brought to the ſcaffold, refuſed to lay her head on the block in obedience to a ſentence, to the juſtice of which ſhe had never conſented. She told the executioner, therefore, that if he would have her head, he muſt win it the beſt way he could; and thus ſhe ran about the ſcaffold, purſued by the executioner, England. tioner, who aimed many fruitless blows at her neck before he was able to put an end to her life. Soon after her, the Lord Leonard Grey was likewise executed for treason, but we have very little account of this transaction.

291 Attainder of Norfolk and Surry.

The last instances of the king's injustice and cruelty were the duke of Norfolk, and his son the earl of Surry. The former had served the king with fidelity, and the latter was a young man of the most promising hopes. His qualifications, however, were no security against the violence of Henry's temper. He had dropped some expressions of resentment against the king's ministers, who had displaced him from the government of Boulogne; and the whole family had become obnoxious on account of the late Queen Catharine Howard. From these motives, orders were given to arrest both the father and son; and accordingly they were arrested both on the same day, and confined to the Tower. The duchess-dowager of Richmond, Surry's own sister, was among the number of his accusers; and Sir Richard Southwell also, his most intimate friend charged him with infidelity to the king. Surry denied the charge, and challenged his accuser to a single combat. This favour was denied him; and, notwithstanding his eloquent and spirited defence, he was condemned and executed at Tower-hill.—The duke of Norfolk vainly endeavoured to mollify the king by letters and submissions. An attainder was found against him, though the only crime his accusers could allege was, that he had once said that the king was sickly, and could not hold out long; and that the kingdom was likely to be torn between the contending parties of different persuasions. Cranmer, though engaged for many years in an opposite party to that of Norfolk, and though he had received many and great injuries from him, would have no hand in such an unjust prosecution; but retired to his seat at Croydon. The death-warrant, however, was made out, and immediately sent to the Lieutenant of the Tower; but a period was put to the cruelties and violence of the king by his death, which happened on the 14th of January 1547, the night before Norfolk was to have been executed.

292 Henry dies and is succeeded by Edward VI.

Henry was succeeded by his only son Edward, a boy of nine years of age. The most remarkable transactions of his reign are those with regard to religion. The restraint which Henry VIII. had laid upon the Protestants was now taken off; and they not only maintained their doctrines openly, but soon became the prevailing party. Henry had fixed the majority of his son at 18 years of age; and in the mean time, appointed 16 executors of his will, to whom, during the minority, he entrusted the government of the king and kingdom. This will, he imagined would be obeyed as implicitly after his death as though he had been alive. But the first act of the executors was to choose the Earl of Hertford, afterwards duke of Somerset, protector of the realm; and in him was lodged all the regal power, together with a privilege of naming whom he pleased for his privy council.

293 Reformation completed.

The duke of Somerset had long been reckoned a secret partisan of the reformers; and, immediately on his elevation to his present high dignity, began to express his intention of reforming the abuses of the ancient religion. Under his direction and that of Cranmer, therefore, the reformation was carried forward and completed. The only person of consequence who opposed the reformers was Gardiner bishop of Winchester; and, to the disgrace of their own principles, the reformers now showed that they could persecute as severely as the papists had formerly persecuted them. Gardiner was committed to the Fleet prison, where he was treated with great severity. He was afterwards sent to the Tower; and having continued there two years, he was commanded to subscribe several articles, among which was one confessing the justice of his own imprisonment. To all the articles but this he agreed to subscribe; but that did not give satisfaction. He was then committed to close custody; his books and papers were seized; all company was denied him, and he was not even permitted the use of pen and ink. The bishops of Chichester, Worcester, and Exeter, were in like manner deprived of their offices; but the bishops of Landaff, Salisbury, and Coventry, escaped by sacrificing the most considerable share of their revenues. The libraries of Westminster and Oxford were ordered to be ransacked, and purged of the Romish legends, missals, and other superstitious volumes; in which search, great devastation was made even in useful literature. Many volumes clasped in silver were destroyed for the sake of their rich bindings; many of geometry and astronomy were supposed to be magical, and destroyed on that account; while the members of the university, unable to put a stop to these ravages, trembled for their own safety.

294 The reformers persecute the catholics.

The reformers, however, were not contented with severities of this kind. A commission was granted to the primate and others, to search after all Anabaptists, heretics, or contemners of the new liturgy. Among the numbers who were found guilty upon this occasion, was one Joan Boucher, commonly called *Joan of Kent*; who was so very obstinate, that the commissioners could make no impression upon her. She maintained an abstruse metaphysical sentiment, that Christ, as man, was a sinful man; but as the Word, he was free from sin, and could be subject to none of the frailties of the flesh with which he was clothed. For maintaining this doctrine, the poor woman was condemned to be burnt to death as an heretic. The young king, who it seems had more sense than his teachers, refused at first to sign the death-warrant: but at last, being overcome by the importunities of Cranmer, he reluctantly complied; declaring, that if he did wrong, the sin should be on the head of those who had persuaded him to it. The primate, after making another unsuccessful effort to reclaim the woman from her opinions, committed her to the flames. Some time after, one Van Paris, a Dutchman was condemned to death for Arianism. He suffered with so much satisfaction, that he hugged and caressed the faggots that were consuming him.

The rest of this reign affords only the history of intrigues and cabals of the courtiers one against another. The protector was first opposed by his own brother admiral Sir Thomas Seymour, who had married Catharine Parr the late king's widow. She died soon after the marriage; and he then made his addresses to the Princess Elizabeth, who is said not to have been averse to the match. His brother, the duke, who was at that time in the north, being informed of his

England.

his ambitious projects, speedily returned, had him attainted of high treason, and at last condemned and executed. The duke of Somerset himself, however, was some time afterwards deprived of his office by Dudley duke of Northumberland; who at last found means to get him accused of high treason, and executed. Not satisfied with the office of protector, which he assumed on the death of Somerset, this ambitious nobleman formed a scheme of engrossing the sovereign power altogether.

295
Lady Jane Gray declared heir to the crown.

He represented to Edward, who was now in a declining state of health, that his sisters Mary and Elizabeth, who were appointed by Henry's will to succeed, in failure of direct heirs to the crown, had both been declared illegitimate by parliament; that the queen of Scots his aunt, stood excluded by the king's will; and, being an alien also, lost all right of succeeding. The three princesses being thus excluded, the succession naturally devolved to the marchioness of Dorset eldest daughter of the French queen, Henry's sister, who had married the earl of Suffolk after her first husband's death. The next heir to the marchioness was Lady Jane Gray, a lady universally respected, both on account of the charms of her person, and the virtues and endowments of her mind. The king, who was accustomed to submit to the politic views of this minister, agreed to have the succession submitted to council, where Northumberland hoped to procure an easy concurrence. The judges, however, who were appointed to draw up the king's letters patent for this purpose, warmly objected to the measure; and gave their reasons before the council. They begged that a parliament might be summoned, both to give it force, and to free its partisans from danger: they said that the form was invalid, and would not only subject the judges who drew it, but every counsellor who signed it, to the pains of treason. Northumberland could not brook their demurs; he threatened them with his authority, called one of them a *traitor*, and said he would fight with any man in his shirt in such a just cause as that of Lady Jane's succession. A method was therefore found out of screening the judges from danger, by granting them the king's pardon for what they should draw up; and at length the patent for changing the succession was completed, the princesses Mary and Elizabeth were set aside, and the crown settled on the heirs of the duchess of Suffolk (for she herself was contented to forego her claim.)

For some time the king had languished in a consumption. After this settlement of the crown, his health visibly declined every day, and little hopes were entertained of his recovery. To make matters worse, his physicians were dismissed by Northumberland's advice, and by an order of council; and he was put into the hands of an ignorant old woman, who undertook in a little time to restore him to health. After the use of her medicines all his bad symptoms increased to the most violent degree. He felt a difficulty of speech and breathing; his pulse failed, his legs swelled, his colour became livid, and many other signs of approaching death made their appearance.

296
Death of Edward IV.

He expired at Greenwich on the 6th of July 1553, in the 16th year of his age and 7th of his reign.

After the death of King Edward, very little regard was paid to the new patent by which Lady Jane Gray had been declared heir to the throne. The undoubted title of Mary, notwithstanding the scandalous behaviour of her father and his servile parliaments, was acknowledged by the whole nation. Northumberland, however, was resolved to put the late king's will in execution. He therefore carefully concealed the death of Edward, in hopes of securing the person of Mary, who by an order of council had been required to attend her brother during his illness; but she being informed of his death, immediately prepared to assert her right to the crown.

297
Lady Jane Gray placed on the throne, but is forced to resign it.

Northumberland then, accompanied by the duke of Suffolk, the earl of Pembroke, and some other noblemen, saluted Lady Jane Gray queen of England. Jane was in a great measure ignorant of these transactions, and it was with the utmost difficulty she was persuaded to accept of the dignity conferred upon her. At last she complied, and suffered herself to be conveyed to the tower, where it was then usual for the sovereigns of England to pass some days after their accession. Mary, however, who had retired to Kenning-hall in Norfolk, in a very few days found herself at the head of 40,000 men; and Lady Jane resigned the sovereignty in ten days, with much more pleasure than she had received it. She retired with her mother to their own habitation; and Northumberland finding his affairs quite desperate, attempted to quit the kingdom. But he was stopped by the band of pensioner guards, who informed him that he must stay to justify their conduct in taking arms against their lawful sovereign. He therefore surrendered himself to Mary; and was soon after executed, together with Sir John Gates and Sir Thomas Palmer, two infamous tools of his power. Sentence was also pronounced against Lady Jane Gray and her husband Lord Guildford; but without any intention of putting it in execution against them at present, as their youth and innocence pleaded so strongly in their favour, neither of them having yet reached their 17th year.

298
Mary declared queen.

Mary now entered London, and was peaceably settled on the throne without any effusion of blood. The English, however, soon found reason to repent their attachment to her cause. Though she had at first solemnly promised to defend the religion and laws of her predecessor, she no sooner saw herself firmly established on the throne, than she resolved to restore the Popish religion, and gave back their former power to the clergy. Gardiner, Bonner, and the other bishops who had been imprisoned or suffered loss during the last reign, were taken from prison, reinstated in their sees, and now triumphed in their turn. On pretence of discouraging controversy, the queen by her prerogative silenced all preachers throughout England, except such as should obtain a particular license, and this she was resolved to give only to those of her own persuasion. The greater part of the foreign Protestants took the first opportunity of leaving the kingdom; and many of the arts and manufactures, which they had successfully introduced, fled with them. Soon after, the queen called a parliament, which seemed willing to concur in all her measures. They at once repealed all the statutes with regard to religion that had passed during the reign of Edward VI. and the national religion was again placed on the same footing in which it had been the death of Henry VIII.

To strengthen the cause of the Catholics, and give the

the queen more power to establish the religion to which she was so much attached, a proper match was to be sought for her: and it was supposed that three had already been proposed as candidates for her favour. Her affection seemed to be engaged by the earl of Devonshire; but as he was rather attached to the Princess Elizabeth, he received the overtures which were made him from the queen with neglect. The next person mentioned as a proper match for her was Cardinal Pole, a man greatly respected for his virtues; but as he was now in the decline of life, Mary soon dropped all thoughts of that alliance. At last she cast her eye on Philip II. of Spain, son to the Emperor Charles V. He was then in the 27th year of his age, and consequently agreeable in that respect to Mary, who was in her 48th year; but when her intentions with regard to this match became known, the greatest alarm took place throughout the whole nation. The commons presented such a strong remonstrance against a foreign alliance, that the queen thought proper to dissolve the parliament in order to get quit of their importunity. To obviate, however, all clamour, the articles of marriage were drawn up as favourably as possible for the interests of England. It was agreed, that though Philip should have the title of king, the administration should be entirely in the queen; that no foreigner should be capable of holding any office in the kingdom; nor should any innovation be made in the laws, customs, and privileges of the people; that Philip should not carry the queen abroad without her consent, or any of her children without the consent of the nobility. Sixty thousand pounds a year were to be settled upon her as a jointure; and the male issue of this marriage was to inherit Burgundy and the Low Countries as well as the crown of England; and in case of the death of Don Carlos, Philip's son by his former marriage, without any heir, the queen's issue should inherit all the rest of the Spanish dominions also.

299 Proposals of marriage to Queen Mary.

300 Alliance with Spain generally disagreeable.

All these concessions, however, were not sufficient to quiet the apprehensions of the people: they were considered merely as words of course, which might be retracted at pleasure; and the whole nation murmured loudly against a transaction so dangerous to its ancient liberty and independence. An insurrection was raised by Sir Thomas Wyatt, a Roman Catholic, at the head of 4000 men, who set out from Kent to London, publishing a declaration against the Spanish match and the queen's evil counsellors. Having advanced as far as Southwark, he required that the queen should put the Tower of London into his hands; that she should deliver four counsellors as hostages; and, in order to ensure the liberty of the nation, should marry an Englishman. But his force was at present by far too small to support such magnificent pretensions; and he unluckily wasted so much time without attempting any thing of importance that the popular ferment entirely subsided, his followers abandoned him gradually, and he was at last obliged to surrender himself to Sir Maurice Berkeley near Temple-bar. His followers were treated with great cruelty, no fewer than 400 of them suffering by the hand of the executioner; 400 more were conducted with ropes about their necks into the queen's presence, and there received their pardon. Wyatt himself was condemned and executed.

301 Wyatt's insurrection.

302 He is condemned and executed with many of his followers.

This rebellion had almost proved fatal to the Princess Elizabeth, who for some time past had been treated with great severity by her sister. Mary, who possessed a most malignant and cruel heart, had never forgot the quarrel between their mothers; and when a declaration was made after her own accession, recognising Queen Catharine's marriage as legal, she was thus furnished with a pretence for accounting Elizabeth illegitimate. She was likewise obnoxious on account of her religion, which Elizabeth at first had not prudence sufficient to conceal; though afterwards she learned full well to disguise her sentiments. But above all, her standing so high in the affection of the Earl of Devonshire, was a crime not to be forgiven; and Mary made her sensible of her displeasure by numberless mortifications. She was ordered to take place at court after the Dutchess of Suffolk and the Countess of Lenox; to avoid which, and other indignities, Elizabeth at last retired from court altogether into the country. After the suppression of Wyatt's rebellion she was committed to the tower, and underwent a strict examination before the council; but as Wyatt had made a declaration on the scaffold that she was in no manner of way concerned, the queen found herself under a necessity of releasing her. To get rid of such a troublesome rival, however, she was offered in marriage to the Duke of Savoy; and on Elizabeth's declining the proposal, she was committed close prisoner to Woodstoke. The rebellion proved fatal, however, to many persons of distinction, and gave the queen an opportunity of manifesting that unbounded cruelty which reigned in her heart. The Tower, and all the prisons in the kingdom, were filled with nobility and gentry, who became objects of royal vengeance, more on account of their credit and interest with the people than any concern they were supposed to have had with Wyatt. Sir Nicholas Throgmorton was tried in Guildhall; but as no satisfactory evidence appeared against him, the jury gave a verdict in his favour. The queen was so much enraged at this disappointment, that she recommitted him to the Tower, summoned the jury before the council, and at last sent them all to prison, fining them afterwards some of 1000 l. and others of 2000 l. each. Sir John Throgmorton, brother to Sir Nicholas just mentioned, was condemned and executed upon evidence which had been already rejected as insufficient. But of all those who perished on this occasion, none excited more universal compassion than the unfortunate Lady Jane Grey and her husband Lord Guilford Dudley. They had already received sentence of death, as has been mentioned; and two days after the execution of Wyatt, they received orders to prepare for eternity. Lady Jane, who had been in expectation of this blow, was no ways intimidated, but received the news with the most heroic resolution. The place intended at first for their execution was Tower-hill; but the council, dreading the effects of the people's compassion for their youth, beauty, and innocence, gave direction that they should be beheaded within the verge of the Tower. The duke of Suffolk was soon after tried, condemned and executed: but would have met with more compassion, had not his am-

303 Princess Elizabeth harshly treated.

304 Execution of Lady Jane Grey and her husband.

England. ambition been the cause of his daughter's unhappy fate just mentioned. Sir Thomas Gray also lost his life on the same account: but the cruel spirit of Mary was still unsatisfied; and finding herself universally odious, that she might free herself from any apprehensions for what was past, as well as tyrannize with the more

305 The people disarmed. freedom in time to come, she disabled the people from resistance, by ordering general musters, and causing the commissioners seize their arms and lay them up in forts and castles.

Notwithstanding this unpopularity, however, the rebellion of Wyatt had so strengthened the hands of government, that a parliament was assembled in hopes of gratifying the queen's wishes in regard to her marriage with Philip of Spain. To facilitate this purpose also, the Emperor of Germany sent over to England. 400,000 crowns to be distributed among the members of parliament in bribes and pensions; a practice of which there had hitherto been no example in England, The queen, notwithstanding her bigotry, resumed the title of *Supreme Head of the Church*, which she had dropped three months before. Gardiner made a speech, in which he proposed, that they should invest the queen with a legal power of disposing of the crown, and appointing her successor; but the parliament, however obsequious in other respects, did not choose to gratify their sovereign in a measure by which the kingdom of England might become a province of the Spanish monarchy. They would not even declare it treason to imagine or attempt the death of the queen's husband during her life time, though they agreed to ratify the articles of marriage. Finding therefore that the parliament even yet was not sufficiently obsequious, it was

306 Marriage with Philip solemnized thought most proper to dissolve them. Soon after this the marriage with Philip was solemnized; but as the latter had espoused the queen merely with a view to become king of England, he no sooner found himself disappointed in this than he showed a total want of affection for her as a wife. He passed most of his time at a distance from her in the Low Countries: and seldom wrote to her except when he wanted money, with which Mary would at all times gladly have supplied him even had it been at the expence of her kingdom, if in her power.

307 Protestants persecuted. The enemies of the state being supposed to be suppressed, those of the Catholic religion were next persecuted. The old sanguinary laws which had been rejected by a former parliament were now revived. Orders were given, that the priests and bishops who had married should be ejected; that the mass should be restored, and the pope's authority established; and that the church and its privileges, all but their goods and estates should be put on the same footing on which they were before the commencement of the reformation. But as the gentry and nobility had already divided the church lands among them, it was thought inconvenient, and indeed impossible, to make a restoration of these. The persons who chiefly promoted these measures were Gardiner bishop of Winchester, and Cardinal Pole, who was a kinsman of Henry VIII. but had been long in Italy, and was now returned from it. The latter was for tolerating the Protestants; but the former, perceiving that rigorous measures would be most agreeable to the king and queen, declared himself against it. He was too prudent, however, to appear in person at the head of the persecution; and therefore consigned that office to Bonner bishop of London, a man of a very abandoned character. The bloody scene began by the execution of Hooper bishop of Glocester, and Rogers prebendary of St Paul's. These were quickly followed by others, of whom the principal were Archbishop Cranmer, Ridley bishop of London, and Latimer bishop of Worcester.* These persecutions soon became odious to the whole nation, and the perpetrators of them were all willing to throw the blame from themselves upon others. Philip endeavoured to fasten the whole reproach upon Bonner; but that bishop would not take the whole, and therefore retorted on the court. A bold step was now taken to introduce a court similar to the Spanish inquisition, that should be empowered to try heretics, and condemn them without any other law but its own authority. But even this was thought a method too dilatory in the present exigence of affairs. A proclamation issued against books of heresy, treason, and sedition, declared, that whosoever had such books in his possession, and did not burn them without reading, should suffer as a rebel. This was attended with the execution of such numbers, that at last the magistrates who had been instrumental in these cruelties refused to give their assistance any longer. It was computed, that during this persecution, 277 persons suffered by fire, besides those punished by imprisonments, fines, and confiscations. Among those who suffered by fire were 5 bishops, 21 clergymen, 8 lay-gentlemen, 84 tradesmen, 100 husbandmen, 55 women, and 4 children.

* See *Cranmer*, &c.

The only remarkable transaction which happened during this reign with regard to the temporal affairs of the kingdom was the loss of Calais, which had been in the possession of the English for upwards of 200 year.* This loss filled the whole kingdom with complaints, and the queen with grief. She was heard to say, that, when dead, the name of *Calais* would be found engraven on her heart. She did not long survive this loss; but died in the year 1558, of a lingering illness, after a reign of five years four months and eleven days.

* See *Calais*.

308 Mary dies, and is succeeded by Elizabeth.

After the death of Mary, the Princess Elizabeth succeeded to the throne without opposition. She was at Hatfield when news of her sister's death were brought her; upon which she hastened up to London, where she was received with great joy. This princess was well qualified for government. She had judgment sufficient to make choice of proper ministers, and authority enough to keep her subjects in awe. The restraints also, to which she had been subjected during her sister's reign, had taught her so well to conceal her sentiments, that she had become a perfect mistress of dissimulation; which, though no commendable part of her character, proved occasionally of great service to her government. She perfected the reformation, and put the religion of England upon the same plan which subsists at present. This was accomplished without the least difficulty; for the persecutions in Mary's reign had served only to give the whole nation an aversion for popery. In the time of Edward VI. the people had been compelled to embrace the Protestant religion, and their fears induced them to conform; but now, almost the whole nation were Protestants from inclination. The reformation was confirmed by act of parliament in 1559, and thus

thus England was seen to change its religion four times in the space of 32 years.

309 Peace with France.

During the time that the queen and her counsellors were employed in settling the religious affairs of the nation, negociations were likewise carried on for a peace between England and France; which was at last concluded on the following terms, viz. that Henry should restore Calais at the expiration of eight years; that in case of failure, he should pay 500,000 crowns, and Elizabeth's title to Calais still remain; that for the payment of this sum he should find the security of eight foreign merchants, not natives of France; and until that security were provided he should deliver five hostages. If during this interval Elizabeth should break the peace with France or Scotland, she should forfeit all title to Calais; but if Henry made war on Elizabeth, he should be obliged to restore the fortress immediately. This pacification was soon followed by an irreconcileable quarrel with Mary queen of Scotland; which was not extinguished but by the death of the Scottish princess; and that with such circumstances of accumulated treachery, hypocrisy, and dissimulation, as have stamped an indelible disgrace on the memory of Elizabeth. See the articles MARY and SCOTLAND.

310 Preparations for war with Spain.

Elizabeth having at last got rid of her rival in the year 1587, began to make preparations for resisting the Spanish invasion. Hearing that Philip was secretly fitting out a great navy to attack her, she sent Sir Francis Drake with a fleet to pillage his coasts and destroy his shipping. On this expedition he set sail with four capital ships furnished by the queen, and 26 others of various sizes furnished him by the merchants of London in hopes of sharing the plunder.

311 Exploits of Sir Francis Drake.

Having learned that a Spanish fleet richly laden was lying at Cadiz in readiness to set sail for Lisbon, he directed his course towards the former port, where he boldly attacked the enemy. Six galleys were obliged to take shelter under the cannon of the forts; he burned about 100 vessels laden with ammunition and naval stores; and destroyed a great ship belonging to the Marquis de Santa Croce. Thence setting sail for Cape St Vincent, he took by assault the castle situated on that promontory, with three other fortresses. Having next insulted Lisbon, he sailed to the Teneras, where after lying in wait for some time, he took a rich prize, and then returned to England; having by this short expedition taught the English to despise the huge and unwieldy ships of the enemy, and thus prepared them to act with more resolution against the formidable armament that now threatened to invade them.

312 Miscarriage of Philip's scheme of an invasion.

But tho' the expedition of Sir Francis Drake had retarded the intended invasion of England for a twelvemonth, it had not by any means induced Philip to abandon his design. During that interval he continued his preparations with the greatest assiduity, the more especially as the invasion of England seemed to be a necessary preparative for regaining his authority over the Netherlands, the revolted provinces having been strongly supported by Elizabeth. The fleet prepared at this time was superior to any thing then existing in the world; and no doubt being entertained of its success, it was ostentatiously styled the *Invincible Armada*. The miserable event of this expedition, and the total failure of all the mighty hopes of Philip, are related under the article ARMADA. The spirit and courage of the English were now excited to attempt invasions in their turn; which they executed in numerous descents on the Spanish coasts; though these were only temporary, and designed not for permanent conquest, but to harass the enemy. It would be endless to relate all the advantages obtained over the enemy at sea, where the capture of every ship must have made a separate narrative. It is sufficient to observe, that the sea-captains of that reign are still considered as the boldest and most enterprising set of men that England ever produced; and among this number we are to reckon Raleigh and Howard, Drake, Cavendish, and Hawkins. The English navy then began to take the lead; and has since continued irresistible in all parts of the ocean.

Elizabeth continued to reign with great glory till the year 1603; but all her greatness could not prevent her from being extremely miserable before her death. She had caused her greatest favourite, and probably her lover, the earl of Essex*, to be executed. Though this execution could not be called unjust, the queen's affection (on being informed that he had at last thrown himself entirely on her clemency) returned to such a degree, that she thenceforth gave herself entirely over to despair. 313 Grief and misery of Elizabeth. She refused food and sustenance; she continued silent and gloomy; sighs and groans were the only vent she gave to her despondence; and she lay for ten days and nights upon the carpet, leaning on cushions which her maids brought her. Perhaps the faculties of her mind were impaired by long and violent exercise; perhaps she reflected with remorse on some past actions of her life, or perceived, but too strongly, the decays of nature, and the approach of her dissolution. She saw her courtiers remitting in their assiduity to her, in order to pay their court to James the apparent successor. Such a concurrence of causes was more than sufficient to destroy the remains of her constitution; and her end was now visibly seen to approach. Feeling a perpetual heat in her stomach, attended with an unquenchable thirst, she drank without ceasing, but refused the assistance of her physicians. Her distemper gaining ground, Cecil and the lord admiral desired to know her sentiments with regard to the succession. To this she replied, That as the crown of England had always been held by kings, it ought not to devolve upon any inferior character, but upon her immediate heir the king of Scotland. Being then advised by the archbishop of Canterbury to fix her thoughts upon God, she replied, that her thoughts did not in the least wander from him. Her voice soon after left her; she fell into a lethargic slumber, which continued some hours; and she expired gently without a groan, in the 70th year of her age, and 45th of her reign. 314 Her death. She was succeeded by James I. king of Scotland; since which time the history of both England and Scotland is comprehended under the article BRITTAIN.

* See *Devereaux*.

315 England, how divided.

Since the Norman conquest, England has been divided into six circuits, each circuit containing a certain number of counties. Two judges are appointed for each circuit, which they visit in the spring and autumn, for administering justice to the subjects who are at a distance from the capital. In holding the lent (or spring) assizes, the northern circuit extends only to York and Lancaster; the assizes at Durham, Newcastle, Carlisle, and Appleby, being held only in the autumn,

autumn, and distinguished by the appellation of the *long circuit*. These circuits and counties are:

1. *Home Circuit* contains the counties of Essex, Hertford, Kent, Surry, and Sussex.

2. *Norfolk Circuit* contains those of Bucks, Bedford, Huntingdon, Cambridge, Suffolk, and Norfolk.

3. *Oxford Circuit.* Oxon, Berks, Gloucester, Worcester, Monmouth, Hereford, Salop, and Stafford.

4. *Midland Circuit.* Warwick, Leicester, Derby, Nottingham, Lincoln, Rutland, and Northampton.

5. *Western Circuit.* Hants, Wilts, Dorset, Somerset, Devon, and Cornwall.

6. *Northern Circuit.* York, Durham, Northumberland, Lancaster, Westmoreland, and Cumberland.

Middlesex and Cheshire are not comprehended in the above circuits; the former being the seat of the supreme courts of justice, and the latter a county palatine. There is still a court of chancery in Lancaster and Durham, with a chancellor; and there is a court of exchequer at Chester, of a mixed kind, both for law and equity, of which the chamberlain of Chester is judge: there are also other justices in the counties palatine to determine civil actions and pleas of the crown.

Besides the 40 counties into which England is divided, there are counties corporate, consisting of certain districts, to which the liberties and jurisdictions, peculiar to a county have been granted by charter from the throne. Thus the city of London is a county distinct from Middlesex; the cities of York, Chester, Bristol, Norwich, Worcester, and the towns of Kingston upon Hull and Newcastle upon Tyne, are counties of themselves, distinct from those in which they lie. The same may be said of Berwick upon Tweed, which lies in Scotland, and has within its jurisdiction a small territory of two miles on the north side of the river. Under the name of a *town*, boroughs and cities are contained: for every borough or city is a town, though every town is not a borough or city.—An account of the English constitution and government is given under the articles KING, LORDS, COMMONS, PARLIAMENT, LAW, LIBERTY, RIGHTS, &c.

316 Religion. The established religion of England is Episcopacy. Since the reign of Henry VIII. the sovereigns of England have been called, in public writs, the supreme heads of the church; but this title conveys no spiritual meaning, as it only denotes the regal power to prevent any ecclesiastical differences, or, in other words, to substitute the king in place of the pope before the reformation, with regard to temporalities and the internal economy of the church. The kings of England never intermeddle in ecclesiastical disputes, and are contented to give a sanction to the legal rights of the clergy.

The church of England, under this description of the monarchial power over it, is governed by two archbishops, and 24 bishops, besides the bishops of Sodor and Man, who, not being possessed of an English barony, does not sit in the house of peers. See ARCHBISHOP and BISHOP.

England contains about 60 archdeacons. Subordinate to them are the rural deacons, formerly styled *archpresbyters*, who signify the bishop's pleasure to his clergy, the lower class of which consists of parish-priests (who are called *rectors* or *vicars*), deacons, and curates. See the articles CURATE, DEACON, PARSON, and VICAR.

317 Revenues of the clergy. The following is a list of the English bishoprics, with their revenues, as charged in the king's books: though that sum is far from being the real annual value of the see, yet it assists in forming a comparative estimate between the revenues of each see with those of another.

ARCHBISHOPRICS.	£.	s.	d.
Canterbury, - -	2682	12	2
York, - -	1610	0	0
BISHOPRICS.			
London, - -	2000	0	0
Durham, - -	1821	1	3
Winchester, - -	3124	12	8
These three bishops take precedency of all others in England, and the others according to the seniority of their consecrations.			
Ely, - -	2134	18	6
Bath and Wells, - -	533	1	3
Hereford, - -	768	11	0
Rochester, - -	358	4	9
Lichfield and Coventry, -	559	17	3
Chester, - -	420	1	8
Worcester, - -	929	13	3
Chichester, - -	677	1	3
St Asaph, - -	187	11	8
Salisbury, - -	1385	5	0
Bangor, - -	131	16	3
Norwich, - -	834	11	7
Gloucester, - -	315	7	3
Landaff, - -	154	14	2
Lincoln, - -	894	18	1
Bristol, - -	294	11	0
Carlisle, - -	531	4	9
Exeter, - -	500	0	0
Peterborough, - -	414	14	8
Oxford, - -	381	11	0
St Davids, - -	426	2	1

The ecclesiastical government of England is, properly speaking, lodged in the convocation; which is a national representative or synod, and answers pretty near to the ideas we have of a parliament. They are convoked at the same time with every parliament; and their business is to consider of the state of the church, and to call those to an account who have advanced new opinions, inconsistent with the doctrines of the church of England. Some high-flying clergymen during the reign of queen Anne, and in the beginning of that of George I. raised the powers of the convocation to a height that was inconsistent with the principles of religious toleration, and indeed of civil liberty: so that the crown was obliged to exert its prerogative of calling the members together, and of dissolving them; and ever since they have not been permitted to sit for any time, in which they could do business.

ENGLAND-*New*. See NEW ENGLAND.

ENGLISH, or the *ENGLISH Tongue*, the language spoken by the people of England, and, with some variation, by those of Scotland, as well as part of Ireland, and the rest of the British dominions.

The ancient language of Britain is generally allowed to have been the same with the Gallic, or French; this island, in all probability, having been first peopled from Gallia, as both Cæsar and Tacitus affirm, and prove

English.

prove by many strong and conclusive arguments, as by their religion, manners, customs, and the nearness of their situation. But now we have very small remains of the ancient British tongue, except in Wales, Cornwall, the islands and Highlands of Scotland, part of Ireland, and some provinces of France; which will not appear strange, when what follows is considered.

Julius Cæsar, some time before the birth of our Saviour, made a descent upon Britain, though he may be said rather to have discovered than conquered it; but about the year of Christ 45, in the time of Claudius, Aulus Plautius was sent over with some Roman forces, by whom two kings of the Britons, Togodumnus and Caractacus, were both overcome in battle: whereupon a Roman colony was planted at Malden in Essex, and the southern parts of the island were reduced to the form of a Roman province: after that, the island was conquered as far north as the friths of Dunbarton and Edinburgh, by Agricola, in the time of Domitian; whereupon a great number of the Britons, in the conquered part of the island, retired to the west part called *Wales*, carrying their language with them.

The greatest part of Britain being thus become a Roman province, the Roman legions, who resided in Britain for above 200 years, undoubtedly disseminated the Latin tongue; and the people being afterwards governed by laws written in Latin, must necessarily make a mixture of languages. This seems to have been the first mutation the language of Britain suffered.

Thus the British tongue continued, for some time, mixed with the provincial Latin, till, the Roman legions being called home, the Scots and Picts took the opportunity to attack and harass England: upon which, K. Vortigern, about the year 440, called the Saxons to his assistance; who came over with several of their neighbours, and having repulsed the Scots and Picts, were rewarded for their services with the isle of Thanet and the whole county of Kent; but growing too powerful, and not being contented with their allotment, dispossessed the inhabitants of all the country as far as the Severn*: thus the British tongue was in a great measure destroyed, and the Saxon introduced in its stead.

* See *England*. n° 13.—42.

What the Saxon tongue was long before the conquest, about the year 700, we may observe in the most ancient manuscript of that language, which is a gloss on the Evangelists, by bishop Edfrid, in which the three first articles of the Lords prayer run thus:

"Uren fader thic arth in heofnas, sic gehalgud thin noma so cymeth thin ric. Sic thin willa sue is heofnas, and in eortho," &c.

In the beginning of the ninth century the Danes invaded England; and getting a footing in the northern and eastern parts of the country, their power gradually increased, and they became sole masters of it in about 200 years. By this means the ancient British obtained a tincture of the Danish language; but their government being of no long continuance, did not make so great an alteration in the Anglo-Saxon as the next revolution, when the whole land, A. D. 1067, was subdued by William the conqueror, Duke of Normandy in France: for the Normans, as a monument of their conquest, endeavoured to make their language as generally received as their commands, and thereby rendered the British language an entire medley.

About the year 900, the Lord's prayer, in the ancient Anglo-Saxon, ran thus:

"Thue ur fader the eart on heofenum, si thin nama gehalgod; cume thin rice si thin willa on eorthan swa, swo on heofenum," &c.

About the year 1160, under Henry II. it was rendered thus by Pope Adrian, an Englishman, in rhyme:

"Ure fader in heaven rich,
"Thy name be halyed ever lich,
"Thou bring us thy mechle blisse:
"Als hit in heaven y doe,
"Evar in yearth been it also,"

Dr Hicks gives us an extraordinary specimen of the English, as spoken in the year 1385, upon the very subject of the English tongue.

"As it is knowe how meny maner peple beeth in this lond; ther beeth also so many dyvers longages and tonges. Notheless Walschemen and Scots that beeth nought medled with other nation, holdeth wel nyh hir firste longage and speche; but yif the Scottes, that were sometime confederate and woned with the Pictes, draw somewhat after hir speche; but the Flemynges, that woneth on the west side of Wales, haveth lost her strange spech, and speketh Sexonliche now. Also Englishemen, they had from the bygynnynge thre maner speche; northerne, southerne, and middle speche in the middle of the lond, as they come of thre maner of peple of Germania: notheless by commyxtion and mellynge first with Danes, and afterwards with Normans, in meny the contrary longage is apayred *(corrupted.)*

"This apayrynge of the burth of the tunge is bycause of tweie things; oon is for children in scole agenst the usuage and maner of all other nations, beeth compelled for to leve hir own longage, and for to constru hir lessons and here thinges in Frensche, and so they haveth sethe Normans come first into Engelond. Also gentlemen children beeth tought to speke Frenche from the tyme that they beeth roked in here cradel, and kunneth speke and play with a childe's broche; and uplondissche men will lykne hymself to gentilmen, and fondeth with great besynesse for to speke Frenche to be told of.—Hit seemeth a greet wonder how Englischemen and hir own longage and tonge is so dyverse of sown in this oon iland: and the longage of Normandie is comlynge of another lond, and hath oon maner soun amonge alle men that speketh it aright in Engelond. Also of the foresaid Saxon tonge that is deled *(divided)* a three, and is abide scarceliche with fewe uplondissche men, is greet wonder. For men of the est, with men of the west, is, as it were, undir the same partie of hevene accordeth more in sownynge of speche, than men of the north with men of the south. Therefore it is that Mercii, that beeth men of myddle Engelond, as it were, partners of the endes, understondeth bettre the side longes northerne and southerne, than northerne and southerene understondeth either other.—All the longage of the Northumbers and spechialliche at York, is so scharp, slitting and frotynge, and unschape, that we southerne men may that longage unnethe understonde," &c.

In the year 1537, the Lord's prayer was printed as follows: "O oure father which arte in heven, hallowed be thy name: let thy kingdome come, thy will be fulfilled as well in erth as it is in heven; geve us this daye

daye in dayly bred," &c. Where it may be observed, that the diction is brought almost to the present standard, the chief variations being only in the orthography. By these instances, and many others that might be given, it appears, that the English Saxon language, of which the Normans despoiled us in a great measure, had its beauties, was significant and emphatical, and preferable to what they imposed on us. "Great, verily (says Cambden), was the glory of our tongue before the Norman conquest, in this, that the old English could express most aptly, all the conceptions of the mind in their own tongue, without borrowing from any." Of this he gives several examples.

Having thus shown how the ancient British language was in a manner extirpated by the Romans, Danes, and Saxons, and succeeded by the Saxon, and after that the Saxon blended with the Norman French, we shall now mention two other causes of change in the language. The first of these is owing to the Britons having been a long time a trading nation, whereby offices, dignities, names of wares, and terms of traffic, are introduced, which we take with the wares from the persons of whom we have them, and form them anew, according to the genius of our own tongue; and besides this change in the language, arising from commerce, Britain's having been a considerable time subject to the see of Rome, in ecclesiastical affairs, must unavoidably have introduced some Italian words among us. Secondly, As to the particular properties of a language, our tongue has undergone no small mutation, or rather has received no small improvement upon that account: for, as to the Greek and Latin, the learned have, together with the arts and sciences now rendered familiar among us, introduced abundance; nay, almost all the terms of art in the mathematics, philosophy, physic, and anatomy; and we have entertained many more from the Latin, French, &c. for the sake of neatness and elegancy; so that, at this day, our language, which, about 1800 years ago, was the ancient British, or Welsh, &c. is now a mixture of Saxon, Teutonic, Dutch, Danish, Norman, and modern French, embellished with the Greek and Latin. Yet this, in the opinion of some, is so far from being a disadvantage to the English tongue as now spoken (for all languages have undergone changes, and do continually participate with each other), that it has so enriched it, as now to render it the most copious, significant, fluent, courteous, and masculine language in Europe, if not in the world.

ENGRAFTING, in gardening. See GRAFTING.

ENGRAILED, or INGRAILED, in heraldry, a term derived from the French *gresly*, "hail;" and signifying a thing the hail has fallen upon and broke off the edges, leaving them ragged, or with half-rounds, or semicircles, struck out of their edges.

ENGRAVING, the art of cutting metals and precious stones, and representing thereon figures, letters, or whatever device or design the artist fancies.

Engraving, properly a branch of sculpture, is divided into several other branches, according to the matter whereon it is employed, and the manner of performing it. For the rudest branch, that of

ENGRAVING on Wood. See *CUTTING in Wood.*

ERGRAVING on Copper, the making, correspondently to some delineated figure or design, such concave lines on a smooth surface of copper, either by cutting or corrosion, as render it capable, when charged properly with any coloured fluid, of imparting by compression the exact representation of the figure or design to paper or parchment.

Whether we consider the art of engraving, with regard to the utility and pleasure it affords, or the difficulty that attends its execution, we cannot but confess, that on every account it deserves a distinguished rank among the polite arts †. It is by means of this art that the cabinets of the curious are adorned with the portraits of the greatest men of all ages and all nations; that their memories, their most remarkable and most glorious actions, are transmitted to the latest posterity. It is by this art also, that the paintings of the greatest masters are multiplied to a boundless number; and that the lovers of the polite arts, diffused over the face of the whole earth, are enabled to enjoy those beauties from which their distant situations seemed to have for ever debarred them; and persons of moderate fortune are hereby enabled to become possessed of all the spirit, and all the poetry, that are contained in those miracles of art, which seemed to have been reserved for the temples of Italy, or the cabinets of princes. When we reflect, moreover, that the engraver, beside the beauties of poetic composition, and the artful ordinance of design, is to express, merely by the means of light and shade, all the various tints of colours and clair obscure; to give a relief to each figure, and a truth to each object; that he is now to paint a sky serene and bright, and then loaded with dark clouds; now the pure tranquil stream, and then the foaming, raging sea; that here he is to express the character of the man, strongly marked in his countenance, and there the minutest ornament of his dress; in a word, that he is to represent all even the most difficult objects in nature; we cannot sufficiently admire the vast improvements in this art, and that degree of perfection to which it is at this day arrived. See the article PRINTS.

† See *Polite* ARTS, n° 13.

Engraving is an art, for the greatest part, of modern invention; having its rise no earlier than the middle of the 15 century. The ancients, it is true, practised engraving on precious stones and crystals with very good success; and there are still many of their works remaining equal to any production of the later ages. But the art of engraving on plates and blocks of wood, to afford prints or impressions, was not known till after the invention of painting in oil.

The different modes of engraving are the following:

In strokes cut through a thin wax, laid upon the copper, with a point, and these strokes bitten or corroded into the copper with aquafortis. This is called *etching*.

In strokes with the graver alone, unassisted by aquafortis. In this instance, the design is traced with a sharp tool, called a *dry point*, upon the plate; and the strokes are cut or ploughed upon the copper with an instrument distinguished by the name of a *graver*.

In strokes first etched and afterwards finished with the graver: by this expedient the two former methods are united.

In dots without strokes, which are executed with the point upon the wax or ground, bitten in with the aquafortis, and afterwards harmonized with the graver, by the means of which instrument small dots are made;

Engraving. made; or with the graver alone, as in the flesh and finer parts, unassisted with the point.

In dots first etched and afterwards harmonized with the dry point, performed by a little hammer called *opus malle*, or *the work of the hammer*, as practised by Lutma and others.

In mezzotinto, which is performed by a dark barb or ground being raised uniformly upon the plate with a toothed tool. The design being traced upon the plate, the light parts are scraped off by instruments for that purpose, in proportion as the effect requires.

In aquatinta, a newly invented method of engraving. The outline is first etched, and afterwards a sort of wash is laid by the acquafortis upon the plate, resembling drawings in Indian ink, bister, &c.

On wood, performed with a single block, on which the design is traced with a pen, and those parts which should be white carefully hollowed out; and this block is afterwards printed by the letter-press printers, in the same manner as they print a book.

On wood, performed with two, three, or more blocks; the first having the outlines cut upon it; the second is reserved for the darker shadows; and the third for the shadows which terminate upon the lights; and these are substituted in their turn, each print receiving an impression from every block. This mode of engraving is called *chiaro-scuro*, and was designed to represent the drawings of the old masters.

On wood and on copper: in these the outline is engraved in a bold dark style upon the copper; and two or more blocks of wood are substituted to produce the darker and lighter shadows, as before.

Of all these modes of engraving, the most ancient is that on *wood*; or, to speak more properly, the first impressions on paper were taken from carved wooden blocks. For this invention it appears that we are indebted to the brief-malers or makers of playing-cards, who pactised the art in Germany about the beginning of the 15th century. From the same source may perhaps be traced the first idea of movable types, which appeared not many years after; for these brief-malers did not entirely confine themselves to the printing and painting of cards, but produced also subjects of a more devout nature; many of which, taken from holy writ, are still preserved in different libraries in Germany, with the explanatory text facing the figures; the whole engraved in wood. In this manner they even formed a species of books; such as, *Historia sancti Johannis, ejusque Visiones Apocalypticæ; Historia Veteris & Novi Testamenti*, known by the name of the *Poor Man's Bible*. These short mementos were printed only on one side; and two of them being pasted together, had the appearance of a single leaf. The earliest date on any of these wooden cuts is 1423. The subject is *St Christopher carrying the Infant Jesus over the Sea*, preserved in a convent at Buxheim near Mennengen. It is of a folio size, illuminated in the same manner as the playing cards; and at the bottom is this inscription, *Cristoferi faciem die quacunque tueris. Illa nempe die morte mala non morieris. Millesimo CCCC° XX° tertio.*

Strutt's Hist. of Engraving. Upon the invention of movable types, that branch of the brief-malers business, so far as it regarded the making of books, was gradually discontinued; but the art itself of engraving on wood continued in an improving state; and towards the end of the 15th and beginning of the 16th century, it became customary for almost every one of the German engravers on copper to engrave on wood also. The works of Albert Durer in this style of engraving are justly held in the highest esteem. Italy, France, and Holland, have produced many capital artists of this kind; but for boldness and spirit, we must see the prints of Christopher Jegher, who worked under the direction of Rubens, and was without doubt assisted by that great master.

The invention of that species of engraving distinguished by the appellation of *chiaro-scuro*, seems also to be justly claimed by the Germans, and first practised by Mair; one of whose prints of this kind is dated 1499. Many excellent works in chairo-scuro have been produced in France; and in Italy it was honoured with the performances of Titian and Parmegiano; but the attempts of Jackson, Kirkall, and others in England, have not been equally successful. A set of excellent prints in this way have lately been published by J. Skippe, Esq; a connoisseur and dillettante.

In Germany, about the year 1450, prints from engraved *copper* first made their appearance. The earliest date of a copperplate print is indeed only 1461; but however faulty this print may be with respect to the drawing, or defective in point of taste, the mechanical part of the execution of it has by no means the appearance of being one of the first productions of the graver. We have also several other engravings, evidently the work of the same master; in which the impressions are so neatly taken from the plates, and the engravings so clearly printed in every part, that, according to all appearance, they could not be executed in a much better manner in the present day, with all the conveniences which the copperplate printers now possess, and the additional knowledge they must necessarily have acquired in the course of more than three centuries. Hence we may fairly conclude, that if they were not the first specimens of the engravers workmanship, they were much less the first efforts of the copperplate printer's ability. It is likewise to be observed, that Martin Schoen, who is said, with great appearance of truth, to have worked from 1460 to 1486, was apparently the scholar of Stoltzhirs; for he followed his style of engraving, and copied from him a set of prints, representing the passion of our Saviour. Now, allowing Stoltzhirs to have preceded his disciple only ten years, this carries the era of the art back to 1450, as was said above. There is no ground to suppose that it was known to the Italians till at least ten years afterwards. The earliest prints that are known to be theirs are a set of the seven planets, and an almanack by way of frontispiece; on which are directions for finding Easter from the year 1465 to 1517 inclusive: and we may be well assured, that the engravings were not antedated, for the almanack of course became less and less valuble every year. In all probability, therefore, these prints must have been executed in the year 1464, which is only four years later than the Italians themselves lay any claim to. The three earliest Italian engravers are, Finiguerra, Boticelli, and Baldini. If we are to refer these prints to any of the three, we shall naturally conclude them to be the work of Finiguerra or Baldini; for they are not equal either in drawing or composition to those ascribed to Boticelli, which

Strutt's Hist. of Engraving.

which we know at least were designed by him; and as Baldini, is expresly said to have worked from the designs of Boticelli, it will appear most probable that they belong to Finiguerra.

With respect to the invention of *etching*, it seems to be not well known to whom it is to be ascribed. One of the most early specimens is that print by Albert Durer, known by the name of the *Cannon*, dated 1518, and thought by some, with little foundation, to have been worked on a plate of iron. Another etching by the same artist is Moses receiving the Tables of the Law, dated 1524. It was also practised in Italy soon after this by Parmegiano, in whose etchings we discover the hand of the artist working out a system as it were from his own imagination, and striving to produce the forms he wanted to express. We see the difficulty he laboured under; and cannot doubt, from the examination of the mechanical part of the execution of his works, that he had no instruction; and that it was something entirely new to him. If the story is true, that he kept an engraver by profession in his house, the novelty of the art is rendered so much the more probable. He died in 1540.

As to that species of engraving in which the modes of *etching* and *cutting* with the graver are united, it must have been found necessary immediately upon the invention of etching; it was, however, first carried to perfection by G. Audran, and is now almost universally practised, whether the work is in strokes or in dots.

Engraving in *dots*, the present fashionable method, is a very old invention, and the only mode discovered by the Italians. Agostino de Musis, commonly called *Augustine of Venice*, a pupil of Marc Antonio, used it in several of his earliest works, but confined it to the flesh, as in the undated print of An Old Man seated upon a Bank, with a Cottage in the back ground. He flourished from 1509 to 1536. We also find it in a print of "A single Figure standing, holding a Cup and looking upwards," by Giulio Campagnola, who engraved about the year 1516. The back ground is executed with round dots, made apparently with a dry point. The figure is outlined with a stroke deeply engraved, and finished with dots, in a manner greatly resembling those prints which Demarteau engraved at Paris in imitation of red chalk. The hair and beard are expressed by strokes. Stephen de Laulne, a native of Germany, followed the steps of Campagnola; and many of his slight works are executed in dots only. John Boulanger, a French artist, who flourished in the middle of the last century, and his contemporary Nicholas Van Plattenberg, improved greatly on this method, and practised it with much success. It is only, however, of late, that it has been considered as an object worthy of general imitation. John Lutma executed this kind of work with a hammer and a small punch or chissel.

The method of engraving in *mezzotinto* was invented about the middle of the 17th century; and the invention has generally been attributed to Prince Rupert, though it has also been asserted that he learnt the secret from another. See MEZZOTINTO.

Engraving in *aquatinto* is quite a recent invention, and seems at once to have been carried to perfection by Sandby and other living artists. See AQUATINTA.

Engraving with the tool was the kind originally practised, and it is yet retained for many purposes. For though the manœuvre of etching be more easy, and other advantages attend it; yet where great regularity and exactness of the stroke or lines are required, the working with the graver is much more effectual: on which account it is more suitable to the precision necessary in the execution of portraits; as there every thing the most minute must be made out and expressed, according to the original subject, without any license to the fancy of the designer in deviating from it, or varying the effect either by that masterly negligence and simplicity in some parts, or those bold sallies of the imagination and hand in others, which give spirit and force to history-painting.

The principal instruments used in engraving with the tool are, gravers, scrapers, a burnisher, an oil-stone, and a cushion for bearing the plates.

Gravers are made in several forms with respect to the points, some being square, others lozenge; the square graver for cutting broad and deep, and the lozenge for more delicate and fine strokes and hatches. La Bosse recommends, as the most generally useful, such as are of a form betwixt the square and lozenge: and he advises, that they should be of a good length; small towards the point, but stronger upwards, that they may have strength enough to bear any stress there may be occasion to lay upon them: for if they be too small and mounted high, they will bend; which frequently causes their breaking, especially if they be not employed for very small subjects.

The burnisher is used to assist in the engraving on some occasions, as well as to polish the plates. It is seven inches in length, and made of fine steel well polished. The burnisher is formed at one end, and a scraper on the other, each about an inch and a half long from the point: betwixt them, about four inches of the instrument is made round, and serves as a handle; and is thicker in the middle than at the necks, where the burnisher and scraper begin, which necks are only one quarter of an inch in diameter. The principal application of it in engraving, besides its use in polishing the plates, is to take out any scratches or accidental defacings that may happen to the plates during the engraving; or to lessen the effect of any parts that may be too strongly marked in the work, and require to be taken down.

A cushion, as it is called, is likewise generally used for supporting the plate in such a manner, that it may be turned every way with ease. It is a bag of leather filled with sand, which should be of the size that will best suit the plates it is intended to bear. They are round, and about nine inches over, and three inches in thickness.

The cushion, made as above directed, being laid on the table, the plate must be put upon it; and the graver being held in the hand in a proper manner, the point must be applied to the plate, and moved in the proper direction for producing the figures of the lines intended: observing, in forming straight lines, to hold the plate steady on the cushion; and where they are to be finer, to press more lightly, using greater force where they are to be broader and deeper. In making circular or other curve lines, hold your hand and graver steadily; and as you work, turn your plate upon the cushion against your graver, otherwise it will be impossible for you to make any circular or curved line with that neatness and command of hand you by this means may. After part of the work is engraved, it is necessary to scrape it with the scraper or graver passed in the most level direction over the plate to take off the roughness formed by the cutting of the graver; but great care must be taken not to incline the edge of the scraper or tool used, in such a manner that it may take the least hold of the copper, as it would otherwise produce false strokes or scratches in the engraving: that the engraved work may be rendered more visible, it may afterwards be rubbed over with a roll of felt dipped in oil. In using the graver, it is necessary to carry it as level as possible with the surface of the plate; for otherwise, if the fingers slip betwixt them, the line that will be produced, whether curve or straight, will become deeper and deeper in the progress of its formation; which entirely prevents strokes being made at one cut, that will be fine at their extremities, and larger in the middle; and occasions the necessity of retouching to bring them to that state. For this reason, it is very necessary for those who would learn to engrave in perfection, to endeavour, by frequent trials, to acquire the habit of making such strokes both straight and curving, by lightening or sinking the graver with the hand, according to the occasion. If, after finishing the design, any scratches appear, or any part of the engraving be falsely executed, such scratches, or faulty parts, must be taken out by the burnisher, and further polished, if necessary, by the abovementioned roll.

The plate being thus engraved, it is proper to round off the edges, by using first a rough file, and afterwards a smoother; and to blunt the corners a little by the same means: after which, the burnisher should be passed over the edges to give it a further polish.

The dry point, or needle, which has been of late much used in engraving, is a tool like an etching point, which being drawn hard on the copper, cuts a stroke, and raises a burr; the burr is scraped off, and there remains a stroke more soft and delicate than can be produced in any other way.

In the conduct of the graver and dry point consists all the art; for which there are no rules to be given; all depending on the habitude, disposition, and genius, of the artist. However, besides the explanations already given, some general observations and directions may not be improper. As the principles of engraving are the same with those of painting, a person cannot expect to attain any considerable degree of perfection in this art who is not a good master of design; and therefore he ought to be well acquainted both with perspective and architecture: for the former, by the proper gradations of strong and faint colours, will enable him to throw backwards the figures and other objects of the picture or design which he proposes to imitate; and the latter will teach him to preserve the due proportion of its several orders, which the painter often entrusts to the discretion of the engraver. In order to preserve equality and union in his works, the engraver should always sketch out the principal objects of his piece before he undertakes to finish them. In working, the strokes of the graver should never be crossed too much in a lozenge manner, particularly in the representation of flesh, because sharp angles produce the unpleasing effect of lattice-work, and take from the eye the repose which is agreeable to it in all kinds of picturesque designs: we should except the case of clouds, tempests, waves of the sea, the skins of hairy animals, or the leaves of trees, where this method of crossing may be admitted. But in avoiding the lozenge, it is not proper to get entirely into the square, which would give too much of the hardness of stone. In conducting the strokes, the action of the figures, and of all their parts, should be considered; and it should be observed how they advance towards, or recede from the eye; and the graver should be guided according to the risings or cavities of the muscles or folds, making the strokes wider and fainter in the light, and closer and firmer in the shades. Thus the figures will not appear jagged; and the hand should be lightened in such a manner, that the outlines may be formed and terminated without being cut too hard; however, though the strokes break off where the muscle begins, yet they ought always to have a certain connection with each other, so that the first stroke may often serve by its return to make the second, which will show the freedom of the engraver.

In engraving the flesh, the effect may be produced in the lighter parts and middle tints by long pecks of the graver, rather than by light lines; or by round dots; or by dots a little lengthened by the graver; or, best of all, by a judicious mixture of these together.

In engraving the hair and the beard, the engraver should begin his work by laying the principal grounds, and sketching the chief shades in a careless manner, or with a few strokes; and he may finish it at leisure with finer and thinner strokes to the extremities. When architecture or sculpture is to be represented, except it be old and ruinous buildings, the work ought not to be made very black; because, as edifices are commonly constructed either of stone or white marble, the colour, being reflected on all sides, does not produce dark or brown shades as in other substances. White points must not be put in the pupils of the eyes of figures, as in engravings after paintings; nor must the hair or beard be represented as in nature, which makes the locks appear flowing in the air; because in sculpture there can be no such appearances.

In engraving cloths of different kinds, linen should be done with finer and closer lines than other sorts, and be executed with single strokes. Woollen cloth should be engraved wide, in proportion to the coarseness or fineness of the stuff, and with only two strokes; and when the strokes are crossed, the second should be smaller than the first, and the third than the second. Shining stuffs, which are generally of silk or satin, and which produce flat and broken folds, should be engraved more hard and more straight than others, with one or two strokes, as their colours are bright or brown; and between the first strokes other smaller must be joined, which is called interlining. Velvet and plush are expressed in the same manner, and should always be interlined. Metals, as armour, &c. are also represented by interlining, or by clear single strokes. In architecture, the strokes which form the rounding object should tend to the point of sight; and when whole

whole columns occur, it is proper to produce the effect as much as possible by perpendicular strokes. If a gross stroke is put, it should be at right angles, and wider and thinner than the first stroke. In engraving mountains, the strokes ought to be frequently discontinued and broken, for sharp and craggy-objects; and they should be straight, in the lozenge manner, and accompanied with long points or dots; and rocks should be represented by cross strokes more square and even. Objects that are distant towards the horizon should be kept very tender, and slightly charged with black. Waters that are calm and still are best represented by strokes that are straight, and parallel to the horizon, interlined with those that are finer; omitting such places as, in consequence of gleams of light, exhibit the shining appearance of water; and the form of objects reflected from the water, at a small distance upon it, or on the banks of the water, are expressed by the same strokes, retouched more strongly or faintly as occasion may require, and even by some that are perpendicular. For agitated waters, as the waves of the sea, the first strokes should follow the figure of the waves, and may be interlined, and the cross strokes ought to be very lozenge. In cascades, the strokes should follow the fall, and be interlined. In engraving clouds, the graver should sport when they appear thick and agitated, in turning every way according to their form and their agitation. If the clouds are dark, so that two strokes are necessary, they should be crossed more lozenge than the figures, and the second strokes should be rather wider than the first. The flat clouds, that are lost insensibly in the clear sky, should be made by strokes parallel to the horizon, and a little waving; if second strokes are required, they should be more or less lozenge; and when they are brought to the extremity, the hand should be so lightened, that they may form no outline. The flat and clear sky is represented by parallel and straight strokes, without the least turning. In landscapes, the trees, rocks, earth, and herbage should be etched as much as possible; nothing should be left for the graver but perfecting, softening, and strengthening. The dry point produces an effect more delicate than the graver can, and may be used to great advantage in linen, skies, distances, ice, and often in water, especially in small engravings. In most things it is proper to etch the shadows, only leaving the lighter tints for the dry point, graver, &c.

To imitate *chalk-drawings*, a mixture of varied and irregular dots are used, made more or less soft, so as to resemble the grain produced by the chalks on paper. Every stroke of the chalks on paper may be considered as an infinite number of adjoining points, which are the small eminences of the grain of the paper touched by the chalk in passing over it. When the copper-plate has been polished and varnished, or properly prepared, as in the common method of engraving, the drawing to be imitated may be counterproved on the varnish of the plate. If this cannot be conveniently done, black lead pencil, or red chalk, must be applied to varnished or oiled paper; and by means of this chalk or pencil, all the traces of the original will be transmitted to the varnish. The outlines of the object must be formed in the etching by points, whose magnitude and distance must be determined by the quality of the strokes in the original drawing. The artist may be provided with pointed instruments or needles of various sizes with single or double points. In forming the light and shade, he should distinguish between those hatches which serve to express the perspective of the object and those which form the ground of it. The principal hatches should be more strongly marked; the middle tints, if etched, should be marked lightly, or they may be left till the varnish is taken off, and be perfected with a greater degree of softness, by needles or the point of the graver, as the original may require. There is nothing peculiar in the method of applying the acquafortis in this kind engraving; but it may be observed, that it should not be left so long as to corrode the lighter parts too much: if the light parts are sufficiently corroded, they may be stopped out with turpentine varnish and lamp-black mixed together, and the acquafortis may be applied again to the stronger parts; for it will be no detriment to them, if the points; which compose the shade burst into one another, provided the extreme be avoided. When the work of the acquafortis is finished, and the varnish taken off the copper, it will be necessary in the softest parts, such as the flesh, &c. to interstiple with proper points; as an effect will be thus produced more delicate than it is possible to attain with the acquafortis only; and the strongest shades will require additional strength to be given them with small strokes of the graver. Drawings made with chalks of different colours may be imitated in this manner, if a plate be provided for every colour.—This method of engraving is intended to form a kind of deception, so that the connoisseur may not be able, on the first inspection, to distinguish between the original drawing and the engraving made in imitation of it; and it is extremely useful, as it serves to multiply copies of drawings left by those masters who excelled in the use of chalks, and thus to form and improve young artists, who could not have access to the originals in the practice of drawing.

Engraving upon Glass. See Chemistry, 2d N°857.

Engraving *on Precious Stones*, is the representing of figures, or devices, in relievo or indented, on divers kinds of hard polished stones.

The art of engraving on precious stones is one of those wherein the ancients excelled; there being divers antique agates, cornelians, and onyxes, which surpass any thing of that kind the moderns have produced. Pyrgoteles among the Greeks, and Dioscorides under the first emperors of Rome, are the most eminent engravers we read of: the former was so esteemed by Alexander, that he forbad any body else to engrave his head; and Augustus's head, engraven by the latter, was deemed so beautiful, that the succeeding emperors chose it for their seal.

All the polite arts having been buried under the ruins of the Roman empire, the art of engraving on stones met with the same fate. It was retrieved in Italy at the beginning of the 15th century, when one John of Florence, and after him Dominic of Milan, performed works of this kind no way to be despised. From that time, such sculptures became common enough in Europe, and particularly in Germany, whence great numbers were sent into other countries: but they came short of the beauty of those of the ancients, especially

cially thoſe on precious ſtones; for, as to thoſe on cryſtal, the Germans, and, after their example, the French, &c. have ſucceeded well enough.

In this branch of engraving, they make uſe either of the diamond or of emery.

The diamond, which is the hardeſt of all ſtones, is only cut by itſelf, or with its own matter. The firſt thing to be done in this branch of engraving is, to cement two rough diamonds to the ends of two ſticks big enough to hold them ſteady in the hand, and to rub or grind them againſt each other till they be brought to the form deſired. The duſt or powder that is rubbed off ſerves afterwards to poliſh them, which is performed with a kind of mill that turns a wheel of ſoft iron. The diamond is fixed in a braſs diſh; and, thus applied to the wheel, is covered with diamond duſt, mixed up with oil of olives; and when the diamond is to be cut facet-wiſe, they apply firſt one face, then another, to the wheel. Rubies, ſapphires, and topazes, are cut and formed the ſame way on a copper wheel, and poliſhed with tripoli diluted in water. As to agates, amethyſts, emeralds, hyacinths, granites, rubies, and others of the ſofter ſtones, they are cut on a leaden wheel, moiſtened with emery and water, and poliſhed with tripoli on a pewter wheel. Lapis-lazuli, opal, &c. are poliſhed on a wooden wheel. To faſhion and engrave vaſes of agate, cryſtal, lapis-lazuli, or the like, they make uſe of a kind of lathe, like that uſed by pewterers, to hold the veſſels, which are to be wrought with proper tools: that of the engraver generally holds the tools, which are turned by a wheel; and the veſſel is held to them to be cut and engraved, either in relievo or otherwiſe; the tools being moiſtened from time to time with diamond duſt and oil, or at leaſt emery and water. To engrave figures or devices on any of theſe ſtones, when poliſhed, ſuch as medals, ſeals, &c. they uſe a little iron wheel, the ends of whoſe axis are received within two pieces of iron, placed upright, as in the turner's lathe; and to be brought cloſer, or ſet further apart, at pleaſure; at one end of the axis are fitted the proper tools, being kept tight by a ſcrew. Laſtly, The wheel is turned by the foot, and the ſtone applied by the hand to the tool, and is ſhifted and conducted as occaſion requires.

The tools are generally of iron, and ſometimes of braſs; their form is various, but it generally bears ſome reſemblance to chiſels, gouges, &c. Some have ſmall round heads, like buttons, others like ferels, to take the pieces out, and others flat, &c. When the ſtone has been engraven, it is poliſhed on wheels of hair-bruſhes and tripoli.

Engraving on Steel, is chiefly employed in cutting ſeals, punches, matrices and dyes, proper for ſtriking coins, medals, and counters. The method of engraving with the inſtruments, &c. is the ſame for coins as for medals and counters: All the difference conſiſts in their greater or leſs relievo; the relievo of coins being much leſs conſiderable than that of medals, and that of counters ſtill leſs than that of coins.

Engravers in ſteel commonly begin with punches, which are in relievo, and ſerve for making the creux or cavities of the matrices and dyes: though ſometimes they begin with the creux or hollowneſs: but then it is only when the intended work is to be cut very ſhallow. The firſt thing done, is that of deſigning the figures; the next is the moulding them in wax, of the ſize and depth they are to lie, and from this wax the punch is engraven. When the punch is finiſhed, they give it a very high temper, that it may the better bear the blows of the hammer with which it is ſtruck to give the impreſſion to the matrice.

The ſteel is made hot to ſoften it, that it may the more readily take the impreſſion of the punch; and after ſtriking the punch on it in this ſtate, they proceed to touch up or finiſh the ſtrokes and lines, where by reaſon of their fineneſs or the too great relievo they are any thing defective, with ſteel gravers of differen kinds, chiſels, flatters, &c. being the principal inſtruments uſed in graving on ſteel.

The figure being thus finiſhed, they proceed to engrave the reſt of the medal, as the mouldings of the border, the engrailed ring, letters, &c. with little ſteel punches, well tempered, and very ſharp.

ENGUICHE', in heraldry, is ſaid of the great mouth of a hunting horn, when its rim is of a different colour from that of the horn itſelf.

ENHARMONIC, in muſic. The Greeks had three different ſpecies of muſic; the *diatonic*, the *chromatic*, and the *enharmonic*. This laſt was eſteemed by much the moſt agreeable and powerful of the three; but the difficulty of its execution rendered its duration ſhort, and latter artiſts were upbraided for having ſacrificed it to their indolence. It proceeded upon leſſer intervals than either the diatonic or chromatic; and as the chromatic ſemitone is ſtill leſs than the diatonic, the *enharmonic* intervals muſt have conſiſted of that ſemitone divided into parts more minute. In Rouſſeau's Muſical Dictionary (at the word *Enharmonique)*, the reader may ſee how that interval was found in the tetrachords of the ancients. It is by no means eaſy for modern ears, inured to intervals ſo widely different, to imagine how a piece of muſic, whoſe tranſitions were formed either chiefly or ſolely upon ſuch minute diviſions, could have ſuch wonderful effects; yet the melody of ſpeech, which riſes or falls by intervals ſtill more minute than the enharmonic, when properly modulated and applied with taſte, has an aſtoniſhing power over the ſoul. As to the modern *enharmonic* ſyſtem, we may likewiſe refer the reader to the ſame work for an account of its nature and uſe; though he will find it accurately and clearly explained by D' Alembert, in the treatiſe of Music given in the preſent work, (art. 144. 145. 146.)

ENHYDRUS, in natural hiſtory, a genus of ſiderochita, or cruſtated ferruginous bodies, formed in large and in great part empty caſes, incloſing a ſmall quantity of an aqueous fluid.

Of this genus there are only two ſpecies: 1. The thick-ſhelled enhydrus, with black, reddiſh-brown, and yellow cruſts. 2. The thinner-ſhelled kind, with yellowiſh-brown and purple cruſts; neither of which ferments with aquafortis or gives fire with ſteel.

ENIGMA. See Ænigma.

ENIXUM, among chemiſts, a kind of natural ſalt, generated of an acid and alkali.

The ſal enixum of Paracelſus, is the caput mortuum of ſpirits of nitre with oil of vitriol, or what remains in the retort after the diſtillation of this ſpirit; being of a white colour, and pleaſing acid taſte.

ENMANCHE', in heraldry, is when lines are drawn from the centre of the upper edge of the chief to the sides, to about half the breadth of the chief; signifying sleeved, or resembling a sleeve, from the French *manche*.

ENNA, (anc. geog.), a town of Sicily, situated on an eminence to the south of the Chrysas; called the *centre of Sicily*. It was famous for a sacred grove, in which the rape of Proserpina happened; for a temple of Ceres, thence surnamed *Ennæa*, and *Ennensis*; and for fine springs, whence the name (Bochart.)

ENNEAGON, in geometry, a polygon with nine sides. See POLYGON.

ENNEAHEDRIA, in natural history, a genus of columnar, crystalliform, and double-pointed spars, composed of a trigonal column, terminated at each end by a trigonal pyramid.

Of this genus there are several species, distinguished by the length or shortness of the column and pyramids, none of which give fire with steel, but all of them ferment with aquafortis. See SPAR.

ENNEANDRIA, in botany, (from εννεα, *nine*; and ανηρ, a *man* or *husband*), the name of the ninth class in Linnæus's sexual system, consisting of plants which have hermaphrodite flowers with nine stamina or male organs. See BOTANY, p. 430. the *Scheme*.

ENNIUS (Quintus), an ancient Latin poet, born at Rudii, a town in Calabria. He came first to Rome when M. Porcius Cato was questor, whom he had instructed in the Greek language in Sardinia; and by his genius and behaviour he gained the esteem of the most eminent persons in the city. According to Horace, Ennius never applied himself to writing till he had drank freely of wine. Hence he contracted the gout, of which he died nine years B. C. He was interred in Scipio's sepulchre; who had a great esteem and friendship for him, and caused a statue to be erected to him upon his monument. He endeavoured to introduce the treasures of the Greek tongue among the Latins, and was the first among the Romans who made use of heroic verses. He wrote the *Annals of Rome*; he translated several tragedies from the Greek, and wrote others, beside several comedies. We have only some fragments of his works, which were first collected by the two Stephens, and afterwards published at Naples, with a learned commentary, by Jerom Columna, in quarto, 1590; and reprinted at Amsterdam in 1707, in quarto, with additions by Hesselius.

ENOCH, the son of Cain (Gen. iv. 17.), in honour of whom the first city taken notice of in scripture was called *Enoch* by his father Cain, who built it. It was situated to the east of the province of Eden.

ENOCH, the son of Jared and father of Methuselah, was born in the year of the world 622. At the age of 65 he begat Methuselah, and lived 300 years after, and had several sons and daughters. Enock walked with God; and after that he had lived in all 365 years, "he was not, for God took him." Some construe these last words, as if they intimated that Enoch died a natural death, because in reality he lived not near so long as the other patriarchs of those times; as if God, to secure him from corruption, had been pleased to take him early out of this world. But the generality of the fathers and commentators assert that he died not, but was translated out of the sight of men, in like manner as Elijah was. The apostle Paul (Heb. xi. 5.) shows very clearly that Enoch was translated, and did not see death.

The apostle Jude (ver. 14, 15.) cites a passage from the book of Enoch, which has very much exercised interpreters. The question is, whether the apostle took this passage out of any particular book written by Enoch, which might be extant in the first ages of the church? whether he received it by tradition? or lastly, by some particular revelation? It is thought probable, that he read it in the book we have been speaking of, which, tho' apocryphal, might contain several truths that St Jude, who was favoured with a supernatural degree of understanding, might make use of to the edification of the faithful.

The ancients greatly esteemed the prophecy of Enoch. Tertullian expresses his concern, that it was not generally received in the world. That father, on the authority of this book, deduces the original of idolatry, astrology, and unlawful arts, from the revolted angels, who married with the daughters of men. St Augustin allows indeed that Enoch wrote something divine, because he is cited by St Jude; but he says it was not without reason that this book was not inserted in the canon which was preserved in the temple at Jerusalem. This father sufficiently insinuates, that the authority of this book is doubtful, and that it cannot be proved that it was really written by Enoch. Indeed the account it gives of giants engendered by angels, and not by men, has manifestly the air of a fable, and the most judicious critics believe it ought not to be ascribed to Enoch.

This apocryphal book lay a long time buried in darkness, till the learned Joseph Scaliger recovered a part of it. Scaliger, Vossius, and other learned men, attribute this work to one of those Jews who lived between the time of the Babylonish captivity, and that of Jesus Christ. Others are of opinion, that it was written after the rise and establishment of Christianity, by one of those fanatics with whom the primitive church was filled, who made a ridiculous mixture of the Platonic philosophy and the Christian divinity.

The eastern people, who call Enoch by the name of *Edris*, believe that he received from God the gift of wisdom and knowledge; and that God sent him 30 volumes from heaven, filled with all the secrets of the most mysterious sciences. The rabbins maintain, that when Enoch was translated to heaven, he was admitted into the number of the angels, and is the person generally known by the name of *Michael*.

ENORMOUS, something excessive or monstrous, especially in bulk.—The word is formed of the privative *e*, and *norma*, "rule;" q. d. void of, or contrary to, rule or measure;" *contra normam*. In the corrupt ages of Latinity, they used *innormis*, and *inormis*.

In the French jurisprudence, *læsio enormis*, "enormous damage," is that which exceeds half the value of the thing sold.

ENOS, the son of Seth and father of Cainan, was born in the year of the world 235. Moses tells us (Gen. iv. 26.), that then "*men* began to call upon the name of the Lord;" or, as others translate it, that "Enos began to call upon the name of the Lord;" that is to say, that he was the inventor of religious

religious rites and ceremonies in the external worship which was paid to God. This worship was kept up and preserved in Enos's family, while Cain's family was plunged in all manner of irregularities and impieties. Several Jews are of opinion, that idolatry was at first introduced into the world in the time of Enos. They translate the Hebrew thus, "Then men began to profane the name of the Lord." Good men, to distinguish themselves from the wicked, began to take upon them the quality of sons or servants of God; for which reason, Moses (Gen. vi. 1, 2.) says, that *the sons of God* (that is to say, the descendants of Enos, who had hitherto preserved the true religion), seeing the daughters of men, that they were fair, took them wives of all which they chose. Enos died at the age of 905 years, in the year of the world 1140.

ENS, among metaphysicians, denotes entity, being, or existence: this the schools call *ens reale*, and *ens positivum*; to distinguish it from their *ens rationis*, which is only an imaginary thing, or exists but in the imagination.

Ens, among chemists, imports the power, virtue and efficacy, which certain substances exert upon our bodies.

Ens, in geography, a city of Germany, situated at the confluence of the Danube and the river Ens, about 80 miles south of Vienna. E. Long. 14. 20. N. Lat. 48. 16.

ENSATÆ, in botany (from *ensis*, "a sword"); the name of the sixth order in Linnæus's natural method, consisting of plants with sword-shaped leaves.* It contains the following genera, viz. Antholyza, Callisia, Commelina, Crocus, Eriocaulon, Ferraria, Gladiolus, Iris, Ixia, Moræa, Pontæderia, Sisyrinchium, Tradescantia, Wachendorffa, Xyris.

* See *Botany*, p. 458. col. 2.

ENSEELED, in falconry, is said of a hawk that has a thread drawn through her upper eye-lid, and made fast under her beak, to take away the sight.

ENSEMBLE, a French term, sometimes used in our language; literally signifying *together*, or *one with another*:—being formed from the Latin *in* and *simul*.

In architecture, we say *the ensemble*, or *tout ensemble*, of a building; meaning the whole work, or composition, considered together, and not in parts; and sometimes also, the relative proportion of the parts to the whole.—"All those pieces of building make a fine *ensemble*.

To judge well of a work, a statue, or other piece of sculpture, one must first examine whether the *ensemble* be good. The *tout ensemble* of a painting, is that harmony which results from the distribution of the several objects or figures whereof it is composed.—"This picture is good, taking the parts separately; but the *tout ensemble* is bad."

ENSIFORMIS CARTILAGO. See XIPHOIDES.

ENSIGN, in the military art, a banner of colours under which soldiers are ranged, according to the different companies or parties they belong to. See FLAG, COLOURS, STANDARD, &c.

The Turkish ensigns are horses tails; those of the Europeans are pieces of taffety, with divers figures, colours, arms, and devices thereon. Xenophon tells us, that the ensign borne by the Persians was a golden eagle on a white flag; the Corinthians bore the winged horse, or Pegasus, in theirs; the Athenians, an owl; the Messenians, the Greek Letter M; the Lacedæmonians, the Λ. The Romans had a great diversity of ensigns; the wolf, minotaur, horse, boar, and at length the eagle, where they stopped: this was first assumed in the second year of the consulate of Marius †. A military ensign on a medal of a Roman colony, denotes it a colony peopled with old soldiers.

† See *Eagle*.

Ensign is also the officer that carries the colours, being the lowest commissioned officer in a company of foot subordinate to the captain and lieutenant. It is a very honourable and proper post for a young gentleman at his first coming into the army; he is to carry the colours both in assault, day of battle, &c. and should not quit them but with his life; he is always to carry them himself on his left shoulder: only on a march he may have them carried by a soldier. If the ensign is killed, the captain is to carry the colours in his stead.

Naval Ensign, a large standard or banner hoisted on a long pole erected over the poop, and called the *ensign staff*.—The ensign is used to distinguish the ships of different nations from each other, as also to characterise the different squadrons of the navy. The British ensign in ships of war is known by a double cross, viz. that of St George and St Andrew, formed upon a field which is either red, white, or blue.

ENSISHEIM, a town of France, in Upper Alsace. It is a pretty little place, well built, and consists of about 200 houses. E. Long. 7. 41. N. Lat. 47. 49.

ENT (Sir George), an eminent English physician, born at Sandwich in Kent in 1604. He was educated at Sidney college, Cambridge; and, afterwards travelling into foreign countries, received the degree of doctor of physic at Padua. After his return he obtained great practice, was made president of the college of physicians in London, and at length received the honour of knighthood from King Charles II. He was extremely intimate with Doctor Harvey; whom he learnedly defended in a piece intitled, *Apologia pro Circulatione Sanguinis, contra Æmilium Parisanum.* He also published, *Animadversiones in Malachiæ Thrustoni*; and some observations in the Philosophical Transactions. Glanville, speaking of his Plus Ultra of the modern improvements in anatomy, numbers Sir George Ent, Doctor Glisson, and Doctor Wallis, with the most celebrated discoverers in that science. The two former were among the first members of the Royal Society. Sir George Ent died in October 1689.

ENTABLATURE, or Entablement, in architecture, is that part of an order of a column which is over the capital, and comprehends the architrave, frieze, and corniche. See Architecture, chap i.

ENTABLER, in the manege, the fault of a horse whose croupe goes before his shoulders in working upon volts; which may be prevented by taking hold of the right rein, keeping your right leg near, and removing your left leg as far from the horse's shoulder as possible.

This is always accompanied with another fault called *aculer*. See Aculer.

ENTAIL, in law, signifies *feetail*, or *fee entailed*; that is, abridged, curtailed, or limited, to certain conditions. See Fee, and Tail.

ENTE, in heraldry, a method of marshalling, very frequent

frequent in Europe, and signifying grafted or ingrafted.

There is, indeed, one instance of enté in the fourth grand quarter of the British royal ensign, whose blazon is Brunswick and Lunenburg impaled with ancient Saxony *enté en pointé*, "grafted in point."

ENTEROCELE, in surgery, a tumor formed by a prolapsion of the intestines through the rings of the abdomen and processes of the peritonæum, into the scrotum. See SURGERY.

ENTHUSIASM, an ecstasy of the mind, whereby it is led to think and imagine things in a sublime, surprising, yet probable manner. This is the enthusiasm felt in poetry, oratory, music, painting, sculpture, &c.

ENTHUSIASM, in a religious sense, implies a transport of the mind, whereby it fancies itself inspired with some revelation, impulse, &c. from heaven. Mr Locke gives the following description of enthusiasm. "In all ages, men in whom melancholy has mixed with devotion, or whose conceit of themselves has raised them into an opinion of a great familiarity with God, and a nearer admittance to his favour than is afforded to others, have often flattered themselves with a persuasion of an immediate intercourse with the Diety, and frequent communications from the Divine Spirit. Their minds being thus prepared, whatever groundless opinion comes to settle itself strongly upon their fancies, is an illumination from the Spirit of God. And whatsoever odd action they find in themselves a strong inclination to do, that impulse is concluded to be a call or direction from heaven, and must be obeyed. It is a commission from above, and they cannot err in executing it. This I take to be properly enthusiasm, which, though arising from the conceit of a warm and overweening brain, works, when it once gets footing more powerfully on the persuasions and actions of men, than either reason or revelation, or both together; men being most forwardly obedient to the impulses they receive from themselves." Devotion, when it does not lie under the check of reason, is apt to degenerate into enthusiasm. When the mind finds itself inflamed with devotion, it is apt to think that it is not of its own kindling, but blown up with something divine within it. If the mind indulges this thought too far, and humours the growing passion, it at last flings itself into imaginary raptures and ecstasies; and when once it fancies itself under the influence of a divine impulse, no wonder if it slights human ordinances, and refuses to comply with the established form of religion, as thinking itself directed by a much superior guide.

ENTHUSIAST, a person possessed with enthusiasm. See the preceding article.

ENTHYMEME, in logic and rhetoric, an argument consisting only of two propositions, an antecedent, and a consequent deduced from it. The word is Greek, ενθυμημα, formed of the verb ενθυμεισθαι, "to think, conceive," a compound of εν and θυμος, "mind."

The enthymeme is the most simple and elegant of all argumentations; being what a man, in arguing closely, commonly makes, without attending at all to the form. Thus, that verse remaining of Ovid's tragedy, intitled *Medea*, contains an enthymeme; *Servare potui, perdere an possum rogas*: "I was able to save you consequently to have destroyed you." All the beauty would have been lost, had all the propositions been expressed; the mind is displeased with a rehearsal of what is no ways necessary.

Sometimes, also, the two propositions of an enthymeme are both included in a single proposition, which Aristotle calls an *enthymematical sentence*, and gives this instance thereof: *Mortal, do not bear an immortal hatred.* The whole enthymeme would be, *Thou art mortal; let not, therefore, thy hatred be immortal.*

ENTITY, the same with ENS.

ENTOMOLOGY.

THE science of insects, or that part of zoology which treats of insects.

By some natural historians, this class of animals is considered as the most imperfect of any, while others prefer them to the large animals. One mark of their imperfection is said to be, that many of them can live a long time, though deprived of those organs which are necessary to life in the higher ranks of nature. Many of them are furnished with lungs and an heart, like the nobler animals; yet the caterpillar continues to live, though its heart and lungs, which is often the case, are entirely eaten away.—It is not, however, from their conformation alone that insects are inferior to other animals, but from their instincts also. It is true, that the ant and the bee present us with striking instances of assiduity; yet even these are inferior to the marks of sagacity displayed by the larger animals. A bee taken from the swarm is totally helpless and inactive, incapable of giving the smallest variations to its instincts. It has but one single method of operating; and if put from that, it can turn to no other. In the pursuits of the hound, there is something like choice; but in the labours of the bee, the whole appears like necessity and compulsion.—All other animals are capable of some degree of education; their instincts may be suppressed or altered; the dog may be taught to fetch and carry, the bird to whistle a tune, and the serpent to dance: but the insect has only one invariable method of operating; no arts can turn it from its instincts; and indeed its life is too short for instruction, as a single season often terminates its existence.—Their amazing number is also an imperfection. It is a rule that obtains through all nature, that the nobler animals are slowly produced, and that nature acts with a kind of dignified economy; but the meaner births are lavished in profusion, and thousands are brought forth merely to supply the necessities of the more favourite part of the creation. Of all productions in nature, insects are by far the most numerous. The vegetables which cover the surface of the earth bear no proportion to the multitudes of insects; and though, at first sight, herbs of the field seem to be the parts of organized nature produced in the greatest abundance, yet, upon more minute inspection, we find every plant supporting a mixture of scarce preceptible creatures, that fill up the compass of youth,

youth, vigour, and age, in the space of a few days existence.—In Lapland, and some parts of America, the insects are so numerous, that if a candle is lighted they swarm about it in such multitudes, that it is instantly extinguished by them; and in these parts of the world, the miserable inhabitants are forced to smear their bodies and faces with tar, or some other unctuous composition, to protect them from the stings of their minute enemies.

On the other hand, Swammerdam argues for the perfection of insects in the following manner. "After an attentive examination (says he) of the nature and anatomy of the smallest as well as the largest animals, I cannot help allowing the least an equal, or perhaps a superior, degree of dignity. If, while we dissect with care the larger animals, we are filled with wonder at the elegant disposition of their parts, to what an height is our astonishment raised, when we discover all these parts arranged, in the least, in the same regular manner! Notwithstanding the smallness of ants, nothing hinders our preferring them to the largest animals, if we consider either their unwearied diligence, their wonderful strength, or their inimitable propensity to labour. Their amazing love to their young is still more unparalleled among the larger classes. They not only daily carry them to such places as may afford them food; but if by accident they are killed, and even cut into pieces, they will with the utmost tenderness carry them away piece-meal in their arms. Who can show such an example among the larger animals which are dignified with the title of *perfect*? Who can find an instance in any other creature that can come in competition with this?"

On this dispute it is only necessary to observe, that the wisdom of the Creator is so conspicuous in all his works, and such surprising art is discovered in the mechanism of the body of every creature, that it is very difficult, if not impossible, to say where it is most, and where it is least, to be observed.

Whoever is desirous of attaining a systematic knowledge of insects, ought primarily to be solicitous about acquiring the terms made use of in the science, that so he may be able rightly to denominate every part of an insect. The student is first to know what an insect is, lest he mistake hippocampi, and other amphibious animals, for them, as was formerly done; or confound them with the *vermes*, which Linnæus first distinguished from insects, and which differ as essentially from them as the class mammalia do from birds. Every insect is furnished with a head, antennæ, and feet, of all which the vermes are destitute. All insects have six or more feet; they respire through pores placed on the sides of their bodies, and which are termed *spiracula*: their skin is extremely hard, and serves them instead of bones, of which they have internally none. From this definition, the acus marina is evidently no insect. But the antennæ placed on the fore part of the head, constitute the principal distinction. These are jointed and moveable in every part, in which they differ from the horns of other animals: they are organs conveying some kind of sense; but we have no more idea of what this kind of sense is, than a man has, who, without eyes, attemps to determine the particular action of the rays of light on the retina of the eye, or to explain the changes which from thence take place in the human mind. That they are the organs of some kind of sense, is apparent from their perpetually moving them forward; yet the hard crust with which they are invested, and their shortness in flies and other insects, would induce one to believe them not to be the organs of touch: Mr. Barbut supposes them to constitute or to contain the organs of hearing. That they are tubular, and filled with air, and some kind of humour, appears from the antennæ of butterflies immersed in water.—To come now to the terms of the art. A knowledge of the external parts of the body is first to be established; which, after the method of anatomists, we divide into head, trunk, abdomen and extremities.

Organs of hearing, &c.

Sect. I. *External Parts of the Body.*

I. CAPUT, the HEAD. This part in insects is without brain. The difference between the brain and spinal marrow consists in the former being a medullary part organized. We do not deny the existence of a medullary thread in the heads of insects, but we never could discover it to be organized: hence the hippobosca equina, or horse fly, will live, run, nay even copulate, after being deprived of its head; to say nothing of many others which are capable of living a long while in the same situation.

Fundamenta Entomologiæ A J. Bladh, Amæn. acad. n° 133.

As they are not apparently furnished with ears, they have been apprehended incapable of hearing; as we can no more conceive that sense to exist without ears than vision without eyes. That they are nevertheless susceptible of any shrill or loud noise, as well as fishes, is indisputable; but it has been supposed to be in a manner different from that of hearing. Mr Barbut, however, supposes them to possess this sense in a very distinct manner. Many insects, he observes, are well known to be endowed with the power of uttering sounds, such as large beetles, the bee, wasp, common fly, gnat, &c. The sphinx atropos squeaks, when hurt, nearly as loud as a mouse. Now, if insects are endowed with the power of uttering sounds, it certainly must be for some purpose. As they vary their cry occasionally, it must certainly be designed either to give notice of pleasure or pain, or some affection in the creature who possesses it. "The knowledge of their sounds, (says our author) is undoubtedly confined to their tribe, and is a language intelligible to them only; saving when violence obliges the animal to exert the voice of nature in distress, craving compassion; then all animals understand the doleful cry. For instance, attack a bee or wasp near the hive or nest, or a few of them: the consequence of that assault will be, the animal or animals, by a different tone of voice, will express his or their disapprobation or pain; that sound is known to the hive to be plaintive, and that their brother or brethren require their assistance; and the offending party seldom escapes with impunity. Now, if they had not the sense of hearing, they could not have known the danger their brother or brethren were in by the alteration of their tone."

Another proof, which he reckons still more decisive, was taken from an observation made by himself on a large spider in St. James's Park. This creature had made a very large web on a wooden railing; and was, at the time of observation, on one of the rails at a considerable distance from the place where a large fly entan-

Organs of hearing, &c.

entangled itself. Nevertheless, the moment the fly was entangled, the spider became sensible of it; tho', from the situation of the rail, he could not possibly have seen it. In this, however, Mr Barbut might possibly be deceived; because the spider was perhaps alarmed by the tremulous motion of the threads, occasioned by the fluttering of the fly; which he might well know how to distinguish from their vibration by the wind. The organ of hearing, in our athor's opinion, is situated in the antennæ: both from their situation in the part of the head most favorable to such organs, their inward structure being moveable, the ears of most inferior animals being so. He has never considered the antennæ as either offensive or defensive, but has observed them to be endowed with an exquisite sense of feeling; that the animal appeared to be in agony when its attennæ were pinched; and that it takes care to avoid the touching any hard substance with them roughly. "This tenderness in the organ of hearing (says he) is common to all animals; and insects seem to be particularly tender in these parts by quickly withdrawing them from the touch."

Our author further observes, that the antennæ of all insects are composed of joints varying in size, form, and number. Those who are chiefly confined to live under water have their antennæ in general shorter than those who live on land. Some who roam at large in the air have them long and slender. They are all hollow, and are rendered flexible by the joints, which are very visible in the horns of the crab and lobster. This hollowness, in our author's opinion, is to receive the sound communicated to the extremities of the antennæ by the repercussion of the air affected by any noise, and convey it by means of joints, from one to another, till it arrives in that lessened degree of tone best suited to the timid nature of the animal. In this circumstance there may be many variations in point of perfection in these organs; the strength, utility, and degree of power in receiving sound being proportioned to the necessities of the animals, different in their nature and requisites. In most animals, the entrance to the auricular organ is patulous; but in this case the animal would suffer great inconvenience from such an organization, as the organ would often be clogged with dirt, &c.

It has also appeared dubious if they have the sense of smell, no organ being found in them adapted to that purpose: and although it was evident they had a perception of agreeable and fetid effluvia, it was thought to be in a manner altogether unknown to us. Mr Barbut is of opinion that the organs of smell reside in the palpi or feeler. Many insects have four and some six, two of which are in general cheliform, in order to assist the insect in conveying its food to its mouth. It may be likewise observed, that the palpi are in continual motion; the animal thrusting them into every kind of putrid and other matter, as a hog would do his nose, smelling and searching after food. Insects which apparently do not possess palpi or spiral tongues, have undoubtedly some organ concealed within the mouth analogous to them in function and utility; the fleshy proboscis of the fly is thrust into every substance in which the animal expects to find food; and when it is extended, nearly in the middle are situated, in our author's opinion, two upright palpi, which, no doubt, perform in their turn some office, perhaps that of smell.

Eyes. Antennæ, &c.

Many insects have no tongue, nor make any sound with their mouth; but for this purpose some use their feet, others their wings, and others some elastic instrument with which they are naturally furnished.

Eyes. Most insects have two; but the gyrinus has four, the scorpion six, the spider eight, and the scolopendra three. They have no eye-brows, but the external tunic of their eyes is hard and transparent like a watch-glass; their eyes have no external motion, unless it be in the crab. They consist for the most part of one lens only: but in those of the butterfly, dipteræ, and many of the beetles, they are more numerous. Pugett discovered 17,325 lenses in the cornea of a butterfly, and Lieuwenhoek 800 in a fly.

Antennæ. Of these there are in general two (unless four are allowed to some kind of crabs), and placed on the forepart of the head: they are peculiar to insects; and are plainly distinguishable from the tenaculæ of the vermes, in being crustaceous; and from the palpi of insects, which are more numerous, placed near the mouth, and are sometimes wanting. As the antennæ are of great moment in distinguishing the various kinds of insect, we shall enumerate and explain the several different forms of them.

Setaceæ, are those which grow gradually taper towards the extremity.

Filiformes, such as are of the same thickness throughout.

Moniliformes, are filiform, like the preceding, but consist of a series of round knobs, like a necklace of beads.

Clavatæ, such as gradually increase in size toward the extremity.

Capitatæ, are *clavatæ*, but have the extremity somewhat round.

Fissiles, are *capitatæ*; but have the capitulum, or knob, divided longitudinally into three or four parts, or laminæ, as in the scarabæi.

Perfoliatæ, are also *capitatæ*; but have the capitulum horizontally divided, as in the dermestes.

Pectinatæ, so called from their similitude to a comb, though they more properly resemble a feather, as in the moths and elateres. This is most obvious in the male.

Aristatæ, such as have a lateral hair, which is either naked or furnished with lesser hairs, as in the fly; *Breviores*, those which are shorter than the body: *longiores*, those which are longer than the body; *mediocres*, those which are of the same length with the body; all three of which varieties are distinguishable in the cerambyces.

Palpi, or *Feelers*, resemble filiform, articulated, moveable antennæ. They are most commonly four in number, sometimes six; they are sufficiently distinguished from antennæ, in being naked, short, and always placed at the mouth.

Os, the *Mouth*, is generally placed in the anterior part of the head, extending somewhat downwards. In some insects it is placed under the breast, as in the chermes, coccus, cancer, (crab), and curculio.

Rostrum, or *Proboscis*, is the mouth drawn out to a rigid point: in many of the hemiptera class it is bent downward toward the breast and belly, as in the cicada, Organs of hearing, &c

cicada, nepa, notonecta, cimex (bug), aphis, and remarkably so in some curculiones.

MAXILLÆ, the *Jaws*, are two in number, sometimes four, and at other times more; they are placed horizontally; the inner edge of them in some insects is serrated or furnished with little teeth.

LINGUA, the *Tongue*, in some insects is taper and spiral, as in the butterfly; in others it is fleshy, resembling a proboscis, and tubular, as in the fly.

LABIUM *superius*, the *upper Lip*, is situated above the jaws; as in the scarabæus and gryllus.

STEMMATA, or *Crown*, are three smooth hemispheric dots, placed generally on the top of the head; as in most of the hymenoptera, and others.

II. TRUNCUS, the TRUNK, is that part which comprehends the breast or thorax: it is situated between the head and abdomen; and has the legs inserted into it. That its parts may be distinctly determined, it is divided into *thorax*, *scutellum*, and *sternum*.

THORAX, the *Thorax*, is the back part of the breast; and is very various in its shape. It is called *dentatus*, when its sides are armed with points; *spinosus*, when its back is furnished with them, as in the cerambyx; and *marginatus*, when its margin is laterally dilated, as in the silpha and cassida.

SCUTELLUM, or *Escutcheon*, is the posterior part of the thorax; it is frequently triangular; and appears to be divided from the thorax by an intervening suture, as in most of the coleoptera.

STERNUM, the *Sternum*, is situated on the inferior part of the thorax; it is pointed behind in the elateres, and bifid in some of the dytisci.

III. ABDOMEN, the ABDOMEN is in most insects distinct from the thorax; it is the posterior part of the body of the insect; and is composed of a number of annular segments, which serve occasionally to lengthen or shorten it, and to contain the organs of chylification, &c.

SPIRACULA, are little holes or pores, placed singly on each side of every segment of the abdomen: thro' these the insect breathes: and if oil be applied so as stop them up, it proves fatal to most of them.

TERGUM, the *Back*, is the superior part of the abdomen.

VENTER, the *Belly*, is the inferior part.

ANUS, is the posterior part of the abdomen, perforated for the evacuation of the excrement. This part also frequently contains the organs of generation.

IV. ARTUS, the LIMBS or EXTREMITIES, are the various instruments of motion.

PEDES, the *Legs*, are generally six. There is an exception to this, however, in the class Aptera, many of which have eight; as acari (mites), phalangii, most of the aranei (spiders), scorpiones (scorpions), and cancri (crabs). The oniscus has 14, and the iuli and scolopendri still more.

The first joint of the leg, which is generally thickest, is called *femur*; the second, which is generally of the same size throughout, *tibia*; the third, which is jointed, is distinguished by the name of *tarsus*; and the last, which in most insects is double, by that of *unguis*. The legs of insects, in general, are named from the various motions they produce: *Cursorii*, from that of running, which are the most numerous; *saltatorii*, from that of leaping; *natatorii*, from that of swimming, &c.—In the *saltatorii*, the thighs are remarkably large, by which means they are able to leap to a considerable distance, as in the gryllus, grasshopper, &c. In those of the *Natatorii*, the feet are flat, and edged with hairs, which answer the purpose of oars in assisting them to swim, as in the dytiscus.—*Mutici*, are such feet as have no claws. —*Chelæ*, or claws, are the fore-feet enlarged towards their extremities, each of which is furnished with two lesser claws, which act like a thumb and finger; as in the crab.

Claws, &c. of Insects.

ALÆ, *Wings*, the instruments which enable them to fly. These are membranous and undivided, except in the instance of the phalænæa alucitæ, in which they are in part divided. Most insects have four; the diptera-class, and the coccus, however, have two only.

The wing is divided into its superior and inferior surfaces: its anterior part in a butterfly, is that towards the anterior margin, or next to the head; its posterior part, that towards the anus; its exterior part that towards the outer edge; and the interior, that next the abdomen.

They are called *plicatiles*, when they are folded at the time the insect is at rest, as in the wasp; opposite to these are the *planæ*, which are incapable of being folded.

Erectæ, such as have their superior surfaces brought in contact when the insect is at rest; as in the ephemera, libellula puella and virgo, and papiliones (butterflies.)

Patentes, which remain horizontally extended when the insect is at rest; as in the phalænæ geometræ, and most of the libellulæ.

Incumbentes, such as cover horizontally the superior part of the abdomen when the insect is at rest.

Deflexæ, are incumbentes, but not horizontally, the outer edges declining toward the sides.

Reversæ, are deflexæ, with this addition, that the edge of the inferior wings projects from under the anterior part of the superior ones.

Dentatæ, in which the edge is serrated, or scolloped.

Caudatæ, in which one or more projections in the hinder wings are extended into processes.

Reticulatæ, when the vessels of the wings put on the appearance of network, as in the hemerobius perla: the two anterior wings generally become superior, and the posterior ones inferior, in moths, when their wings are closed; but the anterior wings are called *primary*, and the inferior ones *secondary*, in butterflies, as they cannot with propriety be called *inferior* when the wings are erect.

Colores, the colours, these are self-apparent: but according to their several shapes, they take the different names of *punctæ*, dots; *maculæ*, spots; *fasciæ*, bands, which frequently run across and sometimes surround the edge of the wings; *strigæ*, streaks, which are very slender fasciæ; and *lineæ*, lines, which are longitudinally extended.

Ocellus,

Wings of Insects.

Ocellus, is a round ſpot, containing a leſſer ſpot of a different colour in its centre.

Stigmata, another term lately introduced by Linnæus, ſignifies the ſpot, or anaſtamoſis, in the middle of the wing near the anterior margin; it is conſpicuous in moſt of the hymenoptera and neuroptera, and even in the coleoptera. The ſingle or double kidney-ſhaped ſpot, ſituated in the ſame part of the anterior wings, and frequently occurring in the phalænæ paganæ, is diſtinguiſhed likewiſe by the name of *ſtigma*.

Elytra (in the ſinglar number elytron). The upper wings, which are of a hard ſubſtance, in ſome degree reſembling leather, and which in moſt inſects are of a very hard texture, but in others flexible, are called *elytra*; their ſuperior ſurface is generally convex, their inferior one concave. When the inſect flies, they are extended; and ſhut when it reſts, cloſing together, and forming a longitudinal ſuture down the middle of the back, as in the coleoptera.

They are of various ſhapes. *Abbreviata*, when ſhorter than the abdomen. *Truncata*, when ſhorter than the abdomen, and terminating in a tranſverſe line. *Faſtigiata*, when of equal or greater length than the abdomen, and terminating in a tranſverſe line. *Serrata*, when the exterior margin towards the apex is notched or ſerrated, as in ſome of the bupreſtes. *Spinoſa*, when their ſurface is covered with ſharp points or prickles. *Scabra*, when their ſurface is ſo uneven as to grate againſt the fingers. *Striata*, when marked with ſlender longitudinal furrows. *Porcata*, when with elevated longitudinal ſulci or ridges. *Sulcata*, when theſe ridges are concave. *Hemelytra*, when the ſuperior wings are of a middle ſubſtance betwixt leather and membrane; either totally ſo, as in the grylli; or partially ſo, as in the cimices, nepæ, and notonectæ: Theſe are commonly diſtinguiſhed by the name *hemiptera*.

Halteres, poiſers, (a term alſo introduced by Linnæus), are little heads placed on a ſtalk or peduncle, moſt frequently under a little arched ſcale. They are found only in the claſs diptera, and appear to be nothing more than the rudiments of the hinder wings.

Cauda, the *Tail*, in moſt inſects is,

Simplex, ſimple, capable of being extended, and again drawn back at pleaſure. In the crab and ſcorpion, however, it is

Elongata, elongated, or lengthened out.

Setacea, briſtle-ſhaped, or taper; as in the raphidea.

Triſeta, conſiſting of three briſtles; as in the ephemera.

Furcata, being forked, as in the podura.

Forcipata, reſembling a pair of forceps; as in the forficula.

Falioſa, reſembling a leaf; as in the blatta, grylli, and ſome ſpecies of cancri.

Telifera, ſuch as are armed with a dart or ſting; as in the ſcorpion and panorpa.

Aculeus, an inſtrument with which they wound, and at the ſame time inſtil a poiſon; with ſuch the bee, waſp, ſcorpion, &c. are furniſhed.

Explanation *of* Plate CLXXXII.

Fig. 1. Antennæ pectinatæ or feathered; as in the *phalænæ*, moths.

2. Antennæ perfoliatæ, or perfoliated; as in the *dermeſtes* and *dytiſcus*.

3. ——— fissiles, or fiſſile, divided into laminæ at the extremity, as in the *ſcarabæi*, beetles.

4. ——— clavatæ, or club-ſhaped, as in the *papilio*, butterfly.

5. ——— moniliformes, like a necklace of beads; as in the *chryſomela*.

6. ——— setaceæ, ſetaceous, or briſtle-ſhaped; as in many of the *phalænæ*.

7. ——— aristatæ, furniſhed with a lateral hair, as in the *fly*.

8. 9. *a* Caput, the head.
b Palpi, or feelers.
c Antennæ, or horns.
d Oculi, the eyes.
e Thorax.
f Scutellum, or eſcutcheon.
g Pectus, or breaſt.
h Sternum, or breaſt-bone.
i Abdomen, and its ſegments.
k Anus.
l Elytra, or ſhells.
m Membranous wings.
n Pedes, or feet, which are natatorii.

10. *o* Femur, or thigh.
p Tibia, or leg.
q Tarſus, or foot.
r Unguis, or claw.

11. *a* The anterior part of the wing.
b The poſterior part.
c The exterior part.
d The interior part.
e The margin.
f The diſk, or middle.
g Oculus, or eye.

12, 13, 14, 15, Repreſent the inſect in its egg, caterpillar, pupa, and perfect ſtate.

Of the Sexes of Insects.

Sect. II. *Of the Sexes of Inſects.*

The ſame difference of ſex exiſts in inſects as in other animals, and they even appear more diſpoſed to increaſe their ſpecies than other animals; many of them, when become perfect, ſeeming to be created for no other purpoſe but to propagate their ſpecies. Thus the ſilk-worm, when it arrives at its perfect or moth-ſtate, is incapable of eating, and can hardly fly: it endeavours only to propagate its ſpecies; after which the male immediately dies, and the female as ſoon as ſhe has depoſited her eggs.

In many inſects, the male and female are with difficulty diſtinguiſhed; and in ſome they differ ſo widely, that an unſkilful perſon might eaſily take the male and female of the ſame inſect for different ſpecies; as for inſtance, in the phalæna humuli, piniaria, ruſſula; each ſex of which differs in colour. This unlikeneſs is ſtill more apparent in ſome inſects, in which the male has wings and the female none; as in the coccus, lampyris, phalæna antiqua, brumata, lichenella. And as moſt inſects remain a long while in copulation, as we may ſee in the tipula and ſilk-worm, the winged males fly with the wingleſs females, and carry them about from one place to another; as in the phalæna antiqua.

Propagation, &c. tiqua. It is, however, no certain rule, that when one insect of the same species is found to have wings, and the other to be without, the former must necessarily be the male, and the latter the female. The aphides, for instance, are an exception; and besides these, individuals of both sexes, and of the same species, are found without wings, as the carabi majores, tenebriones, meloes, cimices. The gryllus pedestris is likewise destitute of wings; and might have passed for a gryllus in its pupa state, had it not been seen in copulation; for it is well known that no insect can propagate its species till it arrives at its last or perfect state.

"Pleraque insectorum genitalia sua intra anum habent abscondita, et penes solitarios, sed nonnulla penem habent bifidum: Cancri autem et Aranei geminos, quemadmodum nonnulla amphibia, et quod mirandum in loco alieno, ut Cancer, sub basi caudæ. *Araneus mas* palpos habet clavatos, qui penes sunt, juxta os utrinque unicum, quæ clavæ sexum nec speciem distinguunt; et fœmina vulvas suas habet in abdomine juxta pectus. Heic vero si unquam vere dixeris, "*Res plena timoris amor:* si enim procus in auspicato accesserit, fœmina ipsum devorat; quod etiam fit, si non statim se retraxerit. Libellula fœmina genitale suum sub apice gerit caudæ, et mas sub pectore; adeo ut cum mas collum fœminæ forcipe caudæ arripit, illa caudam sub pectore ejus adplicit, sicque peculiari ratione connexæ volitent."

Besides those of the male and female, a third sex exists in some insects which we call *neuter:* As these have not the distinguishing parts of either sex, they may be considered as eunuchs or infertile.

We know of no instance of this kind in any other class of animals, nor in vegetables, except in the class Syngenesiæ, and in the Opulus. This kind of sex is only found among those insects which form themselves into societies, as bees, wasps, and ants: and here these kind of eunuchs are real slaves, as on them lies the whole business of the economy; while those of the other sex are idle, only employing themselves in the increase of the family. Each family of *Bees* has one female only (called the *queen*), many males, and an almost innumerable quantity of neuters. Of those, the neuters (whose antennæ have 11 joints) do the working part; they extract and collect honey and wax, build up the cells, keep watch, and do a variety of other things. The males, whose antennæ consist of 15 joints, do no work; they serve the female once, and that at the expence of their lives; they may be considered in the light of a set of parasites, or cecisbei; but as soon as their business of impregnation is over, they are expelled by their servants the neuters, who now shake off the yoke, but yet pay all due respect to their common mother the queen. The same economy nearly takes place in *Wasps*, where the young females, which are impregnated in the autumn, live through the winter, and in the spring propagate their species; but the queen, together with all the males, perish in the winter. Among *Ants*, the neuters form a hill in the shape of a cone, that the water may run off it, and place those which are in the pupa state on that side of it which is least exposed to the heat of the sun. At a considerable distance from these are found the habitations of the males and females, to whom the most ready obedience is yielded by the neuters, till a new offspring succeeds, and then they oblige them to quit their habitations. But those ants which live entirely under ground provide better for themselves in this respect: for a little before their nuptials, they quit their habitation of their own accord, and after swarming in the manner of bees, they copulate in the air; and each retiring to some new habitation, founds a new family.

No *hermaphrodites* have as yet been discovered among insects. There is something very singular, however, in the propagation of the aphides. A female aphis once impregnated, can produce young, which will continue to produce others without any fresh impregnation, even to the fifth progeny; afterwards a new impregnation must take place. See APHIS.

The male insects, like male hawks, are always smaller than the females.

In the propagation of their species they are remarkably careful; so that it is with the greatest difficulty the flies are kept from depositing their eggs on fresh meat, the cabbage butterfly from laying them on cabbage, and other insects from depositing them in the several places peculiar to each. The scarabæus pilularius and carnifex, are deserving of our attention, as they afford a mutual assistance to each other: for when the female has laid her eggs in a little ball of dung, the males with their feet, which are axiform, assist the female to roll it to some suitable place; as Aristotle and Pliny formerly, and Loefling has lately, observed.

It is very wonderful to observe, that in the coccus and oniscus, the female has no sooner brought forth her young, than she is devoured by it; and that the sphex should be able so readily to kill the caterpillar of a moth, then bury it in the earth, and there deposit her eggs in it. Nor can we without admiration behold the same species of aphis, which was viviparous in the summer, become oviparous in the autumn.

Almost innumerable examples might be brought of the singularities in the eggs of insects: we shall, however, only mention those of the hemerobius, which are deposited on a footstalk; those of the phalæna neustria, which are placed regularly on a ring round the branch of some tree; and the compound eggs of the blatta.

SECT. III *Metamorphoses of Insects.*

Changes of Insects. THERE are no insects, except those of the aptera class, but what are continually undergoing some transformation. Insects change first from the (ovum) egg, into the (larva) caterpillar or maggot; then into the (pupa) chrysalis; and lastly into the (imago) fly or perfect state. During each of those changes, their appearance differs as much as night and day.

The insect, as soon as it came out of the egg, was by former entomologists called *eruca;* but as this is synonymous with the botanic name *sisymbrium*, it was changed by Linnæus for the term

Larva; a name expressive of the insect's being, in this state, as it were masked, having its true appearance concealed. Under this mask or skin the entire insect, such as it afterwards appears when perfect, lies concealed, inveloped only in its tender wings, and putting on a soft and pulpy appearance; insomuch that Swammerdam was able to demonstrate the butterfly with its wings to exist in a caterpillar, though

Changes of Inſects.

though it bore but a faint reſemblance to its future perfection. The inſect, therefore, in this ſtate, undergoes no other alteration but the change of its ſkin. The larvæ are, for the moſt part, larger than the inſect, when perfect, and are very voracious. The caterpillar of the cabbage-butterfly eats double what it would ſeem to require from its ſize; but its growth is not adequate to its voracity.

Pupa. The inſect in this ſtate was formerly called *chryſalis*, or *aurelia:* but as the appearance of gilding is confined to a few butterflies only, the term of *pupa* has been adopted in its ſtead; becauſe the lepidoptera, eſpecially, reſemble an infant in ſwadling clothes; and in this ſtate all, except thoſe of the hemiptera claſs, take no nouriſhment.

Imago, is the third ſtate. The name is given by Linnæus to this third change, in which the inſect appears in its proper ſhape and colours; and as it undergoes no more transformations, it is called *perfect*. In this ſtate it flies, is capable of propagating its ſpecies, and receives true antennæ; which before, in moſt inſects, were ſcarce apparent.

As the ſhape of the pupa is different in different claſſes of inſects, it aſſumes different names; thus it is called

Coarctata, when it is round, and as it were turned, without the leaſt reſemblance of the ſtructure of the inſect; as in the diptera.

Obtecta, when it conſiſts as it were of two parts, one of which ſurrounds the head and thorax, and the other the abdomen.

Incompleta, when they have wings and feet, but are not capable of moving them; as in moſt of the hymenoptera.

Semicompleta, in which they walk or run, but have only the rudiments of wings.

Completa, in which they immediately obtain the perfect form of the inſect, without undergoing any more change: as in thoſe of the aptera claſs, except only the flea. The bed-bug alſo belongs to this claſs.

The ſpider undergoes frequent transformations, though only in the colour of its ſkin. The cruſtaceous inſects, as crabs, lobſters, &c. yearly caſt their ſhells, as their growth would otherwiſe be impeded.

The ſcolopendri, when young, have fewer feet than when they are full grown.

All inſects, as ſoon as they undergo the third change, are arrived at their full growth; nor do we find any difference in the ſize of the ſame ſpecies of inſect in the ſame countries, unleſs, during its caterpillar ſtate, it has not had a ſufficiency of proper food.

Sect IV. *Claſſification of Inſects.*

As inſects are endowed with the various powers of creeping, flying, and ſwimming, there is ſcarce any place, however remote and obſure, in which they are not to be found. The great confuſion which appeared to the ancients to riſe from their number, made them never dream of reducing them to any ſyſtem. Swammerdam, that indefatigable inquirer into nature, obſerved that their metamorphoſes were divided by nature into ſeveral ſtates or orders. Their external appearance alſo carried with it ſome mark of diſtinction: ſo that entomologiſts called all thoſe of the coleoptera claſs *Scarabæi* (beetles); thoſe of the lepidoptera *Papiliones*; and thoſe of the gymnoptera claſs that had two wings only, *Muſcæ* (flies); thoſe of the ſame claſs that had four wings, were called *Apes* (bees). No farther progreſs was made in the ſyſtematic part of this ſcience till the time of Linnæus. He was the firſt that undertook to determine the genera, and aſſign them their proper characters, in the *Syſtema Naturæ*; and thus reduced this ſcience to a ſyſtematic form. This ſyſtem, in ſubſequent editions, was conſiderably enriched and amended by him, inſomuch that the ſcience of inſects now ſhines forth in its full luſtre. He it was who firſt inſtituted natural orders, and reduced them into genera by expreſſive names; determined an infinite number of ſpecies in the *Fauna Suecica* and *Muſeum Reginæ*; collected with incredible pains the ſynonymous names of the various authors who had written on them; and laſtly added their deſcriptions, and the places in which they were to be found. So that the ſyſtem of this illuſtrious author will lead any perſon, without the aſſiſtance of a maſter, for the moſt part, eaſily to aſcertain the name of any inſect he may meet with. Before his time ſcarce any more than 200 inſects were known; whereas, in the laſt edition of his ſyſtem he has determined the names of nearly 3000 diſtinct ſpecies; though this is not the ſixth part of the number that is now known.

Claſſification of Inſects.

Orders. The claſs of *inſects* is divided by Linnæus into ſeven orders.

1. The *Coleoptera* (from κωλεος *a ſheath*, and ϖτερον *a wing*), are ſuch inſects as have cruſtaceous elytra or ſhells, which ſhut together, and form a longitudinal ſuture down the back of the inſect; as the beetle *(bupreſtis ignita)*, fig. 16. Plate CLXXXIII.

2. *Hemiptera* (from ημισυ *half*, and ϖτερον *a wing)*, have their upper wings uſually half cruſtaceous and half membranaceous, not divided by a longitudinal ſuture, but incumbent on each other; as the cimex, fig. 17.

3. *Lepidoptera* (from λεπις *a ſcale*, and ϖτερον *a wing)*, are inſects having four wings, covered with fine ſcales in the form of powder or meal; as in the butterfly *(papilio antiopa)*, fig. 18.

4. *Neuroptera*, (from νευρον *a nerve*, and πτερον *a wing)*, have four membranous tranſparent naked wings, generally like net-work; as in the *panorpa coa*, fig. 19.

5. *Hymenoptera* (from υμην *a membrane*, and πτερον *a wing)*, are inſects with four membranous wings, tail furniſhed with a ſting; as in the *tenthredo*, fig. 20.

6. *Diptera* (from δυω *two*, and πτερον *a wing)*, are ſuch as have only two wings, and poiſers; as in the fly *(muſca)*, fig. 21.

7. *Aptera* (from α *without*, and ϖτερον *a wing)*, inſects having no wings. This laſt diviſion contains ſcorpions, ſpiders, crabs, lobſters, &c. See Aranea. Cancer, &c.

Genera. To inſert here the characters of all the different genera which may be found in Linnæus's Syſt. Nat. would be unneceſſary. It will be ſufficient to enumerate ſome new genera mentioned by ſubſequent ſyſtematic writers, that, by being acquainted with the ſubtile diſtinctions on which they are built, the ſtudent may avoid running into confuſion. It is among the moderns only that genera of this kind are to be met with, and new names given them. To remove this difficulty, we ſhall firſt enumerate the names of

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of those authors which are synonymous with those of Linnæus.

New Genera *of authors synonymous with those of Linnæus.*

Linnæus's Names.	Names of other Authors.
Lucanus	*Platyceros*
Hister	*Attelabus*
Byrrhus	*Anthrenus cistela*
Mylabris	*Loria* Scop.
Attelabus	*Clerus*
Silpha	*Peltis*
Bruchus	*Mylabris*
Ptinus	*Byrrhus*
Chrysomela	*Galericula*
Hispa	*Crioseris*
Cantharis	*Cicindela*
Buprestis	*Cucujus*
Carabus	*Buprestis*
Myrmeleon	*Formica-leo*
Sirex	*Urocerus.*

New genera of authors.

Copris. Scarabæus absque scutello
Bostricius. Dermesutes capecinus
Cistela. Byrrhus pilula
Rhinomancer. Attelabus rostro producto fere curculionis.
Anthribus. Silpha
Bruchus. Ptinus Fur ob spinas thoracis
Melolontha. Chrysomela cylindria
Altica. —— saltatoria
Diaperis. —— fungorum
Pyrochora. Cantharis
Telephorus. Cantharis
Cantharis. Meloë alata
Cerocoma. Meloë shafferi
Notaxis. Meloë monoceros
Prionus. Cerambyx thoracis margine denticulato
Stenocoris. Leptura thorace spinosa
Hydrophilus. Dytiscus antennis clavatis
Mylabris. Necydalis minor.
Acridium. Gryllus muticus
Locusta. —— tettigonia
Tettigonia. Cicada
Corixa. Notonecta
Naucoceris. Nepa
Perla. Hemerobius cauda bisecta
Libelluloides. Myrmeleon antennis capitatis
Crabro. Tenthredo antennis clavatis
Pterophorus. Phalæna alucita
Bibio. Tipula thorace spinoso
Stomoxoides. Asilus bucca inflata
Strationymus. Musca
Nemotelus. Musca
Volucella. Musca.

These genera appear to be in a great measure like those which were introduced into botany by the followers of Rivinus. Paying too little regard to nature, they disunited natural genera, on account of the most trifling distinctions. This made their continuance in the science of very short duration; our business here is not to suppose, but to examine, what nature will allow of, and what she will not. Knowledge of this kind, built on opinion only, will not stand. We are therefore to look into the science with great accuracy; and the larva of the insect, its manner of changing, and other things of moment, are to be known, before we presume to form a new genus.

Coining of new names, and changing of one old one for another, has been the source of the greatest confusion. Thus, in order to reduce the cicindela and carabus to the same genus, *buprestis* has been adopted for the generic name: but as that genus had long ago received a very different application, it was changed for that of *cucujus*.

Again, that the officinal cantharides might be ranged among the cerambyces, the cantharides have been removed from the genus of meloë (to which they naturally belong), and referred to the genus of cicindela, obtaining thus a new name. And so of many others.

Thus also, to mention no more, how needless and rash was it to separate the acridium and locusta from the genus of gryllus, the crabro from the tenthredines, and the mylabris from the necydalis!

Trivial Names. The trivial names placed under their respective genera will occasion little or no controversy; they are current like money, and of the same utility as the proper names of men, Peter or Paul, &c. Insects living on vegetables should receive their names from the particular plants on which they mostly feed, as they are preferable to all others. Thus the names of the *phalæna mori*, &c. are excellent; and when we are able to give such to insects, the old ones are to be discarded. But we are to be cautious of not being too hasty in our judgment in this respect; as insects, when they cannot get their favourite food, will often eat other plants. Thus the silk-worm, for want of mulberry leaves, will eat those of lettuce, though it will not thrive so well on them.

Many other instances of the invention of trivial names will be met with in the *Systema Naturæ*, particularly among the butterflies and moths. To prevent confusion from the great number of species which constitute the genus of phalæna, they are destributed into sections, and distinguished by the terms of *bombyces*, *noctuæ*, *geometræ*, *tortricis*, *pyralides*, *tineæ*, and *alucitæ*. The bombyces and noctuæ, which are so much alike, that the females of the bombyces are with great difficulty distinguished from the noctuæ, are named promiscuously.

All those of the geometræ have their names terminating in *aria* and *ata*, according as their antennæ are setaceous or pectinated. The tortrices, in *aria;* the pyralides, in *alis;* the tineæ, in *ella;* and the alucitæ, in *dactyla:* so that it is evident from the termination itself to what section the insect is to be referred.

It were to be wished that similar institutions could be formed throughout the whole science, as here the name itself serves to distinguish the insect.

Butterflies are divided into sections, by the names of *Equites*, *Heliconii*, *Danai*, *Nymphales*, and *Plebeii*.

In such a multitude of butterflies, the greatest part of which are foreign and extra European, and to whose food and manner of life we are utter strangers, it was impossible to give significant trivial names. Linnæus, therefore, by way of simile, has taken the names of the *Equites* from the Trojan history. These consist, as it were, of two troops or bodies; of which one contains the sable, and as it were mourning nobles, having red or bloody spots at the basis of their wings.

They

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These receive names from the Trojan nobles; and as Priam was king of Troy, the most splendid among these bear his name. The other body, ornamented with a variety of gay colours, are distinguished by the names of the Grecian heroes; and as in both armies there were kings as well as officers of an inferior rank, those elegant butterflies, whose hinder wings resembled tails, were distinguished by some royal name. Thus when Paris is mentioned (knowing from history that he was a Trojan, and of royal blood), we find him among those of the first section; that is, those of a sable colour, spotted in the breast with red, and having their hinder-wings resembling tails. When Agamemnon is named, we remember him to be a noble Greek, and find him among those nobles which have variegated and swallow-tailed wings. But when Nereus is spoken of, we readily know him to belong to to the last section with wings having no tails.

The second class, which contains the *Heliconii*, derive their names from the muses, as Urania. The names of the sons and daughters of Danaus are bestowed on the third section. And as these species are subdivided into two other sections, viz. the white and parti-coloured, the metaphor is so conducted, that the white ones preserve the names of the daughters of Danaus, and the parti-coloured ones those of the sons of Egyptus: so that it is evident from the name itself to what section the butterfly is to be referred.

The names or the fourth section, *Nymphales*, are taken from various nymphs of antiquity; and those of the fifth section, *Plebeii*, are selected from different men among the ancients whose names are worthy of remembrance: so that by this means a knowledge of the ancients may be interspersed, and this agreeable science be made doubly pleasing.

Those, therefore, who shall find new lepidoptera, and give them new names, will do well to follow this method, unless it be apparent what food the insect chiefly subsists on.

Entrepas | Entry.

ENTREPAS, in the manege, a broken pace or going, that is neither walk nor trot, but has somewhat of an amble.

This is a pace or gait of such horses as have no reins or back, and go upon their shoulders; or, of such as are spoiled in their limbs.

ENTRING-LADDERS, in a ship, are of two sorts; one used by the vessel's sides, in a harbour, or in fair weather, for persons to go in and out of the ship: the other is made of ropes, with small staves for steps; and is hung out of the gallery to enter into the boat, or to come aboard the ship, when the sea runs so high that they durst not bring the boat to the ship's side for fear of staving it.

ENTROCHUS, in natural history, a genus of extraneous fossils, usually of about an inch in length, and made up of a number of round joints, which, when separate and loose, are called *trochitæ*: they are composed of the same kind of plated spar with the fossil shells of the echini, which is usually of a bluish-grey colour, and very bright where fresh-broken; they are all striated from the centre to the circumference, and have a cavity in the middle. See Plate CLXXXII.

The entrochi are found of all sizes, from that of a pin's head to a finger's length, and the thickness of one's middle finger; and are plainly of marine origin, having often sea-shells adhering to them. They seem to be the petrified arms of that singular species of the sea star-fish, called *stella arborescens*.

They are esteemed very powerful diuretics, and prescribed in nephritic cases with good success; the dose being as much of the powder as will lie on a shilling.

ENTRY, in law, signifies taking possession of lands or tenements, where a person has a right so to do.

Entry of an Heir, in Scots law, that form of law by which an heir vests in himself a proper title to his predecessor's estate.

Bill of Entry, in commerce. See Bill.

In making entries inwards in England, it is usual for merchants to include all the goods they have on board the same ship in one bill, tho' sometimes they may happen to be upwards of 20 several kinds: and in case the goods are short entered, additional or post entries are now allowed; though formerly the goods, so entered, were forfeited. As to bills of entry outwards, or including goods to be exported, upon delivering them, and paying the customs, you will receive a small piece of parchment called a *cocket*, which testifies your payment thereof, and all duties for such goods.

Envelope | Envoy.

If several sorts of goods are exported at once, of which some are free, and others pay customs; the exporter must have two cockets, and therefore must make two entries; one for the goods that pay, and the other for the goods that do not pay custom.

Entries of goods, on which a drawback is allowed, must likewise contain the name of the ship in which the goods were imported, the importer's name, and time of entry inwards. The entry being thus made, and an oath taken that the customs for those goods were paid as the law directs, you must carry it to the collector and comptroller, or their deputies; who, after examining their books, will grant warrant, which must be given to the surveyor, searcher, or land-waiter, for them to certify the quantity of goods; after which the certificate must be brought back to the collector and comptroller, or their deputies, and oath made that the said goods are really shipped, and not landed again in any part of Great Britain.

ENVELOPE, in fortification, a work of earth, sometimes in form of a simple parapet, and at others like a small rampart with a parapet: it is raised sometimes on the ditch, and sometimes beyond it.

ENVIRONNE', in heraldry, signifies surrounded with other things: thus, they say, a lion environné with so many bezants. See Bezant.

ENUMERATION, an account of several things, in which mention is made of every particular article.

Enumeration, in rhetoric, a part of peroration; in which the orator, collecting the scattered heads of what has been delivered throughout the whole, makes a brief and artful relation or recapitulation thereof.

ENVOY, a person deputed to negociate some affair with any foreign prince or state. Those sent from the courts of Britain, France, Spain, &c. to any petty prince or state, such as the princes of Germany, the republic republics of Venice, Genoa, &c. go in quality of envoys, not ambassadors; and such a character only do those persons bear, who go from any of the principal courts of Europe to another, when the affair they go upon is not very solemn or important. There are envoys ordinary and extraordinory, as well as ambassadors; they are equally under the protection of the law of nations, and enjoy all the privileges of ambassadors; only differing from them in this, that the same ceremonies are not performed to them.

ENVY, in ethics; pain felt, and malignity conceived, at the sight of excellence and happiness in another. See EMULATION.

EON, or ÆON. See ÆON.

EONIANS, in church history, the followers of Eon, a wild fanatic of the province of Bretagne, in the 12th century, whose brain was disordered. He concluded from the resemblance between *eum*, in the form for exercising malignant spirits, viz. *Per eum, qui venturus est judicare vivos & mortuos*, and his own name Eon, that he was the son of God, and ordained to judge the quick and dead. Eon, however, was solemnly condemned by the council at Rheins in 1148, at which Pope Eugenius III. presided, and ended his days in a miserable prison. He left behind him a number of followers and adherents, whom persecution and death so weakly and cruelly employed, could not persuade to abandon his cause, or to renounce an absurdity which, says Mosheim, one would think could never have gained credit but in such a place as Bedlam.

EORIA, in mythology, a feast celebrated by the Athenians in honour of Erigonus, who, by way of punishment, for their not avenging the death of his father Icarus, engaged the gods to inflict the curse on their daughters, that they should love men who never returned their passion. The feast was instituted by the order of Apollo.

EOSTRE, in mythology, a Saxon goddess to whom they sacrificed in the month of April, called the month of *Eostra*; and thence the name *Easter*, which the Saxons retained after their conversion to Christianity, applying it to the festival celebrated in commemoration of our Saviour's resurrection.

EPACRIS, in botany: A genus of the monogynia order, belonging to the pentandria class of plants. The calyx is a five-parted perianthium; the corolla monopetalous and tubular; the stamina five; very short filaments; the pericarpium a roundish, depressed, quinquelocular, quinquevalvular, gaping capsule; the seeds are numerous and very small.

EPACTS, in chronology, the excesses of the solar month above the lunar synodical month, and of the solar year above the lunar year of twelve synodical months; or of several solar months above as many synodical months, and several solar years above as many dozen of synodical months.

The epacts, then, are either *annual* or *menstrual*.

Menstrual epacts are the excesses of the civil or kalendar month above the lunar month. Suppose, *e. gr.* it were new-moon on the first day of January; since the lunar month is 29 days 12h. 44′ 3″, and the month of January contains 31 days, the menstrual epact is 1 day 11h. 15′ 57″.

Annual epacts are the excesses of the solar year above the lunar. Hence, as the Julian solar year is 365 days 6h. and the Julian lunar year 354 days 8h. 48′ 38″, the annual epact will be 10 days 21h. 11′ 22″; that is, nearly 11 days. Consequently the epact of 2 years is 22 days; of 3 years, 33 days; or rather 3, since 30 days make an *embolismic* or intercalary month.

Thus the epact of four years is 14 days, and so of the rest; and thus, every 19th year, the epact becomes 30 or 0; consequently the 20th year the epact is 11 again; and so the cycle of epacts expires with the golden number, or lunar cycle of 19 years, and begins with the same, as in the following table:

Gold. Numb.	Epacts.	Gold. Numb.	Epacts.	Gold. Numb.	Epacts.
1	XI	7	XVII	13	XXIII
2	XXII	8	XXVIII	14	IV
3	III	9	IX	15	XV
4	XIV	10	XX	16	XXVI
5	XXV	11	I	17	VIII
6	VI	12	XII	18	XIX
				19	XXX

Again, as the new moons are the same, that is, as they fall on the same day every 19 years, so the difference between the lunar and solar years is the same every 19 years. And because the said difference is always to be added to the lunar year, in order to adjust or make it equal to the solar year; hence the said difference respectively belonging to each year of the moon's cycle is called the *epact of the said year*, that is, the number to be added to the said year, to make it equal to the solar year; the word being formed from the Greek επαγω, *induco, intercalo*.

Upon this mutual respect between the cycle of the moon and the cycle of the epacts, is founded this rule for finding the Julian epact, belonging to any year of the moon's cycle. Multiply the year given of the moon's cycle into 11; and if the product be less than 30, it is the epact sought; if the product be greater than 30, divide it by 30, and the remainder of the dividend is the epact. For instance, I would know the epact for the year 1712, which is the third year of the moon's cycle. Wherefore 3 is the epact for 1712; for 11×3=33, and 33 being divided by 30, there is left 3 of the dividend for the epact. But the difference of the Julian and Gregorian years being equal to the excess of the solar above the lunar year, or 11 days, it happens that the Gregorian epact for one year is the same with the Julian epact for the preceding year.

EPAMINONDAS, a celebrated Theban, the son of Polymnus, and one of the greatest captains of antiquity. He learned philosophy and music under Lysis, a Pythagorean philosopher; and was from his infancy inured to all the exercises of body and mind. He was learned, generous, well-skilled in war, brave, modest, and prudent; and had such a regard for truth, that he would not tell a falsehood even in jest. He served first under the Lacedemonians; saved the life of Pelopidas their chief, who received in a battle seven or eight wounds; and contracted a strict friendship with that general, which lasted till his death. At his persuasions, Pelopidas delivered the city of Thebes from the yoke of the Spartans, who had rendered themselves masters of Cadmea, which occasioned a bloody war between the two nations. Epaminondas was made general of the Thebans; on which he gained the celebrated battle of Leuctra, in which Cleombrotus, the valiant

valiant king of Sparta, was killed. He then ravaged the enemies country, and caused the city of Messina to be rebuilt and peopled. At length, the command of the army was given to another, because Epaminondas had kept his troops in the field four months longer than he had been ordered by the people; but, instead of retiring in disgust, he now served as a common soldier, and distinguished himself by so many brave actions, that the Thebans, ashamed of having deprived him of the command, restored him to his post, in order to carry the war into Thessaly, where his arms were always victorious. A war breaking out between the Elians and the inhabitants of Mantinea, the Thebans took the part of the former. Epaminondas then resolved to endeavour to surprise Sparta and Mantinea; but not succeeding, he gave the enemy battle, in which he received a mortal wound with a javelin, the bearded iron remaining in the wound. Knowing that it could not be drawn out without occasioning instant death, he would not suffer it to be touched, but continued to give his orders: and on being told, that the enemy were entirely defeated, "I have lived long enough (he cried), since I die without being conquered;" and at the same time he plucked the javelin from his wound, and expired, 363, B. C.

EPANALEPSIS. See ORATORY, n° 73.

EPANODOS. *Ibid.* n° 75.

EPANORTHOSIS. *Ibid.* n° 86.

EPARER, in the manege, signifies the flinging of a horse, or his yerking and striking with his hind legs.

EPAULEMENT, in fortification a work raised to cover sidewise, is either of earth, gabions, or fascines loaded with earth. The epaulements of the places of arms for the cavalry, at the entrance of the trenches, are generally of fascines mixed with earth.

EPAULETTES, are a kind of shoulder-knots chosen for the soldiers, which are to be of the colour of the facing, with a narrow yellow or white tape round it, and worsted fringe: those for the officers are made of gold or silver lace, with a rich fringe; they are badges of distinction worn on one or both shoulders. Those of the Btitish dragoon-guards, horse, and dragoons are worn on the left shoulder: the light dragoons and officers of grenadiers, have one on each shoulder: those of the battalion wear one on the right shoulder only, which is to be made of embroidery or lace with a gold or silver fringe. Those of the royal regiment of artillery are to be gold and embroidery, with gold fringe on scarlet cloth, and worn on the right shoulder.

EPENTHESIS, in grammar, the interposition or insertion of a letter or syllable in the middle of a word; as *alituum*, for *alitum*; *relligio*, for *religio*; *indupe-rator*, for *imperator*, &c.

EPEUS, of the line of Endymion, the inventor of the bartering ram, an engine of great service in sieges to make a breach. He is thought to have built the Trojan horse, and to have founded the city Metapontum.

EPHA, or EPHAH, in Jewish antiquity, a measure for things dry, equal to 3 pecks and 3 pints.

EPHEBÆUM, in antiquity, the place where the ephebi or youth exercised; or, as some say, where those who designed to exercise met, and agreed what kind of exercise they should contend in, and what should be the victor's reward.

EPHEBI, among the Athenians, a designation given to their young men when they arrived at 18 years of age, at which time they had their names entered in a public register.

EPHEDRA, in botany, a genus of the monodelphia order, belonging to the diœcia class of plants; and in the natural method ranking under the 51st order, *Coniferæ*. The male calyx is bifid; there is no corolla, but seven stamina; four antheræ inferior, three superior. The female calyx is bipartite, and fivefold, one upon another; there is no corolla: there are two pistils, and two seeds covered by the calyx resembling a berry.

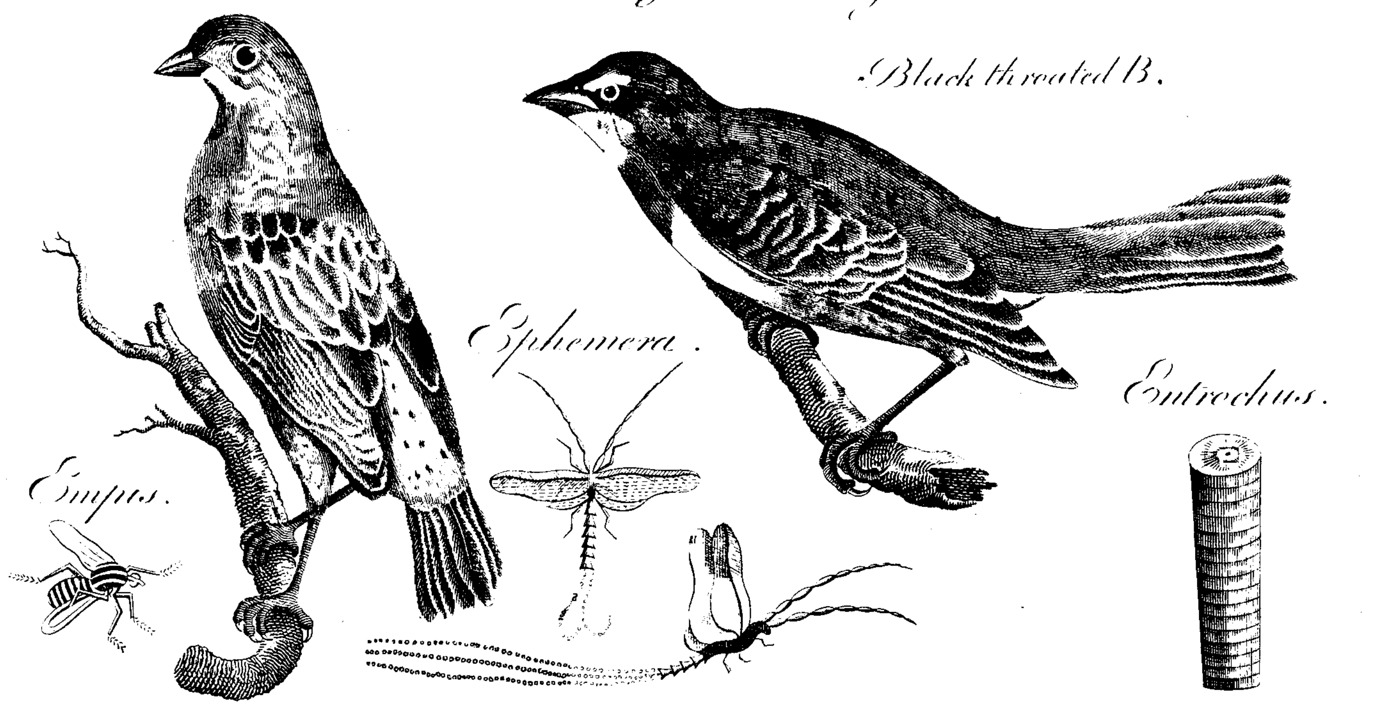
EPHEMERA, from ημερα, "a day;" a diary fever, or a fever of one day's continuance only. In this case, such a heat as attends an excess of wine, a pulse somewhat full and quick, but soft and regular, a slight headach, a nausea, and restlessness, are all the symptoms, and which terminate without any sensible evacuation. If it continue unto the third day, it is not a diary fever; and if the constitution is very dry, an hectic is to be dreaded.

EPHEMERA, the *Day-fly*, in zoology, a genus belonging to the order of neuroptera. It has no teeth or palpæ; there are two large protuberances above the eyes; the wings are erect, the two hind ones being largest; and the tail is bristly. These flies, who take their names from the shortness of their life, are distinguished into several species. Some live several days, others do not take flight till the setting of the sun, and live not to see the rising of that luminary. Some exist but one hour, others but half that time; in which short period they comply with the call of nature. With respect to those who live several days, there is a peculiarity observed, incident to themselves alone. They have to cast off one slough more, an operation which sometimes takes 24 hour to complete. To bring this about they cling fast to a tree. The ephemeræ, before they flutter in air, have in some manner been fishes. They remain in the states of larva and crysalis for one, two, or three years. The chrysalis only differs from the larva by their being observable on its back cases for wings. Both have on their sides small fringes of hair, which, when put into motion, serve them as fins. Nothing can be more curious than the plying of those little oars in the water. Their abdomen is terminated, as well as in their state of flies, by three threads. These larvæ scoop themselves out dwellings in the banks of rivers; and they are small tubes made like siphons, the one serving for an entrance, the other affording them an outlet. The banks of some rivers are often perforated with them. When the waters decrease, they dig fresh holes lower down, in order to enjoy their element the water. The season and hour when the crysalids of the different species of the ephemeræ turn into flies, maintain a kind of regularity. The heat, the rise or fall of the waters, accelerate, however, or postpone their final display. The ephemeræ, of the Rhine appear in the air two hours before sunset. These flies are hatched almost all at the same instant in such numbers as to darken the air. The most early of those on the Marne and Seine in France do not begin to fly till two hours after

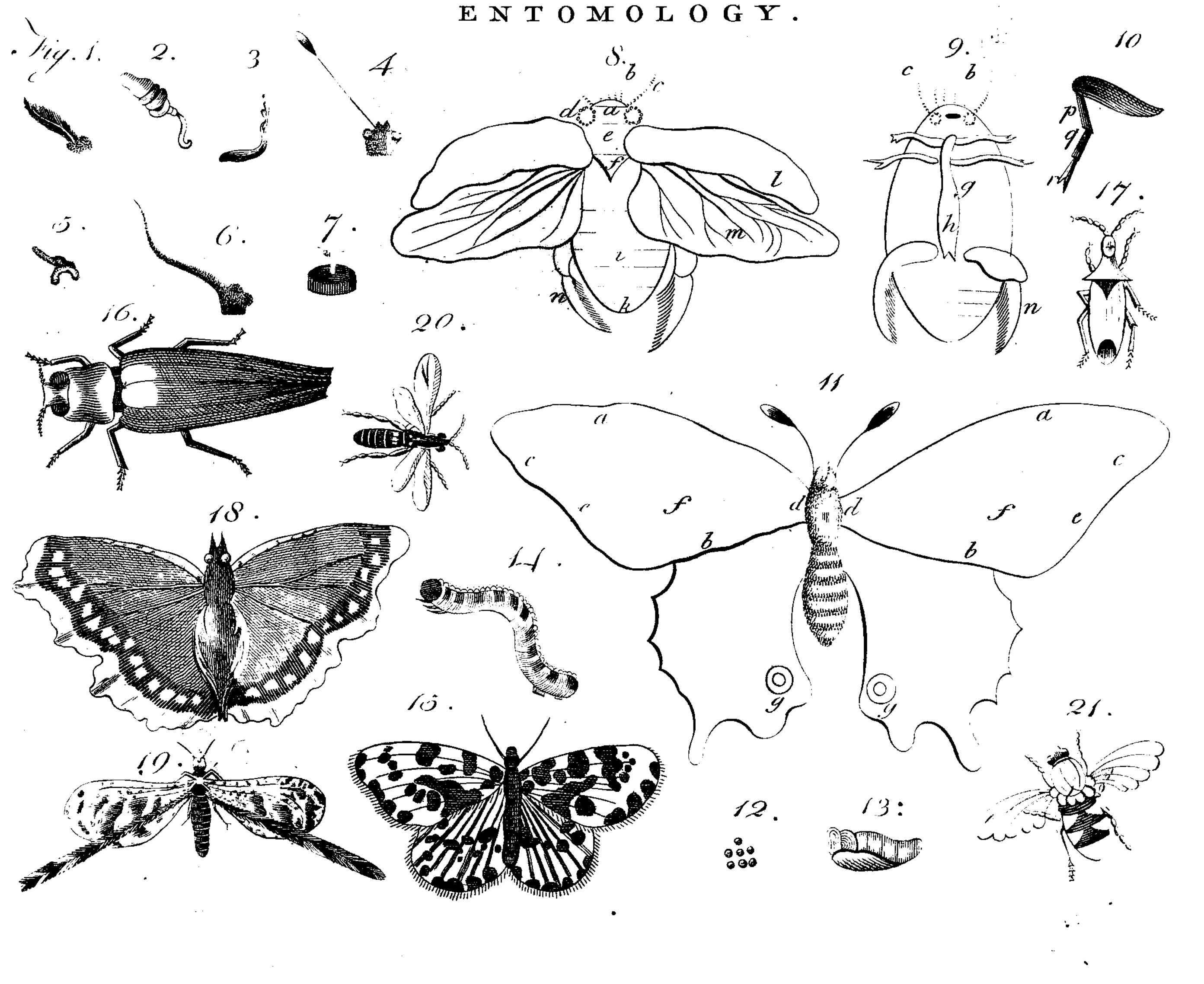
Barbut's Insects.

Plate CLXXXII.

Cinereous B. Emberiza or Bunting.



ENTOMOLOGY.



Ephemerides, Ephesus.

after the setting of the sun, towards the middle of August. They are seen fluttering and sporting on the brink of their tomb. The glare of light attracts them, round which they perform a thousand circles with amazing regularity. Their coming together for the purpose of generation can only be surmised, the shortness of their life requiring that all its functions should be proportionable to their duration. Some naturalists have been of opinion, that the males impragnated the eggs after the manner of fishes. The females, by the help of the threads of their tail and the flapping of their wings, support themselves on the surface of the water, and in that almost upright situation drop their eggs in clusters. One single female will lay 700 or 800 eggs, which sink to the bottom. The larvæ that escape from the voraciousness of the fishes, set about the construction of habitations to shelter them from every kind of danger. When the flies have propagated, they are seen to die and fall by heaps. The land and water are strewed with them to a considerable thickness. The fishermen consider those multitudes of destroyed insects as manna for the fishes.

EPHEMERIDES, in astronomy, tables calculated by astronomers, showing the present state of the heavens for every day at noon; that is, the places wherein all the planets are found at that time. It is from these tables that the eclipses, conjunctions, and aspects of the planets, are determined; horoscopes or celestial schemes constructed, &c. We have ephemerides of Origan, Kepler, Argoli, Heckerus, Mezzaracchis, Wing, De la Hire, Parker, &c. S. Cassini has calculated ephemerides of the sidera medicæa or satellites of Jupiter, which are of good use in determining the longitude.

In Engand, the Nautical Almanac, or Astronomical Ephemeries, published annually by anticipation, under the direction of the commissioners of longitude, is the most considerable. In France, celestial ephemerides have been published by M. Desplaces every ten years, from 1715 to 1745: they were afterwards continued by the abbé Caille, with many additions; of which an account may be seen in the History of the Academy of Sciences for 1743. The academy of Sciences have likewise published annually, from the beginning of the present century, a kind of ephemeries under the title of *Connoissance des Tems*.

EPHESUS, a city of antiquity, much celebrated on account of its temple of Diana, and for being the most famous mart or staple town of Hither Asia. Ephesus was in ancient times the metropolis of all Asia. Stephanus gives it the title of *Epiphanestate*, or *most illustrious*; and Pliny stiles it the ornament of Asia. The ancient city stood about 50 miles south of Smyrna, near the mouth of the river Cayster, and the shore of the Icarian sea, which is a bay of the Ægean; but as it has been so often destroyed and rebuilt, it is no easy matter to determine the precise place. Most of our modern travellers are of opinion, that the ancient city stood more to the south than the present; which they argue from the ruins that still remain. Ephesus was, in ancient times, known by the names of *Alopes*, *Ortygia*, *Morges*, *Smyrna*, *Trachæa*, *Samornion*, and *Ptela*. It was called *Ephesus*, according to Heraclides, from the Greek word *ephesus*, signifying *permission*; because Hercules (says he) permitted the Amazons to live and build a city in that place. Others tell

Ephesus.

us, that Ephesus was the name of the Amazon that founded the city; for Pliny, Justin, and Orosius, unanimously affirm that it was built by an Amazon; while others bestow this honour upon Androclus, the son of Cordus, king of Athens, who was the chief of the Ionians that settled in Asia. But in matters of so early a date, it is impossible to come at the truth, and therefore not worth our while to dwell on such fruitless inquiries. What we know for certain is, that the city, which in the Roman times was the metropolis of all Asia, acknowledged Lysimachus for its founder; for that prince, having caused the ancient city to be entirely demolished, rebuilt, at a vast expence, a new one, in a place more convenient, and nearer the temple. Strabo tells us, that, as the inhabitants showed a great reluctance to quit their ancient habitations, Lysimachus caused all the drains that conveyed the water into the neighbouring fens and the Cayster to be privately stopped up; whereby the city being on the first violent rains in great part laid under water, and many of the inhabitants drowned, they were glad to abandon the ancient and retire to the new city. This new Ephesus was greatly damaged by an earthquake in the reign of Tiberius, but by that emperor repaired and adorned with several stately buildings, of which there are now but few ruins to be seen, and scarce any thing worthy of ancient Ephesus. The aqueduct, part of which is still standing, is generally believed to have been the work of the Greek emperors; the pillars which support the arches are of fine marble, and higher or lower as the level of the water required. This aqueduct served to convey water into the city from the spring of Halitee, mentioned by Pausanias. The gate now called by the inhabitants, for what reason we know not, *the gate of Persecution*, is remarkable for three bas-reliefs on the mould of an exquisite taste. The port, of which so many medals have been struck, is at present but an open road, and not much frequented. The Cayster was formerly navigable, and afforded a safe place for ships to ride in, but is now almost choaked up with sand.

But the chief ornament of Ephesus was the temple of Diana, built at the common charge of all the states in Asia, and for its structure, size, and furniture, accounted among the wonders of the world. This great edifice was situated at the foot of a mountain, and at the head of a marsh; which place they chose, if we believe Pliny, as the least subject to earthquakes. This site doubled the charges; for they were obliged to be at a vast expence in making drains to convey the water that came down the hill into the morass and the Cayster. Philo Byzantius tells us, that in this work they used such a quantity of stone, as almost exhausted all the quarries in the country; and these drains or vaults are what the present inhabitants take for a labyrinth. To secure the foundations of the conduits or sewers, which were to bear a building of such a prodigious weight, they laid beds of charcoal, says Pliny, well rammed, and upon them others of wool. Two hundred and twenty years, Pliny says 400, were spent in building this wonderful temple by all Asia. It was 425 feet in length, and 200 in breadth, supported by 127 marble pillars, 70 feet high, of which 27 were most curiously carved, and the rest polished. These pillars were the works of so many kings, and the bas-

reliefs

Ephesus. reliefs of one were done by Scopas, the most famous sculptor of antiquity; the altar was almost wholly the work of Praxiteles. Cheiromocrates, who built the city of Alexandria, and offered to form Mount Athos into a statue of Alexander, was the architect employed on this occasion. The temple enjoyed the privilege of an asylum, which at first extended to a furlong, was afterwards enlarged by Mithridates to a bow-shot, and doubled by Marc Antony, so that it took in part of the city: but Tiberius, to put a stop to the many abuses and disorders that attend privileges of this kind, revoked them all, and declared that no man guilty of any wicked or dishonest action should escape justice, though he fled to the altar itself.

The priests who officiated in this temple were held in great esteem, and trusted with the care of sacred virgins, or priestesses, but not till they were made eunuchs. They were called *Estiatores* and *Essenæ*, had a particular diet, and were not allowed by their constitutions to go into any private house. They were maintained with the profits accruing from the lake Selinusius, and another that fell into it, which must have been very considerable, since they erected a golden statue to one Artemidorus, who being sent to Rome, recovered them after they had been seized by the farmers of the public revenues. All the Ionians resorted yearly to Ephesus, with their wives and children, where they solemnized the festival of Diana with great pomp and magnificence, making on that occasion rich offerings to the goddess, and valuable presents to her priests. The asiarchæ, mentioned by St Luke, were, according to Beza, those priests whose peculiar province it was to regulate the public sports that were annually performed at Ephesus in honour of Diana: they were maintained with the collections made during the sports; for all Asia flocked to see them. The great Diana of the Ephesians, as she was styled by her blind adorers, was, according to Pliny, a small statue of ebony, made by one Canitia, though commonly believed to have been sent down from heaven by Jupiter. This statue was first placed in a nich, which, as we are told, the Amazons caused to be made in the trunk of an elm. Such was the first rise of the veneration that was paid to Diana in this place. In process of time the veneration for the goddess daily increasing among the inhabitants of Asia, a most stately and magnificent temple was built near the place where the elm stood, and the statue of the goddess placed in it. This was the first temple; but not quite so sumptuous as that which we have described, though reckoned, as well as the second, among the wonders of the world. The second, being that above described, was remaining in Pliny's time, and in Strabo's; and is supposed to have been destroyed in the reign of Constantine, pursuant to the edict by which that emperor commanded all the temples of the heathens to be thrown down and demolished: the former was burnt the same day that Alexander was born, by one Erostratus, who owned on the rack, that the only thing which had prompted him to destroy so excellent a work, was the desire of transmitting his name to future ages. Whereupon the common council of Asia made a decree, forbidding any one to name him; but this prohibition served only to make his name more memorable, such a remarkable extravagance, or rather madness, being taken notice of by all the historians who have written of those times. Alexander offered to rebuild the temple at his own expence, provided the Ephesians would agree to put his name on the front; but they rejected his offer in such a manner as prevented the resentment of that vain prince, telling him, that "it was not fit one god should build a temple to another." The pillars, and other materials that had been saved out of the flames, were sold, and also the jewels of the Ephesian women, who on that occasion willingly parted with them; and the sum raised from thence served for the carrying on of the work till other contributions came in, which, in a short time, amounted to an immense treasure. This is the temple which Strabo, Pliny, and other Roman writers speak of. It stood between the city and the port, and was built, or rather finished, as Livy tells us, in the reign of king Servius. Of this wonderful structure there is nothing at present remaining but some ruins, and a few broken pillars. Ephesus.

The Ionians first settled at Ephesus under the conduct of Androclus, who drove out the Carians and Leleges, by whom those places were possessed at his arrival. The city, whither built by him, as Strabo affirms, or by one Crœsus or Ephesus, long before the Ionic migration, as others maintain, became soon the metropolis of Ionia. It was at first governed by Androclus, and his descendants, who assumed the royal title, and exercised the regal authority over the new colony: whence, even in Strabo's time, the posterity of Androclus were styled kings, and allowed to wear a scarlet robe, with a sceptre, and all the ensigns of the royal dignity. In process of time, a new form of government was introduced, and a senate established; but when, or on what occasion, this change happened, we know not. This kind of government continued till the time of Pythagoras, who lived before Cyrus the Great, and was one of the most cruel and inhuman tyrants we read of in history; for, having driven out the senate, and taken all the power into his own hands, he filled the city with blood and rapine, not sparing even those who fled to the temple of Diana, for shelter. Pythagoras was succeeded by Pindarus, who bore the same sway in the city; but treated the citizens with more humanity. In his time Ephesus being besieged by Crœsus king of Lydia, he advised the inhabitants to devote their city to Diana, and fasten the wall, by a rope, to the pillars of her temple. They followed his advice, and were, from reverence to the goddess, not only treated with great kindness by Crœsus, but restored to their former liberty. Pindarus being obliged to resign his power, retired to Peloponnesus. He was, according to Ælian, grandson to Alyattes king of Lydia, and Crœsus's nephew. The other tyrants of Ephesus mentioned in history are, Athenagoras, Comas, Aristarchus, and Hegesias; of whom the last was expelled by Alexander, who, coming to Ephesus, after having defeated the Persians on the banks of the Granicus, bestowed upon Diana all the tributes which the Ephesians had paid to the Persians, and established a democracy in the city. In the war between Mithridates and the Romans, they sided with the former, and, by his direction, massacred all the Romans that resided in their city; for which

which barbarity they were severely fined, and reduced almost to beggary by Sylla, but afterwards treated kindly, and suffered to live acccording to their own laws, as is plain from several ancient inscriptions and medals. The Ephesians were much addicted to superstition, sorcery, and curious arts, as the scripture styles them; whence came the proverb "Ephesian letters," signifying all sorts of spells or charms.

In the time of the apostle Paul, Ephesus retained a great deal of its ancient grandeur. But it was a ruinous place, when the emperor Justinian filled Constantinople with its statues, and raised his church of St Sophia upon its columns. Since then it has been almost quite exhausted. Towards the end of the 11th century, a Turkish pirate, named *Tangripermes*, settled there. But the Greek admiral, John Ducas, defeated him in a bloody battle, and pursued the flying Turks up the Mæander. In 1306, it was among the places which suffered from the exactions of the grand-duke Roger; and two years after, it surrendered to sultan Saysan, who, to prevent future insurrections, removed most of the inhabitants to Tyriæum, where they were massacred. Ephesus appears to have subsisted as an inconsiderable place for some time. But now, the Ephesians are only a few Greek peasants, living in extreme wretchedness, dependence, and insensibility; the representatives of an illustrious people, and inhabiting the wreck of their greatness; some, the substructions of the glorious edifices which they raised; some, beneath the vaults of the Stadium, once the crowded scene of their diversions; and some, by the abrupt precipice, in the sepulchres which received their ashes.

EPHETÆ (from εφιημι, "I send forth"), in antiquity, a sort of magistrates among the Athenians, instituted by king Demophoon, to take cognizance of murder, manslaughter, and chance-medley.

Their number was 100, whereof 50 were Athenians, and 50 Argians: they were not admitted to the post till upwards of 50 years of age. Draco new modelled it, excluded the Argians out of it, and made it to consist of 51 Athenians, each above 50 years of age: Ubbo Emmius de Rep. Athen. says, he transferred to them part of the jurisdiction of the Areopagites. See AREOPAGUS.

EPHOD, in Jewish antiquity, one part of the priestly habit; being a kind of girdle, which, brought from behind the neck over the two shoulders, and hanging down before was put across the stomach, then carried round the waist, and made use of as a girdle to the tunic.—There were two sorts of ephods, one of plain linen for the priests, and the other embroidered for the high priest.

EPHORI, in Grecian antiquity, magistrates established in ancient Sparta to balance the regal power. The authority of the ephori was very great. They sometimes expelled and even put to death the kings, and abolished or suspended the power of the other magistrates, calling them to account at pleasure. There were five of them, others say nine. They presided in the public shows and festivals. They were entrusted with the public treasure; made war and peace; and were so absolute, that Aristotle makes their government equal to the prerogative of a monarchy. They were established by Lycurgus, according to the generality of authors: though this is denied by others, who date their origin 130 years after the time of that legislator. Thus Plutarch, in his life of Cleomenes, ascribes their institution to Theopompus king of Sparta; which is also confirmed by the authority of Aristotle.

EPHORUS, an orator and historian of Cumæ in Æolia, about 352 years before Christ. He was disciple to Isocrates, by whose advice he wrote an history which gave an account of all the actions and battles that had happened between the Greeks and Barbarians for 750 years. It was greatly esteemed by the ancients; but is now lost.

EPHRAIM (anc. geog.), one of the divisions of Palestine by tribes; Ephraim and the half tribe of Manasseh are blended together by the sacred writer; and it only appears that Ephraim occupied the more southern, and the half tribe of Manasseh the more northern parts, but both seem to have extended from the Jordan to the sea. Ephraim also denotes a kingdom, on the separation of the 10 tribes from the house of David, called also the kingdom of Israel and of Samaria.

EPHRATA, a small town of Pennsylvania in America, and the principal settlement of the religious sect called *Dunkards* or *Tunkers*. See TUNKERS.

EPHREM (Syrus), an ancient Christian writer, in the fourth century, deacon of Edessa, was born at Nisibe, in Syria. He was greatly esteemed by St Basil, St. Gregory, Nyssen, and other great men. He wrote against the opinions of Sabellius, Arius, Apollonarius, the Manichees, &c. and acquired such a reputation by his virtue and his works, that he was called the *doctor and the prophet of the Syrians*. He died in 378. The best editions of his works are, that of Oxford, in 1708, in folio, and that of Rome, from 1732 to 1736, in Syriac, Greek, and Latin, 6 vols folio.

EPHYDOR, in antiquity, an officer in the Athenian courts of justice, who was to provide the plaintiff and defendant with equal water hour-glasses. When the glass was run out, they were not permitted to speak any farther; and, therefore, we find them very careful not to lose or mispend one drop of their water. Whilst the laws quoted by them were reciting, or if any other business happened to intervene, they gave orders that the glass should be stopped.

EPIBATÆ, Επιβαται, among the Greeks, marines or soldiers who served on board the ships of war. They were armed in the same manner as the land forces, only that more of them wore full or heavy armour.

EPIBATERION, a poetical composition, in use among the ancient Greeks. When any person of condition and quality returned home after a long absence or journey into another country, he called together his friends and fellow-citizens, and made them a speech, or rehearsed them a copy of verses, wherein he returned solemn thanks to the immortal gods for his happy return; and ended with an address by way of compliment to his fellow citizens.—These verses made what the Greeks call επιβατεριον *epibaterium*, of επιβαινω, "I go abroad." At going away they had another, called *apobaterium*.

EPIBATERIUM, in botany: A genus of the hexandria order, belonging to the monœcia class of plants. In the male flowers the calyx is a double peri-

perianthium, the outward one with six leaves, very small; the inner one three-leaved, and three times larger than the former, with egg-shaped leaves. The corolla has six petals smaller than the interior calyx and roundish. The stamina are six capillary filaments, crooked, and as long as the petals; the antheræ are roundish. The female flowers are on the same plant. The calyx and corolla are as in the male. The pericarpium consists of three roundish, monospermous plums; the seed a kidney-shaped compressed nut, somewhat furrowed.

EPIC, or HEROIC, *Poem*, a poem expressed in narration, formed upon a story partly real and partly feigned; representing in a sublime stile, some signal and fortunate action, distinguished by a variety of great events, to form the morals, and affect the mind with the love of heroic virtue.

We may distinguish three parts of the definition, namely, the matter, the form, and the end. The matter includes the action of the fable, under which are ranged the incidents, episodes, characters, morals, and machinery. The form comprehends the way or manner of the narration, whether by the poet himself, or by any person introduced, whose discourses are related; to this branch likewise belong the moving of the passions, the descriptions, discourses, sentiments, thoughts, style, and versification; and besides these the similies, tropes, figures, and, in short, all the ornaments and decorations of the poem. The end is to improve our morals and increase our virtue. See POETRY.

EPICEDION (formed of επι *upon*, and κηδος *funeral)*, in the Greek and Latin poetry, a poem, or poetical composition, on the death of a person.—At the obsequies of any man of figure, there were three kinds of discourses usually made; that rehearsed at his *bustum* or funeral pile, was called *nenia*; that engraven on his tomb, *epitaph*; and that spoken in the ceremony of his funeral *epicedion*. We have two beautiful epicedions in Virgil, that of Euryalus and that of Pallas.

EPICEDIUM, in ancient poetry, a poem rehearsed during the funeral solemnity of persons of distinction.

EPICHARMAS, an ancient poet and philosopher, born in Sicily, was a scholar of Pythagoras. He is said to have introduced comedy at Syracuse in the reign of Hiero. Horace commends Plautus for imitating him, in following the chace of the intrigue so closely as not to give the readers or spectators time to trouble themselves with doubts concerning the discovery. He wrote likewise treatises concerning philosophy and medicine; but none of his works have been preserved. He died aged 90, according to Laertius, who has preserved four verses inscribed on his statue.

EPICHIROTONIA, among the Athenians. It was ordained by Solon, that once every year the laws should be carefully revised and examined; and if any of them were found unsuitable to the present state of affairs, they should be repealed. This was called επιχειροτονια των νομων, from the manner of giving their suffrages by *holding up their hands*. See a farther account of this custom in Pott. Archæol. Græc. lib. I. cap. 26. tom. i. p. 142.

EPICOENE, in grammar, a term applied to nouns, which, under the same gender and termination, mark indifferently the male and female species. Such in Latin is *aquila*, *vespertilio*, &c. which signify equally a male or female eagle or bat.

Grammarians distinguish between *epicœne* and *common*. A noun is said to be common of two kinds, when it may be joined either with a masculine or feminine article; and epicœne, when it is always joined to some of the two articles, and yet signifies both genders.

EPICTETUS, a celebrated Stoic philosopher, born at Hierapolis in Phrygia, in the first century, was the slave of Epaphroditus, a freedman and one of Nero's guard. Domitian banishing all philosophers from Rome, about the year 94, Epictetus retired to Nicopolis in Epirus, where he died in a very advanced age; and after his death, the earthen lamp he made use of sold for 3000 drachmas. He was a man of great modesty; which was eminent in his own practice, as well as in his recommendation to others: hence he used to say, "That there is no need of adorning a man's house with rich hangings or paintings, since the most graceful furniture is temperance and modesty, which are lasting ornaments, and will never be the worse for wearing." Of all the ancient philosophers, he seems to have made the nearest approaches to the Christian morality, and to have had the most just ideas of God and providence. He always possessed a cool and serene mind, unruffled by passion; and was used to say, that the whole of moral philosophy was included in these words, *support* and *abstain*. One day his master Epaphroditus strove in a frolic to wrench his leg; when Epictetus said, with a smile, and free from any emotion, "If you go on, you will certainly break my leg:" but the former redoubling his effort, and striking it with all his strength, he at last broke the bone; when all the return Epictetus made was, "Did not I tell you, Sir, that you would break my leg?" No man was more expert at reducing the rigour of the maxims of the Stoics into practice. He conformed himself strictly, both in his discourse and behaviour, to the manners of Socrates and Zeno. He waged continual war with fancy and fortune; and it is an excellence peculiar to himself, that he admitted all the severity of the Stoics without their sourness, and reformed Stoicism as well as professed it; and besides his vindicating the immortality of the soul as strenuously as Socrates or any stoic of them all, he declared openly against self-murder, the lawfulness of which was maintained by the rest of the sect. Arian, his disciple, wrote a large account of his life and death, which is lost; and preserved four books of his discourses and his Enchiridion, of which there have been several editions in Greek and Latin; and, in 1758, a translation of them into English was published by the learned and ingenious Miss Carter.

EPICUREAN PHILOSOPHY, the doctrine or system of philosophy maintained by Epicurus and his followers.

His philosophy consisted of three parts; canonical, physical, and ethereal. The first was about the canons or rules of judging. The censure which Tully passes upon him for his despising logic, will hold true only with regard to the logic of the Stoics, which he could not approve of, as being too full of nicety and quirk, Epicurus was not acquainted with the analytical method of division and argumentation, nor was he so curious in modes and formation as the Stoics. Soundness and simplicity

simplicity of sense, assisted with some natural reflections, was all his art. His search after truth proceeded only by the senses; to the evidence of which he gave so great a certainty, that he considered them as an infallable rule of truth, and termed them the *first natural light of mankind*.

In the second part of this philosophy he laid down atoms, space, and gravity, as the first principles of all things: he did not deny the existence of God, but thought it beneath his majesty to concern himself with human affairs; he held him a blessed immortal Being, having no affairs of his own to take care of, and above meddling with those of others.

As to his ethics, he made the supreme good of man to consist in pleasure, and consequently supreme evil in pain. Nature itself, says he, teaches us this truth; and prompts us from our birth to procure whatever gives us pleasure, and avoid what gives us pain. To this end he proposes a remedy against the sharpness of pain: this was to divert the mind from it, by turning our whole attention upon the pleasures we have formerly enjoyed. He held that the wise man must be happy, as long as he is wise: the pain, not depriving him of his wisdom, cannot deprive him of his happiness.

There is nothing that has a fairer show of honesty than the moral doctrine of Epicurus. Gassendus pretends, that the pleasure in which this philosopher has fixed the sovereign good, was nothing else but the highest tranquillity of mind, in conjunction with the most perfect health of body; but Tully, Horace, and Plutarch, as well as almost all the fathers of the church, give us a very different representation: indeed the nature of this pleasure, in which the chief happiness is supposed to be seated, is a grand problem in the morals of Epicurus. Hence there were two kinds of Epicureans, the rigid and the remiss: the first were those who understood Epicurus's notion of pleasure in the best sense, and placed all their happiness in the pure pleasures of the mind, resulting from the practice of virtue: the loose or remiss Epicureans, taking the words of that philosopher in a gross sense, placed all their happiness in bodily pleasures or debauchery.

EPICURUS, the greatest philosopher of his age, was born at Gargettium in Attica, about 340 B. C. in the 109th Olympiad. He settled at Athens in a fine garden he had bought; where he lived with his friends in great tranquillity, and educated a great number of disciples. They lived all in common with their master. The respect which his followers paid to his memory is admirable: his school was never divided, but his doctrine was followed as an oracle. His birth-day was still kept in Pliny's time; the month he was born in was observed as a continual festival; and they placed his picture every where. He wrote a great many books, and valued himself upon making no quotations. He raised the atomical system to a great reputation, though he was not the inventor of it, but had only made some change in that of Democritus. As to his doctrine concerning the supreme good or happiness, it was very liable to be misrepresented, and some ill effects proceeded from thence, which discredited his sect. He was charged with perverting the worship of the gods, and inciting men to debauchery; but he did not forget himself on this occasion: he published his opinions to the whole world: he wrote some books of devotion; recommended the veneration of the gods, sobriety, and chastity; and it is certain that he lived in an exemplary manner, and conformably to the rules of philosophical wisdom and frugality. Timocrites, a deserter of his sect, spoke very scandalously of him. Gassendus has given us all he could collect from the ancients concerning the person and doctrine of this philosopher: who died of a suppression of urine, aged 72.

EPICYCLE, in the ancient astronomy, a little circle whose centre is in the circumference of a greater circle; or it is a small orb or sphere, which being fixed in the deferent of a planet, is carried along with it; and yet, by his own peculiar motion, carries the planet fastened to it round its proper center.

It was by means of epicycles that Ptolemy and his followers solved the various phenomena of the planets, but more especially their stations and retrogradations.

EPICYCLOID, in geometry, a curve generated by the revolution of the periphery of a circle, along the convex or concave side of the periphery of another circle.

EPICYEMA, among physicians, denotes a superfetation; being a false conception or mole happening after the birth of a regular fetus.

EPIDAURUM, EPIDAURUS, or EPITAURUM, (anc. geog.), a town of Dalmatia, on the Adriatic, built the same year, as it is said, with Dyrrachium, 430 years after the destruction of Troy: A considerable town formerly, but now reduced to a small village, called *Ragusi Vecchio;* distant six miles from the modern Ragusi. E. Long, 19°. Lat. 42°, 20′.

EPIDAURUS (anc. geog.), a town of Argolis, in Peloponnesus, on the Saronic bay, to the south of the promontory *Spiræum*, called *sacred*, because of the religious veneration paid to Æsculapius, whose temple stood at the distance of five miles from the town. The Romans, during a pestilence, being advised to convey the god to Rome, sent a ship, with a solemn embassy, for his conveyance: but while the Epidaurians were in suspense to part with him, a huge serpent sailed to the ship; and, being taken for the god, was carried to Rome in great solemnity. Epidaurus stood in a recess of the bay, fronting the east; and was fortified by nature, being inclosed by high mountains reaching to the sea, and rendering it difficult of access. It had several temples, and in the acropolis or citadel was a remarkable statue of Minerva. The site is now called *Epi-thavro.* The traces are indistinct, and it has probably been long deserted. The harbour of Epidaurus is long. Its periplus or circuit was 15 stadia or near two miles. The entrance is between mountains, and on a small rocky peninsula on the left hand are ruins of a modern fortress. This, it seems, was the point on which a temple of Juno stood. It is frequented by vessels for wood or corn. The grove of Æsculapius was inclosed by mountains, within which all the sacrifices as well of the Epidaurians as of strangers were consumed. One was called Titthion; and on this the god when an infant was said to have been exposed, and to have been suckled by a she-goat. He was a great physician, and his temple was always crowded with sick persons. Beyond it was the dormitory of the suppliants; and near it, a circular edifice called the *Tholus*, built by Polycletus, of white marble, worth seeing. The grove, besides other temples, was adorned with a portico, and a fountain remarkable for its roof and decorations. The bath of Æſculapius was one of the benefactions of Antoninus Pius, while a Roman ſenator; as was alſo a houſe for the reception of pregnant women and dying perſons, who before were removed out of the incloſure, to be delivered or to expire in the open air. The remains are heaps of ſtones, pieces of brick wall, and ſcattered fragments of marble; beſides ſome churches or rather piles of rubbiſh miſ-called, being deſtitute of doors, roofs, or any kind of ornament. The ſtatue of Æſculapius was half as big as that of Jupiter Olympius at Athens. It was made of ivory and gold, and, as the inſcription proved, by Thraſymedes ſon of Arignotus of Paros. He was repreſented ſitting, holding his ſtaff, with one hand on the head of the ſerpent, and a dog lying by him. Two Argive heroes, Bellerophon combating with the monſter Chimæra, and Perſeus ſevering the head of Meduſa, were carved on the throne. Many tablets deſcribed the cures performed by the deity, yet he had not eſcaped contumely and robbery. Dionyſius deprived him of his golden beard, affirming it was very unſeemly in him to appear in that manner when his father Apollo was always ſeen with his face ſmooth. Sylla amaſſed the precious offerings belonging to him and to Apollo and Jupiter at Delphi and Olympia, to pay his army before Athens. The marks in the walls teſtified that a great number had been plucked down. A few fragments of white marble exquiſitely carved occur in the heap of the temple. The incloſure of the temple once abounded in inſcriptions. In the ſecond century ſix marbles remained, on which were written in the Doric dialect the names of men and women who had been patients of the god, with the diſtemper each had laboured under, and the remedies he had directed. Dr Chandler found only a couple of votive inſcriptions, and two pedeſtals of ſtatues, one of which repreſented a Roman, and was erected by the city of the Epidaurians. The Stadium was near the temple. It was of earth, as moſt in Greece were. At the upper end are ſeats of ſtone, but theſe were continued along the ſides only a few yards. A vaulted paſſage leading underneath into the area, now choked up, was a private way by which the Agonothetæ or preſidents with the prieſts and perſons of diſtinction entered. Two large ciſterns or reſervoirs remain made by Antoninus for the reception of rain-water. Beyond them is a dry water-courſe; and in the mountain-ſide on the right-hand are the marble ſeats of the theatre, overgrown with buſhes. The ſprings and wells by the ruins are now ſuppoſed to poſſeſs many excellent properties. To theſe and a good air, Dr Chandler thinks, with the recreations of the theatre and of the ſtadium, and to the medinical knowledge and experience of the prieſts, may be attributed both the recovery of the ſick and the reputation of Æſculapius.

Epidaurus, with the ſurname *Limera*, to diſtinguiſh it from the Epidaurus of Argolis; called ſo, either from its meadows or its commodious harbours (Stephanus, Apollodorus): a town of Laconica, on the Ionian ſea, to the ſouth of the Sinus Argolicus, ſituated where now Molvaſia ſtands, in the Morea. E. Long. 23. 30. Lat. 55. 40.

EPIDEMIA, in Grecian antiquity, feſtivals kept in honour of Apollo and Diana, at the ſtated ſeaſons

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when thoſe deities, who could not be preſent every where, were ſuppoſed to viſit different places, in order to receive the vows of their adorers.

EPIDEMIC, among phyſicians, an epithet of diſeaſes which at certain times are popular, attacking great numbers at or near the ſame time.

EPIDENDRUM, in botany: A genus of the diandria order, belonging to the gynandria claſs of plants; and in the natural method ranking under the ſeventh order, *Orchideæ*. The nectarium is turbinated, oblique, and reflexed. This is the plant which produces the fruit called *vanilla*, and which is uſed in the making of chocolate. It is a native of Mexico, and alſo of ſome parts of the Eaſt Indies. It is a paraſitic plant; the leaves of which greatly reſemble the vine, and are about 18 inches long and three inches broad. The flowers are of a white colour intermixed with ſtripes of red and yellow. When theſe fall off, they are quickly ſucceeded by the pods, which at firſt are green, but afterwards, as they ripen, become yellow, and are gathered for uſe. The pods of the beſt vanilla are long, ſlender, and well filled with ſeeds. If opened when freſh, the cavity of the pod is found to contain a humid ſubſtance that is black, oily, and balſamic, of ſuch a ſtrong ſmell, that it frequently cauſes headachs, and even a ſort of temporary intoxication. The ſeaſon for gathering the pods begins about the latter end of September, and laſts till the end of December. They are dried in the ſhade; and when dry and fit for keeping, they are rubbed externally with a little oil of cocoa or calba, to render them ſupple, or preſerve them the better, and to prevent them from becoming too dry or brittle. The uſe of this fruit is only for perfuming chocolate. In New Spain it is reckoned unwholeſome; and therefore never uſed: but in England and other countries of Europe, it is a conſtant ingredient; and perhaps its noxious qualities may be corrected by the ſea-air. In thoſe countries where they grow, the plants are very eaſily propogated by cuttings. In Britain they require to be kept in a ſtove, and to be placed near ſome American tree, round which they may climb for their ſupport.

EPIDERMIS, in anatomy, the cuticle or ſcarf-ſkin. See Anatomy, n° 74. The word is formed of the Greek ἐπι, *on, over*; and δερμα, *ſkin*.

EPIDICASIA, among the Athenians. Daughters inheriting their parents eſtate, were obliged to marry their neareſt relation; which gave occaſion to perſons of the ſame family to go to law with one another, each pretending to be more nearly allied to the heireſs than the reſt. The ſuit was called ἐπιδικασιας δικη: and the virgin, about whom the relations conteſted, ἐπιδικος.

EPIDIDYMIS, in anatomy, a little round body, on the back of each teſticle; called all *paraſtata*. See Anatomy, p. 738, col. 1.

EPIGÆA, in botany: A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 18th order, *Bicornes*.

EPIDOTÆ, certain deities who preſided over the growth of children. They were worſhipped by the Lacedæmonians, and chiefly invoked by thoſe who were perſecuted by the ghoſts of the dead, &c.

EPI-

EPIGASTRIC REGION, a part or subdivision of the abdomen. See ANATOMY, n° 88.

EPIGLOTTIS, in anatomy, one of the cartilages of the larynx or wind-pipe. See ANATOMY, n° 104, par. 3, and n° 116.

EPIGONI, the sons and descendants of the Grecian heroes who were killed in the first Theban war. The war of the Epigoni is famous in ancient history. It was undertaken ten years after the first. The sons of those that had perished in the first war, resolved to avenge the death of their fathers, and marched against Thebes, under the command of Thersander; or, according to others, of Alcmæon the son of Amphiaraus, about 1307 years before Christ. The Argives were assisted by the Corinthians, the people of Messenia, Arcadia, and Megara. The Thebans had engaged all their neighbours in their quarrel, as in one common cause. These two hostile armies met and engaged on the banks of the Glissas. The fight was obstinate and bloody, but victory declared for the Epigoni, and some of the Thebans fled to Illyricum with Leodamas their general, while others retired into Thebes, where they were soon besieged, and forced to surrender. In this war Ægialeus was the only one who was killed, and his father Adrastus was the only one who escaped alive in the first war. This whole war, as Pausanias observes, was written in verse; and Callinus who quotes some of the verses, ascribes them to Homer, which opinion has been adopted by many writers. "For my part (continues the geographer), I own, that next to the Iliad and Odyssey of Homer, I have never seen a finer poem." The descendants of the veteran Macedonians, who served under Alexander the Great, and who had children by Asiatic women, were also called *Epigoni*, (Justin.)

EPIGRAM, in poetry, a short poem in verse, treating only of one thing, and ending with some lively, ingenious, and natural thought or point. The word is formed of ἐπιγραμμα *inscription*, of ἐπιγραφειν *to inscribe* or *write upon*.

Epigrams then, originally, signify inscriptions, and they derive their origin from those inscriptions placed by the ancients on their tombs, statues, temples, triumphal arches, &c. These, at first, were only simple monograms; afterwards, increasing their length, they made them in verse, to be the more easily retained: Herodotus, and others, have transmitted to us several of them. Such little poems retained the name of epigrams, even after the design of their first institution was varied, and people began to use them for the relation of little facts and accidents, the characterizing of persons, &c. The point or turn is a quality much insisted on by the critics, who require the epigram constantly to close with something poignant and unexpected, to which all the rest of the composition is only preparatory; while others, on the contrary, exclude the point, and require the thought to be equally diffused throughout the poem without laying the whole stress on the close: the former is usually Martial's practice, and the latter that of Catullus.

The Greek epigrams have scarce any thing of the point or briskness of the Latin ones; those collected in the Anthology, have most of them a remarkable air of ease and simplicity, attended with something just and witty; such as we find in a sensible peasant, or a child that has wit. They have nothing that bites, but something that tickles. Though they want the salt of Martial, yet to a good taste they are not insipid; except a few of them, which are quite flat and spiritless. However, the general faintness and delicacy of the pleasantry in them has given occasion for a Greek epigram, or *epigram à la Greque*, to denote, among the French, an epigram void of salt or sharpness.

The epigram admits of great variety of subjects; some are made to praise and others to satirize; which last are much the easiest, ill-nature serving instead of point and wit. Boileau's epigrams are all satires on one or another; those of des Reaux are all made in honour of his friends; and those of Mad. Scudery are so many eloges. The epigram being only a single thought, it would be ridiculous to express it in a great number of verses.

EPIGRAPHE, among antiquarians, denotes the inscription of a building pointing out the time when, the persons by whom, the uses, and the like, for which it was erected.

EPILEPSY, in medicine, the same with what is otherwise called the *falling-sickness*, from the patient's falling suddenly to the ground. See *MEDICINE-Index*.

EPILOBIUM, the WILLOW-HERB, in botany: A genus of the monogynia order, belonging to the octandria class of plants, and in the natural method ranking under the 17th order, *Calycanthemæ*. The calyx is quadrifid; the petals four; the capsule oblong inferior; the seeds pappous or downy. There are seven species, all of them natives of Britain. They grow in marshes, or under hedges in moist and shady places; having blossoms generally of a red colour, and sometimes of considerable beauty. The most remarkable is the hirsutum, commonly called *codlins and cream*. The top-shoots of this plant have a very delicate fragrancy; but so transitory, that before they have been gathered five minutes, it is no longer perceptible. Horses, sheep, and goats eat this plant; cows are not fond of it; swine refuse it. An infusion of the leaves of another species, the augustifolium, or rosebay willow-herb, has an intoxicating quality, as the inhabitants of Kamtscatka have learned. These people also eat the white young shoots which creep under the ground, and have a sort of ale brewed from the dried pith of it. The down of the seeds have been lately manufactured by mixing it with cotton or beaver's hair.

EPILOGUE, in oratory, the end or conclusion of a discourse, ordinarily containing a recapitulation of the principal matters delivered.

EPILOGUE, in dramatic poetry, a speech addressed to the audience after the play is over, by one of the principal actors therein; usually containing some reflections on certain incidents in the play, especially those in the part of the person that speaks it; and having somewhat of pleasantry, intended to compose the passions raised in the course of the representation: A practice which is ridiculed by the *Spectator*; and compared to a merry jigg upon the organ after a good sermon, to wipe away any impressions that might have been made thereby, and send the people away just as they came.

EPIMEDIUM, BARREN-WORT, in botany: A genus of the monogynia order, belonging to the tetrandria

dria class of plaints; and in the natural method ranking under the 24th order, *Corydales*. There are four nectaria, cup-shaped, and lying on the petals. The corolla is tetrapetalous, the calyx dropping off. The seed-vessel is a pod. There is only one species, *viz.* the alpinum. It is a low herbaceous plant, with a creeping root, having many stalks about nine inches high, each of which has three flowers composed of four leaves placed in the form of a cross. They are of a reddish colour, with yellow stripes on the border.

EPIMENIDES, an ancient poet and philosopher, was born at Gnossus in Crete. Contrary to the custom of his country, he always wore his hair long; which, according to some, was because he was ashamed of being thought a Cretan: and indeed he does not seem to have had a high opinion of his countrymen, if that verse cited by St Paul be, as it is generally believed to be, his; "The Cretans are always liars, evil beasts, slow bellies." Many stories are related of him, too wonderful to merit attention; however, his reputation was so great over all Greece, that he was there esteemed a favourite of the gods. The Athenians being afflicted with the plague, and commanded by the oracle to make a solemn lustration of the city, sent Nicias, the son of Niceratus, with a ship to Crete, to desire Epimenides to come to them. He accepted their invitation, accompanied the messengers to Athens, performed the lustration of the city, and the plague ceased. Here he contracted an acquaintance with Solon, whom he privately instructed in the proper methods for the regulation of the Athenian commonwealth. Having finished his business at Athens, the citizens offered him many valuable presents and high honours, and appointed a ship to carry him back to Crete: but he returned their presents, and would accept of nothing except a little branch of the sacred olive preserved in the citadel; and desired the Athenians to enter into an alliance with the Gnossians. Having obtained this, he returned to Crete, where he died soon after, aged 157 years; or as the Cretans, consistently with their character, pretended, 299. He was a great poet, and wrote 5000 verses on "the genealogy of the gods," 6500 "on the building the ship Argos and Jason's expedition to Colchis;" and 4000 "concerning Minos and Rhadamanthus." He wrote also in prose, "Concerning sacrifices and the commonwealth of Crete." St Jerom likewise mentions his "book of oracles and responses." The Lacedemonians procured his body, and preserved it among them by the advice of an oracle; and Plutarch tells us, that he was reckoned the seventh wise man by those who refused to admit Periander into the number.

EPIMETHEUS, a son of Japetus and Clymene, one of the Oceanides, who inconsiderately married Pandora, by whom he had Pyrrha, the wife of Deucalion. He had the curiosity to open the box which Pandora had brought with her, and from thence issued a train of evils, which from that moment have never ceased to afflict the human race. Hope was the only one which remained at the bottom of the box, not having a sufficient time to escape, and it is she alone which comforts men under misfortunes. Epimetheus was changed into a monkey by the gods, and sent into the island Pithecusa.

EPIPHANIUS (St), an ancient father of the church, born at Besanducan, a village in Palestine, about the year 332. He founded a monastery near the place of his birth, and presided over it. He was afterwards elected bishop of Salamis; when he sided with Paulinus against Meletius, and ordained in Palestine, Paulinian the brother of St Jerom; on which a contest arose between him and John bishop of Jerusalem. He afterwards called a council in the island of Cyprus, in which he procured a prohibition of the reading of Origen's writings; and made use of all his endeavours to prevail on Theophilus bishop of Alexandria to engage St Chrysostom to declare in favour of that decree: but not meeting with success, he went himself to Constantinople, where he would not have any conversation with St Chrysostom; and formed the design of entering the church of the apostles, to publish his condemnation of Origen; but being informed of the danger to which he would be exposed, he resolved to return to Cyprus; but died at sea, in the year 403. His works were printed in Greek, at Basil, 1544, in folio; and were afterwards translated into Latin, in which language they have been often reprinted. Petavius revised and corrected the Greek text by two manuscripts, and published it together with a new translation at Paris in 1622. This edition was reprinted at Cologne in 1682.

EPIPHANY, a Christian festival, otherwise called the *Manifestation of Christ to the Gentiles*, observed on the sixth of January, in honour of the appearance of our Saviour to the three magi or wise men, who came to adore him and bring him presents. The feast of epiphany was not originally a distinct festival; but made a part of that of the nativity of Christ, which being celebrated 12 days, the first and last of which were high or chief days of solemnity, either of these might properly be called *epiphany*, as that word signifies the appearance of Christ in the world.

The word in the original Greek, επιφανια signifies *appearance* or *apparition*; and was applied, as some critics will have it, to this feast, on account of the star which appeared to the magi.—St Jerom and St Chrysostom take the epiphany for the day of our Saviour's baptism, when he was declared to men by the voice, *Hic est filius meus dilectus, in quo mihi complacui*: "This is my beloved Son, in whom I am well pleased." And accordingly it is still observed by the Cophtæ and Ethiopians in that view. Others contend, that the feast of Christmas, or the nativity of our Saviour, was held in divers churches on this day; which had the denomination *epiphany*, or *appearance*, by reason of our Saviour's first appearance on earth at that time. And it must be allowed, that the word is used among the ancient Greek fathers, not for the appearance of the star to the magi, but for that of our Saviour to the world: In which sense St Paul uses the word *epiphania*, in his second epistle to Timothy, i. 10.

EPIPHONEMA. See ORATORY, n° 96.

EPIPHORA, in medicine, a preternatural defluxion of the eyes, when they continually discharge a sharp serous humour, which excoriates the cheeks.

EPIPHYSIS, in anatomy. See ANATOMY, p. 677. col. 2.

EPIPLOCELE, in medicine, is a kind of hernia or rupture, in which the omentum subsides into the scrotum.

EPIPLOOMPHALON, in medicine, an hernia umbilicalis, proceeding from the omentum falling into the region of the umbilicus or navel.

EPIPLOON. See OMENTUM.

EPIRUS, a district of ancient Greece, bounded on the east by Etolia, on the west by the Adriatic, on the north by Thessaly and Macedon, and on the south by the Ionian sea. This country was anciently governed by its own princes, in which state it made a very considerable figure. The country, according to Josephus, was first peopled by Dodanim the son of Javan and grandson of Japhet. The people were very warlike: but they continued in their savage state long after their neighbours were civilized; whence the Islanders used to threaten their offenders with transportation to Epirus. Their horses were in great request among the ancients, as well as the dogs produced in one of the divisions called *Molossus*; and hence these dogs were called by the Romans *Molossi*.

The history of Epirus commences with the reign of Pyrrhus the son of Achilles by Deidamia the daughter of Lycomedes king of Scyros. He is said to have behaved with great bravery at the siege of Troy; but it would appear that he behaved with no less barbarity. After the city was taken, he is said to have killed old king Priam with his own hand: to have thrown Astyanax the son of Hector and Andromache headlong from an high tower; and sacrificed Polyxena the daughter of Priam on the tomb of his father. He carried Andromache with him into Epirus, where he settled by the advice of the famous soothsayer Helenus, one of Priam's sons, who had served during the Trojan war both under his father and himself. The only remarkable period of the history of Epirus is the reign of Pyrrhus II. who made war upon the Romans. He was invited into Italy by the Tarentines; and embarked about 280 B. C. After having escaped many dangers by sea, he landed in that country, and with great difficulty gained a victory over the Romans; but he was afterwards utterly defeated by them †, and obliged to return into his own country. To retrieve his honour, he then undertook an expedition against Macedon; where he overthrew Antigonus, and at last made himself master of the whole kingdom. He then formed a design of subduing all the other Grecian states; but met with such an obstinate resistance at Lacedæmon, that he was obliged to drop the enterprise; and was soon after killed at the siege of Argos by a woman, who from the wall threw a tile upon his head. Deidamia, the grand-daughter of Pyrrhus, was the last that sat on the throne of Epirus. She is said to have been murdered after a short reign; upon which the Epirots formed themselves into a republic.

† See *Rome*

Under the new form of government Epirus never made any considerable figure, but seems rather to have been dependent on the kingdom of Macedon. The Romans having conquered Philip king of that country, restored the Epirots to their ancient liberty; but they, forgetful of this favour, soon after took up arms in favour of Perseus. As a punishment for this ingratitude, the Romans gave orders to Paulus Emilius, after the reduction of Macedon, to plunder the cities of Epirus, and level them with the ground. This was punctually executed throughout the whole country on the same day and at the same hour. The booty was sold, and each foot soldier had 200 denarii, that is, six pounds nine shillings and two-pence, and each of the horse the double of this sum. An hundred and fifty thousand men were made slaves, and sold to the best bidder for the benefit of the republic. Nor did the vengeance of Rome stop here; all the cities of Epirus, to the number of 70, were dismantled, and the chief men of the country carried to Rome, where they were tried, and most of them condemned to perpetual imprisonment. After this terrible blow, Epirus never recovered its ancient splendor. Upon the dissolution of the Achæan league, it was made part of the province of Macedon; but when Macedon became a diocese, Epirus was made a province of itself, called the province of *Old Epirus*, to distinguish it from *New Epirus*, another province lying to the east of it. On the division of the empire, it fell to the emperors of the east, and continued under them till the taking of Constantinople by the Latins, when Michael Angelus, a prince nearly related to the Greek emperor, seized on Etolia and Epirus, of which he declared himself despot or prince; and was succeeded by his brother Theodorus, who took several towns from the Latins, and so far enlarged his dominions, that, disdaining the title of *despot*, he assumed that of *emperor*, and was crowned by Demetrius archbishop of Bulgaria. Charles, the last prince of this family, dying without lawful issue, bequeathed Epirus and Acarnania to his natural sons, who were driven out by Amaruth the second. Great part of Epirus was afterwards held by the noble family of the Castriots; who, though they were masters of all Albania, yet styled themselves princes of Epirus. Upon the death of the famous George Castriot, surnamed *Scanderbeg*, Epirus fell to the Venetians, who were soon dispossessed of it by the Turks; in whose hands it still continues, being now known by the name of *Albania*, which comprehends the Albania of the ancients, all Epirus, and that part of Dalmatia which is subject to the Turks.

EPISCOPACY, that form of church government, in which diocesan bishops are established as distinct from and superior to priests or presbyters. We have already observed, that it is a long time since the ministers of religion have been distinguished into different orders, and that it has been much controverted whether the distinction be of divine or human right; whether it was settled in the apostolic age or afterwards. (See BISHOP.) This controversy commenced soon after the Reformation: and has been agitated with great warmth between the *Episcopalians* on the one side, and the *Presbyterians* and *Independents* on the other. Among the protestant churches *abroad*, those which were reformed by *Luther* and his associates are in general *episcopal*; whilst such as follow the doctrines of *Calvin* have for the most part thrown off the order of bishops as one of the corruptions of popery. In *England*, however, the controversy has been considered as of greater importance than on the *Continent*: for it has there been strenuously maintained by one party, that the *episcopal order* is essential to the constitution of the church; and by others, that it is a pernicious encroachment on the rights of men, for which there is no authority in scripture. Though the question has for some time lain almost dormant, and though we have no desire to revive it; yet as a work of this kind might perhaps be deemed

1 Commencement of the episcopal controversy.

Episcopacy ed defective, did it contain no account whatever of a controversy which has employed some of the ablest writers of the past and present centuries, we shall give a fair though short view of the chief arguments, by which the advocates of each contending party have endeavoured to support their own cause, leaving our readers to judge for themselves where the truth lies. See Independents and Presbytyrians.

2 The independent scheme.

The *Independent* maintains, that under the gospel dispensation there is nothing which bears the smallest resemblance to an exclusive priesthood; that Christ and his apostles constituted no permanent order of ministers in the church; but that any man who has a firm belief in revelation, a principle of sincere and unaffected piety, a capacity for leading devotion and communicating instruction, and a serious inclination to engage in the important employment of promoting the everlasting salvation of mankind; is to all intents and purposes a regular minister of the New Testament, especially if he have an invitation to the pastoral office from some particular society of Christians.

3 Episcopal arguments against it.

Against this scheme, which supposes the rights of Christians all equal and common, and acknowledges no authority in the church except what may be derived from the election of her members, the Protestant Episcopalian reasons in the following manner. He admits, as an undoubted truth, that our blessed Lord gave to none of his immediate followers authority or jurisdiction of such a nature, as could interfere with the rights of the civil magistrates, for all such authority was disclaimed by himself; "My kingdom (said he to Pilate) is not of this world:" and to a certain person who asked him to decide a question of property between him and his brother, he replied, "Man, who made me a jugde or a divider over you?" But when it is considered, that Christ came into this world to "turn men from darkness to light, and from the power of Satan to the living God; that he gave himself for us, that he might redeem us from all iniquity, and purify to himself a peculiar people zealous of *good works;* that of these works many are such as unregenerate humanity has no inclination to perform, and that the doctrines which he revealed are such as human reason could never have discovered; the advocate for episcopacy thinks it was extremely expedient, if not absolutely necessary, that, when he ascended into heaven, he should establish upon earth some authority to illustrate the revelation which he had given, and to enforce obedience to the laws which he had enacted. There is nothing, continues he, more strictly required of Christians, than that they live together in unity, professing the same faith, joining in the same worship, and practising the same virtues. But as men have very different passions, prejudices, and pursuits, such unity would be impossible, were they not linked together *in one society* under the government of persons authorised to watch over the purity of the faith, to prescribe the forms of public worship, and to explain the nature and inculcate the necessity of the several virtues. The society of Chistians, in respect of its unity and organization, is compared to the human body: for "as we have many members in one body, and all members have not the same office; so we being many are one body in Christ, and every one members one of another." (Rom. xii. 4, 5.) It is called the *church*, the *kingdom of heaven*, and *the kingdom of God;* and its affairs, like those of every other kingdom, are administered by proper officers in subordination to the ONE LORD, "when he ascended up on high, and led captivity captive, gave some apostles, and some prophets, and some pastors and teachers, for the perfecting of the saints, for the work of the ministry, for the edifying of the body of Christ;" (Ephes. iv. 8---13.) That those various orders of ministers were vested with real authority in the church, might be inferred from principles of reason as well as from the dictates of revelation. A society without some sort of government, government without laws, or laws without an executive power, is a direct absurdity. Where there are laws, same some govern, and others be governed: some must command, and others obey; some must direct, and others submit to direction This is the voice or *nature*; it is likewise the language of *scripture*. "Obey them (says the inspired author of the epistle to the Hebrews) who have the rule over you, and submit yourselves: for they watch for your souls as they that must give account." A text which shows ~~that~~ the authority of the ministers of religion was distinct from that of the civil magistrate, whose duty is to watch *not for the souls*, but for the *lives* and *properties*, of his subjects.

4 Christians linked together in one society called the *church*, the *kingdom of heaven*, and the *kingdom of God*.

5 The church governed by proper officers.

6 All Christians required to be members of the church.

Of the society thus constituted, it was not, as of a philosophical sect, left to every man's *choice* whether or not be would become a member. All who embrace the faith of the Redeemer of the world are required to be *baptized*, under the pain of forfeiting the benefits of redemption: but one great purpose for which baptism was instituted, is to be the rite of initiation into the church of Christ; "for by one spirit are we all baptized into one body, whether we be Jews or Gentiles whether we be bond or free," (1. cor xii. 13.) Of baptism, whatever be the importance, it is evident, that to receive it, is not, like the practice of justice, or the veneration of the Supreme Being, a duty resulting from the relation of Man to his Creator and fellow-creatures; that its whole efficacy, which in scripture is said to be nothing less than the remission of sins, is derived from *positive institution;* and therefore, that the *external rite* can be of no avail, but when it is administered in the *manner prescribed*, and by a person *authorised* to administer it. That *all* Christians are not vested with this authority, as one of the common privileges of the faith, appears from the commission which our Savour after his resurrection gave to his apostles. At that period, we are assured that the number of his followers was not less than *five hundred*; yet we find, that to the *eleven disciples* only did "he come and speak, saying, All power is given unto me in heaven and in earth; go ye, therefore, and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghost."

7 All Christians not authorised to administer the sacraments.

Of the 500 disciples there is surely no reason to believe that there were not *many* well qualified to instrict either a Jew or a Gentile in the doctrines of the gospel; and it is certain, that *any one* of them could have washed his convert with water in the name of the Holy Trinity as well as St Peter or St John: but such an unauthorised washing would not have been Christian baptism, nor of equal validity with it, any more than the opinion of a lawyer at the bar is the judgment of a court of justice, or equal obligation. It is the commission

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mission of the sovereign which gives force to the judgment of the court; it is the commission of Christ which gives validity to baptism. The same reasoning is applicable to the Lord's supper, which, if it be not administered by those who have authority for such administration, cannot be deemed a sacrament of Christ's institution.

These two rites are the external badges of our profession. By the *one*, we are incorporated into that society of which our Redeemer is the head and sovereign: in the celebration of the *other*, we have a right to join, whilst of that society we continue members. But if by an open and scandalous disregard of the precepts of the gospel, we should prove ourselves unworthy of its privileges, the same persons who were authorised to admit us into the church, are likewise vested with authority to cast us out of it; for to them were given "the keys of the kingdom of heaven (or the church), with assurance, that whatsoever they should bind on earth, should be bound in heaven; and whatsoever they should loose on earth, should be loosed in heaven," (Mat. xviii. 18.) As baptism is to be administered so long as there shall be persons to be enlisted under the banners of Christ, and the Lord's supper to be celebrated so long as it shall be the duty of soldiers to adhere to the standard of their leader and their head; and as it is likewise to be feared that there will never come a time when all Christians shall "walk worthy of the vocation wherewith they are called;" it follows, that this *power of the keys* which was originally given to the apostles, must continue in the church through all ages, even unto the end of the world. But as we have seen, that it was not at first intrusted to *all* the disciples in common, as one of the privileges inseparable from their profession, and as no body of men can possibly *transfer* an authority of which they themselves were *never possessed:* it is certain, that even now it cannot, by the election of one class of Christians, be delegated to another, but must, by some mode of succession, be derived from the apostles, who were sent by Christ as he was sent by his Father. To argue from the origin of *civil* to that of *ecclesiastical* government, although not very uncommon, the Episcopalian deems extremely fallacious. Of the various nations of the world, many of the sovereigns may indeed derive their authority from the suffrages of their subjects; because in a state of nature, every man has an inherent right to defend his life, liberty and property; and what he possesses in his own person, he may for the good of society transfer to another: but no man is by *nature*, or can *make himself*, a member of the Christian church; and therefore authority to govern that society can be derived only from him by whom it was founded, and who died that he might "gather together in one all the children God."

8 Christians as a body cannot transfer to one of their number an authority of which they were never possessed.

9 Authority to govern the church can be derived only from Christ.

10 An objection answered.

Against such reasoning as this it hath been urged, that to make institutions, which like baptism and the Lord's supper are generally necessary to the salvation of *all* Christians, depend for their efficacy upon the authority or commission of a *particular order*, appears inconsistent with the wisdom and goodness of God; as by such an economy an intolerable domination would be established over the souls of men, and the purpose for which he the Saviour of the world died might be in some degree defeated by the caprice of an ignorant and arbitrary priesthood. The objection is certainly plausible; but the Episcopalian affirms, that either it has no weight, or militates with equal force against all religion, natural as well as revealed, and even against the wisdom of Providence in the government of this world. ---In every thing, he observes, relating to their temporal and to their spiritual interests, mankind are all subjected to mutual dependence. The rich depend upon the poor, and the poor upon the rich. An infant neglected from the birth, would barely cry and cease to live; nor is it easily to be conceived, that in the more rigid climates of the earth, a full grown man could provide even the necessaries of mere animal life. Of religion, it is certain that in such a state nothing could be known; for there is not the smallest reason to imagine that any individual of the human race---an *Aristotle*, a *Bacon*, or a *Newton* had he been left alone from his infancy, without culture and without education,---could ever, by the native vigour of his own mind, have discovered the existence of a God, or that such speculations as lead to that discovery would have employed any portion of his time or his thoughts. Even in civilized society it would be impossible, in the present age, for any man, without the assistance of others, to understand the very first principles of our common Christianity; for the scriptures, which alone contain those principles, are written in languages which are now no where vernacular. In the fidelity of translators, therefore, every illiterate disciple of Jesus *must* confide, for the truth of these doctrines which constitute the foundation of all his hopes; and as no man ever pretended that the Christian *sacraments* are more necessary to salvation than the Christian *faith*, the Episcopalian sees no impropriety or inconsistency in making those persons receive baptism and the Lord's supper by the ministration of others, who by such ministration must of necessity receive the truths of the gospel.

11 A permanent order of ministers constituted by Christ.

By such arguments as these does the Episcopalian endeavour to prove that Christ constituted some *permanent order of ministers* in the church, to whom in the externals of religion the great body of Christians are commanded to pay obedience; and thus far the Presbyterian agrees with him: but here their agreement ends. They hand in hand attack the Independent with the same weapons, and then proceed to attack each other. The *one* maintains, that originally the officers of the Christian church were all *presbyters* or *elders* of *one order*, and vested with *equal powers*; whilst the *other* holds, that Christ and his apostles appointed *divers orders* of ministers in the church; that of these orders the highest alone was empowered to ordain others; and that therefore obedience, as to those who watch for our souls, can be due only to such as are *episcopally ordained*.

12 The Presbyterian plea.

In behalf of the Presbyterian plea it is urged, that the titles *bishop* and *presbyter*, being in the New Testament indifferently given to the same persons, cannot be the titles of distinct ecclesiastical officers; which appears still more evident from the ordination of *Timothy*, who although he was the first *Bishop* of Ephesus, received his episcopal character by the imposition of the hands of the *presbytery*.—That one and the same man is in the New Testament, styled sometimes a *bishop* and sometimes a *presbyter*, cannot be denied; but although every apostolic bishop was therefore undoubtedly a

 presbyter

presbyter, it does not of course follow, says the Episcopalian, that every presbyter was likewise a bishop. In the *Old* Testament, Aaron and his sons are without any discrimination of order frequently styled *priests*; and in the *New*, both St Peter and St John call themselves *presbyters*, as St Paul, upon one occasion, styles himself a *deacon*—διακονος, (Eph. iii. 7.): yet no man ever supposed those apostles to have been such ecclesiastical officers as modern presbyters and deacons; and it is universally known that in the Jewish priesthood there were different orders, and that Aaron was of an order superior to his sons. This being the case, the presbyters, by the laying on of whose hands Timothy was made a bishop, *may have been* of the same order with St Peter and St John; and if so, it follows that his ordination was *episcopal*. At all events, we are certain, continues the advocate for Episcopacy, that it was not, in the modern sense of the word, *Presbyterian*; for the gift, which in the first epistle is said to have been "given by prophecy *with* the laying on of the hands of the presbytery," is in the second said to have been "in him *by* the putting on of the hands of St Paul." And here it is worthy of observation, that the preposition used in the former case is μετα, which signifies *concurrence* rather than instrumentality; but *that* in the latter is δια, which, as every Greek scholar knows, is prefixed to the *instrumental cause* by which any thing is effected: so that whatever may have been the order of the presbyters who *concurred*, St Paul appears to have been the *sole* ordainer. But by the confession of all parties, St Paul was a bishop in the highest sense in which that word is ever used; and the powers of the episcopate not being parcelled out among various partners, of whom each possesses only a share, the imposition of his hands was sufficient for every purpose which could have been effected by the hands of the whole college of apostles.

13 Episcopal arguments against it.

It appears, therefore, that from the promiscous use of the titles *bishop* and *presbyter*, and from the *ordination of Timothy*, nothing can with certainty be concluded on either side of this celebrated question. But if, instead of resting in mere *words*, which, when taken alone and without regard to the context, are almost all of ambiguous signification, we attend to some important *facts* recorded in the New Testament, the Episcopalian thinks we shall in them discover sufficient evidence that the government of the primitive church was prelatical,

During our Saviour's stay upon earth, it is undeniable that he had under him two distinct orders of ministers---the twelve, and the seventy; and after his ascension, immediately before which he had enlarged the powers of the *eleven*, we read of *apostles presbyters*, and *deacons*, in the church. That the presbyters were superior to the deacons, and the apostles superior to both, is universally acknowledged; but it has been said that in scripture we find no intimation that the apostolic order was designed for continuance. A Quaker says the same thing of water-baptism: and the Episcopalian observes, that it would be difficult to point out by what passage of scripture, or what mode of reasoning, those who, upon this plea, reject the apostolic order of Christian ministers, could overthrow the principles upon which the disciples of *George Fox* reject the use of that rite which our Saviour instituted for the initiation of mankind into his church. They were the *eleven* alone to whom Christ said, "Go ye therefore and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghost:" and therefore, although we frequently find presbyters and deacons administering the sacrament of baptism, we must conclude, that as a *judge* administers justice by authority derived from his *sovereign*, so those *inferior officers* of the church administered baptism by authority derived from the *apostles*. Indeed, had they pretended to act by any other authority, it is not easily to be conceived how *their* baptism could have been the baptism instituted by Christ; for it was not with the *external washing* by whomsoever performed, but with the *eleven* and their successors, that he promised to be "always, even unto the end of the world."

14 Three orders of Christian ministers during our Saviour's stay upon earth; and likewise after his ascension into heaven.

That the *eleven* did not consider this promise, or the commission with which it was given, as terminating with their lives, is evident from their admitting others into their own order; for which they had competent authority, as having been sent by Christ as he was sent by his Father. When St Paul, to magnify his office and procure to it from the Galatians due reverence, styles himself, "an apostle not of men, neither by man, but by Jesus Christ and God the Father," he must have known some who derived their apostolic mission *by man*; otherwise he could with no propriety have claimed particular respect, as he evidently does, from what was in his own apostleship no particular distinction. At that very early period, therefore, there must have been in the church *secondary* apostles, if they may be so called, upon whom, by imposition of hands, or by some other significant ceremony, the eleven had conferred that authority which was given to them by their Divine Master. Such were *Matthias* and *Barnabas*; such likewise were *Timothy*, *Titus*, and the *angles* of the seven churches in Asia, with many others whose names and offices are mentioned in the New Testament.

15 The apostolic or highest order designed to be permanent.

That *Matthias* and *Barnabas* were of the apostolic order, has never been controverted; and that *Timothy* and *Titus* were superior to modern presbyters, is evident from the offices assigned them. Timothy was, by St Paul, empowered to *preside* over the presbyters of Ephesus, to receive accusations against them, to *exhort*, to *charge*, and even to *rebuke* them; and Titus was, by the same apostle, left in Crete for the express purpose of setting things in order, and ordaining *presbyters* in *every* city. To *exhort*, to *charge*, and with authority to *rebuke* one's equal, is certainly incongruous; and therefore the Episcopalian thinks the powers conferred on Timothy altogether inconsistent with that parity of order and of office for which his antagonists so strenuously plead: Even the commission given to Titus appears in his eyes by much too extensive for a Presbyterian minister, who, after having ordained in *one* city, could not have proceeded to ordain in *another* without the consent and assistance of his brother and fellow labourer. With respect to the *angels* of the Asiatic churches, he observes, that in the Old Testament the title of *angel* is sometimes given to the *Jewish high priest*, and particularly by the prophet Malachi, who calls him "the *messenger* (αγγελος) of the Lord of Hosts;" and that the *angels* of the churches mentioned

16 Matthias, Barnabas, Timothy, Titus, and the angels of the seven churches in Asia, *bishops*.

Episcopacy. ed by St John were *Christian high priests* or *bishops* presiding over more than one congregation, as it is affirmed by all the ancient writers, cannot, he thinks, be denied by any man who will take the trouble to compare scripture with scripture. We read (Acts xix. 10, and 20.), that "in the space of two years *all they* who dwelt in Asia heard from St Paul the word of the Lord Jesus, both Jews and Greeks; and that there the word of God *grew mightily* and *prevailed*: but with what truth or propriety could this have been said, if at the time of St John's writing the Apocalypse, which was 30 years after St Paul's death, all the Christians of Proconsular Asia were comprised in *seven congregations*, which assembled, each with its proper pastor, to perform, in *one place*, the duties of public worship? In a word, the advocate for episcopacy insists, that no man, that reads without prejudice the acts of the apostles, the epistles of St Paul, and the Apocalypse of St John, can seriously believe that *Timothy, Titus, Epaphroditus, Sosthenes*, and *Silvanus*, with the *angels* of the seven churches in Asia, were *mere presbyters*, or that the government of the church was, in those days, by a college of elders.

When from the inspired penmen of the New Testament he proceeds to examine the succeeding writers of the Christian church, the Episcopalian finds such multiplied and concurring evidence of the apostolic institution of episcopacy, as he thinks it impossible to resist without denying the truth of all ancient history, and even shaking the pillars of revelation itself; for "in the noble army of martyrs," the witnesses of the episcopal government of the church are earlier, and by far more numerous, than those who testify that the *gospel* of *St Matthew* was written by that apostle, or that the book of the *Apocalypse* is canonical scripture. The authority of the *fathers* indeed is at present very low; but should they be allowed to be as fanciful divines and as bad critics as their worst enemies are pleased to represent them, this would detract nothing from their evidence when they bear witness to the constitution of the church in their own times; for of their *integrity* there can be no doubt: and what the Episcopalian wants of them is only their testimony to matters of fact which fell under the cognizance of their own senses, and about which therefore they could not be deceived. It is here indeed chiefly that he triumphs over his antagonists. In the second and

17 The divine right of episcopacy.

third centuries there was no general council, nor any Christian sovereign. And prelacy therefore, he urges, could not have been *universally* introduced during that period, either by a concert among the clergy, or by the authority of the civil magistrate. Yet that even *then* there was no such church under heaven, of which the government was not episcopal, has been confessed by some of the most learned writers among the Presbyterians themselves; whence he concludes that episcopacy is of divine institution.

The candid Episcopalian, however, allows, that in the apostolic age there may have been some churches which at first had only bishops and deacons to perform the offices of religion; for when the number of disciples in any place was so small that they all could meet in one assembly, there was no necessity for any other order of ministers: but it appears that, from the very *beginning, bishops, presbyters*, and *deacons*, were settled in all the *larger* cities of the Roman empire; and it was in those days an allowed maxim, that without a *bishop*, there could be *no church*. The better to understand the original state and institution of episcopacy, it is necessary to observe, that the empire which contained almost all the known part of the Christian world, was by Augustus Cæsar divided into provinces, subjected each to the authority of one chief magistrate, who was commonly a *prætor* or *proconsul*, and who resided in the metropolis or chief city of the province. A province comprehended the cities of a whole region; and in the age of the apostles, each city was under the immediate government of certain magistrates within its own body, known by the name of βουλη, or *senatus, ordo* and *curia*, "the states and court of the city." Those magistrates were subordinate to the *prætor* or *proconsul*: but among them there was *one* superior to the rest, called sometimes *dictator*, and sometimes *defensor civitatis*, whose jurisdiction extended not only over the city itself, but likewise over all the adjacent territory. That territory was denominated προαστεια, or the suburbs, and often reached to the distance of 10 or 12 miles round the city, and sometimes much farther, containing within it many villages and small towns under the go- 18

The origin of dioceses.

vernment of the city magistrates. From some passages in the New Testament, and from the concurring evidence of the earliest writers of the church, it appears to have been the purpose of the apostles to settle a bishop in *every* city where there was a civil magistracy: but as they could not be personally present in all places at once, it was natural for them to *enter* upon the great work of converting the nations, by *first* preaching the gospel in that city of each province which was the ordinary residence of the governor; because to it there must have been the greatest resort of people, who would carry the glad tidings with them into the country when they returned. Accordingly, having dispersed themselves over the empire, and made numbers of proselytes in the principal cities, they fixed in each, where they saw it necessary, a *bishop*, with a college of *presbyters* and *deacons*; and to give those bishops, who were at first called *apostles*, a commission, as the *other* cities in the province should be converted, to fix in them bishops also.

In some of the smaller cities, it is extremely probable that a bishop and a deacon were for a short time the only ecclesiastical officers, till the number of Christians increased so much as to make it impossible for them all to assemble in one house for the purposes of public worship. The bishop then ordained *presbyters* to officiate in those congregations where he himself could not be present, and to assist him in other parts of his pastoral office; but in all their ministrations the presbyters were subordinate to him, who was the chief pastor within the city, who composed the prayers which were offered up in public, and to whom all the other ministers of religion were accountable for their conduct. So long as the number of the faithful was confined within the *walls* of the city, it appears that the bishop with his presbyters and deacons lived together as in a college; that divine service was every Lord's day, or oftener, performed in what was afterwards called the cathedral or mother-church, by the bishop himself, assisted by some of his clergy; and that the congregations which met in other churches, having no *fixed* pastors, Episcopacy

pastors, were supplied by such presbyters as the bishop chose to send them from his own church. Whilst matters continued in this state, the clergy had no other revenues than what arose from the voluntary oblations of the people; which were indeed so large as not only to support them with decency, but likewise to answer other ends of charity and munificence. They were commonly divided into four equal parts; of which one was allotted to the bishop, a second to the inferior clergy, a third to the poor, and a fourth to keep the churches in repair; and it was considered as part of the bishop's duty to take care that the offerings should be faithfully applied to these purposes.

19
The origin of parishes.

When converts increased in number, and churches were built in the suburbs, each of those churches had a fixed pastor similar to a parish-priest among us; but still those pastors, as well as the city clergy, ministered in subordination to the bishop, whose authority extended as far as the civil authority of the Roman magistrate, within which district or diocese it was supreme over all orders of Christians. This every man knows who is acquainted with ecclesiastical history; for the bishop alone could ordain *priests* and *deacons*, administer the rite of *confirmation*, *absolve penitents* who were under church-censure, and *exclude from communion* heretics and notorious offenders; and from his sentence there lay no appeal but to a synod of comprovincial bishops.

Such synods were in each province convened by the bishop of the chief city; for the apostles having been careful to place in those cities men of the most eminent gifts and abilities, the other bishops of the provinces applied to them for advice upon every emergency, and paid a particular deference to them upon every occasion. So that though all bishops were of equal authority as *bishops* yet when they met to consecrate a new bishop, or to deliberate upon the affairs of the church, they yielded a precedency to the bishop of the metropolis, who called them together, and who sat as *president* or *moderator* of the synod. Hence the origin of metropolitans or *archbishops*; whose authority was so considerable, that though there is not a doubt but the *election* of bishops was anciently placed in the clergy and people of the vacant diocese, yet the bishop *elect* could not be *consecrated* without the consent of the archbishop of the province.

20
The origin of metropolitans or archbishops

In consequence of the extensive powers with which the primitive bishops were vested, they are commonly styled in the writings of those times *presidents*, *provosts*, or *inspectors* of the church *chief priests*, *princes of the clergy*, and even *princes of the people*; but their authority was wholly spiritual. Those prelates, imitating the example of their Divine Master when on earth, neither possessed nor assumed to themselves any jurisdiction over the *properties* or *civil rights* of men. In consequence of St Paul's having reprimanded the Corinthians for going to law before the *unbelievers*, they were indeed often chosen as *arbiters* of such civil disputes as arose between individuals under their episcopal government; but on these occasions they could not act unless the submission was *voluntarily* made by *both* the contending parties, and *then* their decision was final. When the empire became Christian, this privilege was confirmed to them by law; for any *civil* cause depending before a court of justice could be withdrawn, and by the mutual consent of parties be submitted to the arbitration of the bishop whose award, which in former times could be enforced only by the terror of church-censures, was then enforced by the secular magistrate. In *criminal* causes, where the trial might be for life or death, they were prohibited both by the canons of the church and by the laws of the state from acting as judges; and therefore they never suffered such causes to come before them, except when it was necessary that the person accused, if found guilty, should be excluded from the communion of the faithful. But they had so many civil causes flowing in upon them, that they were soon obliged to devolve part of that care upon other persons in whose knowledge, prudence, and integrity, they could fully confide; and as the persons employed to act in the bishop's stead were often *laymen*, it has been conjectured that they gave rise to the office of *lay-chancellor* in the church, and to all that train of spiritual judges and spiritual courts against which such numbers are disposed to clamour.

21
The probable origin of spiritual courts.

Be this as it may, it is certain that, through the piety and munificence of the Christian emperors the bishops enjoyed large revenues and many valuable privileges; but it does not appear that they had any rank or authority, as *barons* or *temporal princes*, till the Gothic nations, which subverted the Roman empire, had embraced the Christian faith. As Christianity incapacitated the leaders of those tribes from officiating as chief priests at the religious rites which were usually celebrated at the opening of their public assemblies, the bishops came naturally to discharge that duty on such occasions, when they must have shared in the rank by sharing in the functions of the chief. The situation in which they thus appeared at the opening of all political conventions, would enable them to join with much effect in the deliberations which ensued; and their superior knowledge, their sacred character, and their influence with the people, would soon acquire them power equal to their rank. They must therefore have been well entitled to demand admission into that council which was formed by the king and the lay-chiefs at the national assemblies: and as they balanced the authority of those chiefs, we cannot doubt that the king would be disposed to give the utmost effect to their claim. Accordingly we find the dignified clergy, who received large grants of land to be held on the same tenures with the lands of the lay magistrates, presiding along with those magistrates in the provincial assemblies of every degree in all the Gothic nations, and enjoying every advantage in point of rank and authority in their national diets. Hence the bishop of Rome, and several bishops in Germany, have, like the dukes and marquises of that enpire, been for a long time sovereign princes; and hence too the bishops of England and Ireland have always sat, and have an equal right with the lay-peers to sit, in the upper house of parliament. It is, however obvious, that, so far as episcopacy is of *apostolical* institution, those peers and princes possess not the *original* character in any higher degree than the bishops in America, who are barely tolerated, or than those in Scotland who do not enjoy that privilege; and that confirmation administered, or holy orders conferred, by a persecuted prelate, must be as effectual to the purposes of religion, as if given by a German prince or an English peer.

22
Bishops had no civil rank till after the subversion of the Roman empire and the conversion of the Gothic nations.

In

In this short view of episcopacy, it has been our endeavour to do justice to the subject, without suffering ourselves to be influenced by partiality or prejudice. As we are not ourselves episcopalian, we have advanced nothing of our own; but have selected from English writers, who have at different times undertaken to defend the *divine right* of episcopacy, such facts and arguments as to us appear to be of the most importance, or to have the greatest weight, without remarking upon them, or offering any answer. The reasoning employed to prove that the order of bishops was instituted by the apostles, is taken from a work prepared for the press by Dr Berkley prebendary of Canterbury, and son of the celebrated bishop of Cloyne. For the rest of the detail, we are indebted chiefly to Bingham's *Origines Ecclesiasticæ*; a performance in great estimation with those English divines who are commonly known by the appellation of *high churchmen*. As editors of a work of this kind, it is not *our* business to be of *any party*, or to support, in opposition to all others, a *particular* church, though that church should be our own: We shall therefore treat *independency* and *presbytery* as we have treated *episcopacy*, by employing some able writer of each society to plead his own cause. Mean while, we shall conclude this article with a few reflections, which, though they come from the pen of an obscure author, deserve to be engraved deep in the memory of every controvertist of every communion.

23 Moderation in controversy recommended.

"On complicated questions (says a late apologist for the episcopal church in Scotland), men will always differ in opinion; but conscious each of the weakness of his own understanding, and sensible of the bias which the strongest minds are apt to receive from thinking long in the same track, they ought to differ with charity and meekness. Since unhappily there are still so many subjects of debate among those who name the name of Christ; it is doubtless every man's duty, after divesting himself as much as possible of prejudice, to investigate those subjects with accuracy, and to adhere to that side of each disputed question which, after such investigation, appears to him to be the truth; but he transgresses the favourite precept of his divine Master, when he casts injurious reflections, or denounces anathemas, upon those who, with equal sincerity, may view the matter in a different light; and by his want of charity does more harm to the religion of the *Prince of Peace*, then he could possibly do good, were he able to convert all mankind to his own orthodox opinions."

EPISCOPAL, something belonging to BISHOPS.

EPISCOPALIANS, in church-history, an appellation given to those who prefer the episcopal government and discipline to all others. See EPISCOPACY.

By the test act, none but Episcopalians, or members of the church of England, are qualified to enjoy any office civil or military.

EPISCOPIUS (Simon), one of the most learned men of the 17th century, and the chief supporter of the Arminian sect, was born at Amsterdam in 1583. In 1612, he was chosen divinity professor at Leyden, in the room of Gomarus, who resigned, and the functions of his office, with his private studies, were light burdens to him, compared with the difficulties he sustained on account of the Arminian controversy: which, though it began in the universities, soon flew to the pulpits from whence it spread and inflamed the people. The states of Holland having invited Episcopius to take his place at the synod of Dort, he went thither accompained by some remonstrant ministers; but the synod woud not allow them to sit as judges, nor to appear in any other capacity than as persons summoned before them: they submitted, were deposed from their functions, and banished the territories of the commonwealth. Episcopius and his persecuted brethren retired to Antwerp; but the times growing more favourable, he returned to Holland in 1626, and was made minister of the church of the Remonstrants at Rotterdam: in 1634, he was chosen rector of the college founded by this sect at Amsterdam where he spent the remainder of his days. He died in 1643, of the same disorder which had killed his wife before, a retention of urine; having lost his sight some weeks previous to his end. The learned have bestowed great eulogiums on Episcopius; but he did not always write with that moderation which might have been wished. His works make two volumes in folio, of which the second consists of posthumous publications.

EPISCOPUS, the same with bishop. See BISHOP and EPISCOPACY.

EPISODE, in poetry, a separate incident, story, or action, which a poet invents, and connects with his principal action, that his work may abound with a greater diversity of events; though in a more limited sense, all the particular incidents whereof the action or narration is compounded, are called *episodes* See POETRY.

EPISPASTIC, in medicine, a topical remedy, which being applied to the external parts of the body, attracts the humours to that part.

EPISTATES, in the Athenian government, was the president of the proedri. See PROEDRI.

EPISTEMONARCH, in the ancient Greek church an officer of great dignity, who had the care of every thing relating to faith, in the quality of censor. His office answered pretty nearly to that of master of the sacred palace at Rome.

EPISTLE, denotes the same with a missive letter; but is now chiefly used in speaking of ancient writings, as the epistles of St Paul, epistles of Cicero, epistles of Pliny, &c.

EPISTLES and Gospels, in the liturgy of the church of England, are select portions of scripture, taken out of the writings of the evangelists and apostles, and appointed to be read, in the communion-service on Sundays and holidays. They are thought to have been selected by St Jerom, and by him put into the lectionary. It is certain, that they were very anciently appropriated to the days whereon we now read them, since they are not only of general use throughout the western church, but are also commented upon in the homilies of several ancient fathers, which are said to have been preached upon those very days to which these portions of scriptures are now affixed.

The epistles and gospels are placed in an admirable order and method, and bear a special relation to the several days whereon they are read. The year is distinguished into two parts; the first being designed to commemorate Christ's living among us, the other to instruct us to live after his example. The former takes in the whole time from advent to Trinity Sunday; the

Epistolary ‖ Epithalamium.

latter, all the Sundays from Trinity to Advent. During the first of these seasons, the epistles and gospels are calculated to raise in us a grateful sense of what our Saviour did and suffered for us, and set before our eyes his nativity, circumcision, and manifestation to the Gentiles; his doctrines and miracles; his baptism, fasting, and temptation; his agony and bloody sweat; his cross and passion; his death, burial, resurrection, and ascension; and his mission of the Holy Ghost. During the second season of the year, the epistles and gospels tend to instruct us in the true paths of Christianity. See Collects.

EPISTOLARY, something belonging to an epistle. See Epistle.

Epistolary Composition. See Letter; and the article Poetry.

EPISTROPHE. See Oratory, n° 71.

EPISTYLE, in the ancient architecture, a term used by the Greeks for what we call *architrave*, viz. a massive piece of stone or wood, laid immediately over the capital of a column.

EPITAPH, (from επι *upon*, and ταφος *sepulchre*), a monumental inscription, in honour or memory of a person deceased. It has been disputed whether the ancient Jews inscribed epitaphs on the monuments of the dead; but be this as it will, epitaphs it is certain, of very ancient date, are found amongst them.—The Athenians, by way of epitaph, put only the name of the dead, with the epithet χρηστος, signifying "good," or ηρως "hero," and the word χαιρε, signifying their good wishes: The name of the deceased's father and his tribe were frequently added.—The Lacedemonians allowed epitaphs to none but those who had died in battle. The Romans inscribed their epitaphs to the *manes, diis manibus*; and frequently introduced the dead by way of prosopopœia, speaking to the living; of which we have a fine instance, worthy the Augustan age, wherein the dead wife thus bespeaks her surviving husband:

Immatura perî; sed tu, felicior, annos
Vive tuos, conjux optime, vive meos.

The epitaphs of the present day are generally crammed with fulsome compliments which were never merited, characters which human nature in its best state could scarce lay claim to, and expressions of respect which were never paid in the life time of the deceased. Hence the proverb with great propriety took its rise, "He lies like an epitaph."

Epitaph, is also applied to certain eloges, either in prose or in verse, composed without any intent to be engraven on tombs; as that of Alexander,

Sufficit huic tumulus, cui non sufficeret orbis;

and that of Newton,

Isaacum Newton,
Quem immortalem
Testantur Tempus, Natura, Cælum,
Mortalem hoc marmor
Fatetur.

EPITASIS, in ancient poetry, the second part or division of a dramatic poem, wherein the plot, entered upon in the first part or *protasis*, was carried on, heightened, and worked up, till it arrived at its state or height, called *catastasis*.

Epitasis, in medicine, the increase of a disease or beginning of a paroxysm, particularly in a fever.

EPITHALAMIUM, in poetry, a nuptial song or composition in praise of the bride and bridegroom, praying for their prosperity, for a happy offspring, &c.

Epithem ‖ Epode.

Epithalamia were sung amongst the Jews, at the door of the bride, by her friends and companions, the evening before the marriage. Psalm xlv. is an epithalamium. Among the Greeks the epithalamium was sung as soon as the married couple were gone to bed, and attended with shouts and stamping of the feet to drown the cries of the bride. They returned in the morning, and with the same song, a little altered, saluted them again. The evening song was called επιθαλαμια κοιμητικα, the morning salute was called επιθαλαμια εγερτικα. This was the practice among the Romans also, but their epithalamia were often obscene.

EPITHEM, in pharmacy, a kind of fomentation, or remedy of a spirituous or aromatic kind, applied externally to the regions of the heart, liver, &c. to strengthen and comfort the same, or to correct some intemperature thereof.

EPITHET, in poetry and rhetoric, an adjective expressing some quality of a substantive to which it is joined; or such an adjective as is annexed to substantives by way of ornament and illustration, not to make up an essential part of the description. Nothing, says Aristotle, tires the reader more than too great a redundancy of epithets, or epithets placed improperly; and yet nothing is so essential in poetry as a proper use of them. The writings of the best poets are full of them.

EPITOME, in literary history, the same with Abridgement.

EPITRITUS, in prosody, a foot consisting of three long syllables and one short. Of these, grammarians reckon four kinds: the first consisting of an iambus and spondee, as sălūtāntēs, the second, of a trocheus and spondee, as cōncĭtātī; the third, of a spondee and an iambus, as cōmmūnĭcāns; and the fourth, of a spondee and trocheus, as īncāntārĕ. See the articles Spondeus, Trocheus, &c.

EPITROPE. See Oratory, n° 83.

EPITROPUS, a kind of judge, or rather an arbitrator, which the Greek Christians under the dominion of the Turks elect in the several cities, to terminate the differences that arise among them, and avoid carrying them before the Turkish magistrates. See Arbitrator.

Anciently the Greeks used the term επιτροπος in the same sense as the Latins did *procurator*, viz. for a commissioner or intendant. Thus the commissioners of provisions in the Persian army are called by Herodotus and Xenophon *epitropi*. In the New Testament, επιτροπος denotes the steward of a household, rendered in the vulgate *procurator*.

EPIZEUXIS. See Oratory, n° 68.

EPOCHA, in chronology, a term or fixed point of time whence the succeeding years are numbered or counted. See Æra.

EPODE, in lyric poetry, the third or last part of the ode, the ancient ode being divided into strophe, antistrophe, and epode. See Ode, &c.

The epode was sung by the priests, standing still before the altar, after all the turns and returns of the strophe and antistrophe, and was not confined to any precise number or kind of verses.

The epode is now a general name for all kinds of little verses that follow one or more great ones, of what kind

kind soever they be: and in this sense, a pentameter is an epode after an hexameter. And as every little verse, which, being put after another, closes the period, is called *epode;* hence the sixth book of Horace's odes is intitled *liber epodon,* "book of epodes," because the verses are all alternately long and short, and the short ones generally, though not always, close the sense of the long one.

EPOPOEIA, in poetry, the history, action, or fable, which makes the subject of an epic poem. The word is derived from the Greek ἔπος *carmen,* "verse;" and ποιέω *facio,* "I make."

In the common use of the word, however, *epopœia* is the same with *epos,* or epic poem itself. See the article POETRY.

EPOPS, or HOOPOE. See UPUPA.

EPSOM, a town of Surry, about 16 miles southwest from London, long famous for its mineral waters. These were discovered in 1618; and though not in such repute as formerly, yet they are not impaired in virtue, and the salt* made from them is famous all over Europe, for gently cleansing and cooling the body. The hall, galleries, and other public apartments are now run to decay; and there remains only one house on the spot which is inhabited by a countryman and his wife, who carry the waters in bottles to the adjacent places, and supply the demands of dealers in London. On the neighbouring downs are annually horse-races, but the inns, shops, and bowling-greens are not near so much frequented as formerly. The market is on Friday; fair, July 25. The town is about one mile and an half in semicircle, from the church to the palace at Durdans, which was burnt down some years since, but has been rebuilt. It was once inhabited by his present Majesty's father. In Hudson's-Lane here was Epsom-Court, an ancient Saxon seat, long since converted into a farm. Here are so many fields, meadows, orchards, gardens, and the like, that a stranger would be at a loss to know whether this was a town built in a wood, or a wood surrounded by a town.

* See *Chemistry* Index

Epsom water is easily imitated by art; *i. e.* by only dissolving half an ounce of Epsom salt in a quart of pure water, made somewhat brisk or quick by a few drops of spirit of vitriol and oil of tartar, so as to let the alkali prevail.

EPULARES, in antiquity, an epithet given to those who were admitted to the sacred *epulæ* or entertainments, it being unlawful for any to be present at them who were not pure and chaste.

EPULO, in antiquity, the name of a minister of sacrifice among the Romans.

The pontifices, not being able to attend all the sacrifices performed at Rome to so many gods as were adored by that people, appointed three ministers, whom they called *epulones,* because they conferred on them the care and management of the *epula,* feasts in the solemn games and festivals. To them belonged the ordering and serving the sacred banquet, offered on such occasions to Jupiter, &c. They wore a gown bordered with purple like the pontifices. Their number was at length augmented from three to seven, and afterwards by Cæsar to ten. Their first establishment was in the year of Rome 558, under the consulate of L. Furius Purpureo, and M. Claudius Marcellus.

EPULUM, in antiquity, a holy feast prepared for the gods in times of public danger. The feast was sumptuous, and the gods were formally invited and attended; for the statues were brought on rich beds furnished with soft pillows, called *pulvinaria:* Thus accommodated, their godships were placed on their couches at the most honourable part of the table. The care of the *epula* belonged to the *epulonis,* and the gods were plentifully served with the richest dainties, as if they were able to eat; but the *epulones* performed that function for them, and doubtless were competent proxies! No wonder that Pliny solicited Trajan to be admitted of their order.

EPULUM is also used to signify any solemn feast; so we meet with *epulum ferale,* "a funeral entertainment."

EQUABLE, an appellation given to such motions as always continue the same in degree of velocity, without being either accelerated or retarded.

EQUAL, a term of relation between two or more things of the same magnitude, quantity, or quality.

Mathematicians speak of *equal* lines, angles, figures, circles, ratios, solids.

EQUALITY, that agreement between to or more things, whereby they are denominated equal.

EQUANIMITY, in ethics, denotes that even and calm frame of mind and temper, under good or bad fortune, whereby a man appears to be neither puffed up nor overjoyed with prosperity, nor dispirited, soured, or rendered uneasy by adversity.

EQUATIONS, in algebra. See ALGEBRA, chap. iii.

EQUATION of Time, in astronomy and chronology, the reduction of the apparent time or motion of the sun, to equable, mean, or true time. See ASTRONOMY, n° 383.

EQUATOR, or ÆQUATOR, in astronomy and geography, a great circle of the sphere, equally distant from the two poles of the world, or having the same poles with those of the world. It is called the *equator,* because when the sun is in it the days and nights are *equal*; whence also it is called the *equinoctial*; and when drawn on maps and planispheres, the *equinoctial line,* or simply the *line.* Every point of the equator is a quadrant's distance from the poles of the world; whence it follows, that the equator divides the sphere into two hemispheres, in one of which is the northern, and in the other the southern pole.

EQUATORIAL INSTRUMENT. See ASTRONOMY, n° 499, 504.

EQUERY, or ECURY, a grand stable or lodge for horses, furnished with all the conveniences thereof; as stalls, manger, rack, &c. The word is formed from the French *escurie,* which signifies the same thing. Some again derive *escurie* from the Latin *scuria,* which not only denotes a place for beasts to be put up in, but also a grange or barn. But a more probable derivation is from *equile* "a stable for horses," of *equus* "horse." Some hold that the word *stable,* in propriety, relates only to bullocks, cows, sheep, hogs, &c. and *equery,* to horses, mules, &c.

A *simple equery* is that provided for one row of horses; a *double equery* that provided for two, with a passage in the middle, or two passages; the horses being placed head to head, as in the little equery at Versailles.

Under equery are sometimes also comprehended the lodgings and apartments of the equerries, grooms, pages, &c.

EQUERY (*Escuyer*), is also an officer who has the care and management of the horses of a king or prince.

EQUERIES, or EQUERRIES, popularly called *Querries*, are particularly used in Britain for officers of the king's stables, under the master of the horse, seven in number, who, when his majesty goes abroad, ride in the leading coach, are in waiting one at a time monthly, and have a table with the gentlemen-ushers during the time, and a salary of L. 300 a-year each. They used to ride on horseback by the coach-side when the king travelled; but that being more expensive to them than necessary to the sovereign, it has been discontinued.

EQUERRIES of the Crown Stable have that appellation, as being employed in managing and breaking the saddle-horses, and preparing them for the king's riding. These are two in number; the first having an annual salary of L. 256, and the second L. 200, whereof one is, or always should be, in close waiting at court; and when his majesty rides, holds the stirrup, while the master of the horse, or one of the equeries in his absence, assists in mounting him; and when his majesty rides, they usually attend him.

EQUES, in antiquity. See *EQUESTRIAN Order*, and EQUITES.

EQUES Auratus, is used to signify a knight-bachelor, called *auratus*, q. d. *gilt*, because anciently none but knights might gild or beautify their armour or other habiliments of war with gold. In law this term is not used, but instead of it *miles*, and sometimes *chevalier*.

EQUESTRIA, among the Romans, a place in the theatre where the equites or knights sat.

EQUESTRIAN (*Equestris*), a term chiefly used in the phrase *equestrian statue*, which signifies a statue representing a person mounted on horseback. The word is formed of the Latin *eques*, "knight, horseman," of *equus*, "horse."

EQUESTRIAN Games, among the Romans, horse-races, of which there were five kinds, the *prodromus* or *plain horse race*, the *chariot-race*, the *decursory-race* about funeral piles, the *ludi sevirales*, and the *ludi neptunales*.

EQUESTRIAN Order, among the Romans, signified their knights or equites; as also their troopers or horsemen in the field; the first of which orders stood in contradistinction to the senators; as the last did to the foot, military, or infantry. Each of these distinctions was introduced into the state by Romulus.

EQUIANGULAR, in geometry, an epithet given to figures whose angles are all equal: such are a square, an equilateral triangle, &c.

EQUIDISTANT, an appellation given to things placed at equal distances from some fixed point or place to which they are referred.

ÆQUILATERAL, in general, something that hath equal sides; as an equilateral triangle.

EQUILIBRIUM, in mechanics, is when the two ends of a lever or balance hang so exactly even and level, that neither doth ascend or descend, but both keep in a position parallel to the horizon; which is occasioned by their being both charged with an equal weight.

EQUIMULTIPLES, in arithmetic and geometry, are numbers or quantities multiplied by one and the same number or quantity. Hence, equimultiples are always in the same ratio to each other as the simple quantities before multiplication: thus, if 6 and 8 are multiplied by 4, the equimultiples 24 and 32 will be to each other as 6 to 8.

EQUINOCTIAL, or ÆQUINOCTIAL, in astronomy, a great and immoveable circle of the sphere, under which the equator moves in its diurnal motion.

The equinoctial or equinoctial line, is ordinarily confounded with the equator: but there is a difference; the equator being moveable, and the equinoctial immoveable; and the equator being drawn about the convex surface of the sphere, but the equinoctial on the concave surface of the magnus orbis.

Whenever the sun in his progress through the ecliptic comes to this circle, it makes equal days and nights all around the globe; as then rising due east and setting due west, which he never does at any other time of the year. And hence the denomination from *æquus* and *nox*, "night," *quia æquat diem nocti*.

The equinoctial then is the circle which the sun describes, or appears to describe, at the time of the equinoxes; that is, when the length of the day is every where equal to that of night, which happens twice a-year. See EQUINOX.

EQUINOCTIAL, in geography. See EQUATOR.

The shadows of those who live under this circle are cast to the southward of them for one half of the year, and to the northward of them during the other half; and twice in a year, viz. at the equinoxes, the sun at noon casts no shadow, being in their zenith.

From this circle is the declination or latitude of places accounted in the degrees of the meridian.

EQUINOCTIAL Points, are the two points wherein the equator and ecliptic intersect each other; the one being in the first point of Aries, is called the *vernal point* or *equinox*; and the other in the first point of Libra, the *autumnal point* or *equinox*.

EQUINOCTIAL Dial, is that whose plane lies parallel to the equinoctial. See DIAL.

EQUINOX, or ÆQUINOX, in astronomy, the time when the sun enters one of the equinoctial points.

The equinoxes happen when the sun is in the equinoctial circle; when of consequence the days are equal to the nights throughout the world, which is the case twice a year, viz. about the 20th of March, and the 23d of September, the first of which is the vernal and the second the autumnal equinox.

It is found by observation, that the equinoctial points, and all the other points of the ecliptic, are continually moving backward, or *in antecedentia*, that is, westward. This retrograde motion of the equinoctial points, is that famous and difficult phenomenon called the *precession of the equinoxes*. See ASTRONOMY, n° 349.

EQUIPAGE, in the military art, denotes all sorts of utensils, artillery, &c. necessary for commencing and prosecuting with ease and success any military operations. Camp and field equipage consists of tents, kitchen-furniture, saddle-horses, baggage, waggons, bat-horses, &c.

To EQUIP, in naval language, a term borrowed from the French marine, and frequently applied to the businefs of fitting a fhip for fea, or arming her for war.

EQUIPOLLENCE, in logic, is when there is an equivalence between any two or more terms or propofitions; *i. e.* when they fignify one and the fame thing, though they exprefs it differently. Such propofitions, &c. are faid to be *equipollent*.

EQUIRIA, in antiquity, a feftival inftituted by Romulus, and celebrated on the 27th of February, in honour of Mars, at which there were horfe-races.

EQUISETUM, Horse-tail: A genus of the order of filices, belonging to the cryptogamia clafs of plants; and in the natural method ranking under the 51ft order, *Coniferæ*. There is a fpike of peltated or fhielded fructifications opening at the bafe. There are feven fpecies; of which the moft remarkable are, 1. The fylvaticum, or wood horfe-tail. It grows in woods and moift fhady places in many parts of England and Scotland. The ftalk rifes from 12 to 18 inches high, angular, and rough to the touch; the angles being edged with fharp *fpiculæ*, fcarce vifible without a microfcope. The leaves grow verticillate, 12 or more in a whorl, and thefe whorl are about an inch diftant from one another. The leaves are very flender nearly quadrangular, about five inches long, pendent, and befet with feveral other fecondary whorls, fo that it refembles a pine-tree in miniature. Horfes are very fond of this plant, and in fome parts of Sweden it is collected to ferve them as winter food. 2. The arvenfe, common or corn horfe-tail, grows in wet meadows and cornfields. The moft remarkable property of this is, that its feeds, when viewed by a mifcrofcope, are feen to leap about as if they were animated. It has a very aftringent and diuretic quality, and has been efteemed ferviceable in the *hæmaturia* and *gonorrhœa*, but is difregarded by the prefent practice. It is a troublefome plant in paftures; and difagreeable to cows, being never touched by them unlefs they are compelled by hunger, and then it brings on an incurable diarrhœa. It does not feem to affect horfes or fheep. 3. The paluftre, marfh horfe-tail, or paddock pipe, is frequent in marfhes and ditches. It is not fo rough as the former, but is likewife prejudicial to cattle. 4. The fluviatile, or great river horfe-tail, is frequently in fhady marfhes, and on the brinks of ftagnant waters. It is the largeft of all the fpecies, growing fometimes to the height of a yard, and near an inch in diameter. Haller tells us, that this kind of equifetum was eaten by the Romans; and Linnæus affirms, that oxen and rein-deer are fond of it, but that horfes refufe it. 5. The hyemale, rough horfe-tail, fhave-grafs or Dutch rufhes. This is much ufed by the whitefmiths and cabinet makers, under the name of *Dutch Rufhes*, for polifhing, their metals and wood. All the other fpecies will anfwer this purpofe in fome degree, but the laft better than any of the reft. In Northumberland the dairy-maids fcour and clean their milk-pails with it. Some imagine, that if cows are fed with this fpecies, their teeth will fall out.

EQUITES, amongft the Romans, were perfons of the fecond degree of nobility, immediately fucceeding the fenators in point of rank. The *equites* or knights were required to be poffeffed of 400 *feftertia* before they could be admitted into that order; and when the knights were fo reduced as to fall fhort of the prefcribed revenue, they were expunged out of the equeftrian lift. The equeftrian revenue juft mentioned amounted to about 10,000 crowns.

Part of the ceremony whereby the honour of knighthood was conferred amongft the Romans was the giving of a horfe: for every *eques* or knight had a horfe kept at the public charge, he received alfo the ftipend of an horfeman to ferve in the wars, and wore a ring which was given him by the ftate. The *equites* compofed a large body of men, and conftituted the Roman cavalry; for there was always a fufficient number of them in the city, and nothing but a review was requifite to fit them for fervice.

The knights at laft grew too powerful, were a balance for the fenate and the people, neglected the exercifes of war, and betook themfelves to civil employments. The *equites* were liable to be punifhed by the cenfors, and to fuffer degradation. They were degraded by taking from them the horfe which was kept for each of them at the public charge; this was called *equum adimere*.

EQUITY, in a general fenfe, the virtue of treating all other men according to reafon and juftice, or as we would gladly be treated ourfevles when we underftand aright what is our due. See Justice.

Equity, in jurifprudence, is defined a correction or qualification of the law, generally made in that part wherein it faileth or is too fevere. It likewife fignifies the extenfion of the words of the law to cafes unexpreffed, yet having the fame reafon; fo that where one thing is enacted by ftatute, all other things are enacted that are of the like degree. For example, the ftatute of *Glouc.* gives action of wafte againft him that holds lands for life or years; and by the equity thereof, a man fhall have action of wafte againft a tenant that holds but one year, or one half-year, which is without the words of the act, but within the meaning of it; and the words that enact the one, by *equity* enact the other. So that equity is of two kinds. The one abridges and takes from the letter of the law: the other enlarges and adds to it; and ftatutes may be conftrued according to equity, efpecially where they give remedy for wrong, or are for expedition of juftice. Equity feems to be the interpofing *law of reafon*, exercifed by the lord chancellor in extraordinary matters to do equal juftice; and by fupplying the defects of the law, gives remedy in all cafes. See Chancery.

Equtiy, in mythology, fometimes confounded with *Juftice*, a goddefs among the Greeks and Romans, reprefented with a fword in one hand and a balance in the other.

EQUIVALENT, is underftood of fomething that is equal in value, force, or effect, to another.

Equivalence is of various kinds, in propofitions, in terms, and in things.

Equivalent Propofitions. See Equipollence.

Equivalent Terms are where feveral words that differ in found have yet one and the fame fignification; as *every body was there*, and *nobody was abfent*, *nihil non*, and *omne*.

Equivalent Things, are either *moral*, *phyfical*, or *ftatical*. *Moral*, as when we fay that the commanding or advifing a murder is a guilt equivalent to that of the murderer. *Phyfical*, as when a man who has the ftrength of of two men is said to be equivalent to two men. *Statical*, whereby a less weight becomes of equal force with a greater, by having its distance from the centre increased.

EQUIVOCAL TERMS or WORDS, among logicians, are those which have a doubtful or double meaning.

According to Mr Locke, the doubtfulness and uncertainty of words has its cause more in the ideas themselves than in any incapacity of the words to signify them; and might be avoided, would people always use the same term to denote the same idea or collection of ideas: but, adds he, it is hard to find a discourse on any subject where this is the case; a practice which can only be imputed to folly or great dishonesty; since a man, in making up his accounts, might with as much fairness use the numeral characters sometimes for one sometimes for another collection of units.

EQUIVOCAL Generation, the production of animals without the intercourse between the sexes, by the influence of the sun or stars, &c.

This kind of generation is now quite exploded by the learned.

EQUIVOCATION, the using a term or expression that has a double signification. Equivocation are expedients to save telling the truth, and yet without telling a falsity. The fathers are great patrons of equivocations and mental reservations, holding that the use of such shifts and ambiguities is in many cases allowable.

EQUULEUS, or ECCULAS, in antiquity, a kind of rack used for extorting a confession, at first chiefly practised on slaves, but afterwards made use of against the Christians.

The equuleus was made of wood, having holes at certain distances, with a screw, by which the criminal was stretched to the third, sometimes to the fourth, or fifth holes, his arms and legs being fastened on the equuleus with cords; and thus was hoisted aloft, and extended in such a manner, that all his bones were dislocated. In this state red-hot plates were applied to his body, and he was goaded in the sides with an instrument called *ungula*.

EQUULEUS, EQUICULUS, and *EQUUS Minor*, the horse's head in astronomy, a constellation of the northern hemisphere, whose stars in Ptolemy's catalogue are 4, in Tycho's 4, in Hevelius's 6, and in Mr Flamsteed's 80.

Plate CLXXXIII.

EQUUS, in zoology, a genus of quadrupeds belonging to the order of belluæ. This genus comprehends the horse, the mule, the ass, the zebra, and the quagga: they have six erect and parallel fore-teeth in the upper jaw, and six somewhat prominent ones in the under jaw; the dog-teeth are solitary, and at a considerable distance from the rest; and the feet consist of an undivided hoof.

Buffon Histoire Naturelle.

1. The *caballus*, or HORSE, has a long flowing mane, and the tail covered on all parts with long hairs.

The horse in a domestic state, is a bold and fiery animal; equally intrepid as his master, he faces danger and death with ardour and magnanimity. He delights in the noise and tumult of arms, and seems to feel the glory of victory: he exults in the chase; his eyes sparkle with emulation in the course. But though bold and intrepid, he is docile and tractable: he knows how to govern and check the natural vivacity and fire of his temper. He not only yields to the hand, but seems to consult the inclination of his rider. Constantly obedient to the impressions he receives, his motions are entirely regulated by the will of his master. He in some measure resigns his very existence to the pleasure of man. He delivers up his whole powers; he reserves nothing; he will rather die than disobey. Who could endure to see a character so noble abused! who could be guilty of such gross barbarity!

This character, though natural to the animal, is in some measure the effect of education. His education commences with the loss of liberty, and is finished by constraint. The slavery of the horse is so ancient and so universal, that he is but rarely seen in a natural state. Several ancient writers talk of wild horses, and even mention the places where they were to be found. Herodotus takes notice of white savage horses in Scythia; Aristotle says they were to be found in Syria; Pliny, in the northern regions; Strabo, in Spain and the Alps. Among the moderns, Carden says, that wild horses are to be found in the Highlands of Scotland and the Orkney isles; Olaus, in Muscovy; Dapper, in the island of Cyprus; Leo and Marmol, in Arabia and Africa, &c. But as Europe is almost equally inhabited, wild horses are not to be met with in any part of it: and those of America were originally transported from Europe by the Spaniards; for this species of animals did not exist in the new world. The Spaniards carried over a great number of horses, left them in different islands, &c. with a view to propagate that useful animal in their colonies. These have multiplied incredibly in the vast deserts of those thinly peopled countries, where they roam at large without any restraint. M. de Salle relates, that he saw, in the year 1685, horses feeding in the meadows of North America, near the bay of St Louis; which were so ferocious that nobody durst come near them. Oexmelin says, that he has seen large troops of them in St Domingo running in the valleys: that when any person approached, they all stopped; and one of them would advance till within a certain distance, then snort with his nose, take to his heels, and the whole troop after him. Every author who takes notice of these horses of America agree that they are smaller and less handsome than those of Europe. These relations sufficiently prove, that the horse, when at full liberty, though not a fierce or dangerous animal, has no inclination to associate with mankind; that all the softness and ductility of his temper proceeds entirely from the culture and polish he receives in his domestic education, which in some measures commences as soon as he is brought forth.

The motions of the horse are chiefly regulated by the bit and the spur; the bit informs him how to direct his course, and the spur quickens his pace. The mouth of the horse is endowed with an amazing sensibility: the slightest motion or pressure of the bit gives him warning, and instantly determines his course.

The horse has not only a grandeur in his general appearance, but there is the greatest symmetry and proportion in the different parts of his body. The regularity and proportion of the different parts of the head gives him an air of lightness which is well supported by the strength and beauty of his chest. He erects his head,

 head, as if willing to exalt himself above the condition of other quadrupeds: his eyes are open and lively; his ears are handsome, and of a proper height; his mane adorns his neck, and gives him the appearance of strength and boldness.

At the age of two years, or two years and a half, the horse is in a condition to propagate; and the mare, like most other females, is ready to receive him still sooner. But the foals produced by such early embraces are generally ill-made and weakly. The horse should never be admitted to the mare till he is four or four and a half: this is only meant with regard to draught-horses. Fine horses should not be admitted to the mare before they be six years old; and Spanish stallions not till seven. The mares are generally in season from the beginning of April to the end of June; but their chief ardour for the horse lasts but about 15 or 20 days, and this critical season should always be embraced. The stallion ought to be sound, well made, vigorous, and of a good breed. For fine saddle-horses, foreign stallions, as Arabians, Turks, Barbs, and Andalusians, are preferable to all others. Next to these, British stallions are the best; because they originally sprang from those abovementioned, and are very little degenerated. The stallions of Italy, and especially the Neapolitans are very good. The best stallions for draught or carriage horses, are those of Naples, Denmark, Holstein, and Freezeland. The stallions for saddle-horses should be from 14 to 15 hands high, and for draught horses at least 15 hands. Neither ought the colour of stallions to be overlooked; as a fine black, grey, bay, sorrel, &c. Besides these external qualities. a stallion ought to have courage, tractability, spirit, agility, a sensible mouth, sure limbs, &c. These precautions in the choice of a stallion are the more necessary, because he has been found by experience to communicate to his offspring almost all his good or bad qualities, whether natural or acquired.

The mare contributes less to the beauty of her offspring than the stallion; but she contributes perhaps more to their constitution and stature; for these reasons, it is necessary that the mares for breed be perfectly sound, and make good nurses. For elegant horses, the Spanish and Italian mares are best; but for draught-horses, those of Britain and Normandy are preferable. However, when the stallions are good, the mares of any country will produce fine horses, provided they be well made and of a good breed.

Mares go with young 11 months and some days. They bring forth standing; contrary to the course of most other quadrupeds, who lie during this operation. They continue to bring forth till the age of 16 or 18 years; and both horses and mares live between 25 and 30 years. Horses cast their hair once a-year, generally in the spring, but sometimes in the autumn. At this time they are weak, and require to be better fed and taken care of than at any other season.

In Persia, Arabia, and most eastern countries, they never geld their horses, as is done in Europe and China. This operation greatly diminishes their strength, courage and spirit; but it makes them good humoured, gentle, and tractable. With regard to the time of performing this operation, the practice of different countries is different: some geld their horses when a year old, and others at 18 months. But the best and most general practice is to delay the operation till they be two years old at least: because, when the gelding is delayed for two years or more, the animals retain more of the strength and other qualities which naturally belong to the male.

As the utility of horses surpasses that of all other domestic animals, it may be of use to subjoin some marks by which the age and other properties of horses may be distinguished.

In old horses, the eye-pits are generally deep; but this is only an equivocal mark being also found in young horses begot by old stallions. The most certain knowledge of the age is to be obtained from the teeth. Of these a horse has 40; 24 grinders or double-teeth, four tushes, and 12 fore-teeth: mares have no tushes, or at least very short ones. It is not from the grinders that we know the age; it is discovered first by the fore-teeth, and afterwards by the tushes. The 12 fore-teeth begin to shoot within 12 days after the colt is foaled. These first, or foal-teeth, are round, short, not very solid, and are cast at different times, to be replaced by others. At the age of two years and a half, the four middle fore-teeth are cast, two in the upper jaw, and two in the lower. In one year more, four others drop out, one on each side of the former, which are already replaced. When he is about four years and a half old, he sheds four others, and always next to those which have fallen out and been replaced. These four foal-teeth are replaced by four others, but are far from growing so fast as those which replaced the eight former, and are called the *corner teeth;* they replace the four last foal-teeth, and by these the age of the horse is discovered. They are easily known, being the third both above and below, counting from the middle of the jaw. They are hollow and have a black mark in their cavity. When the horse is four years and a half old, they are scarce visible above the gum, and the cavity is very sensible: at six and a half, they begin to fill; and the mark continually diminishes and contracts till seven or eight years, when the cavity is quite filled up, and the black spot effaced. After eight years, these teeth ceasing to afford any knowledge of the age, it is judged of by the tushes: which are four teeth adjoining to those last mentioned; and, like the grinders, are not preceded by any other teeth. The two in the lower jaw usually begin to shoot at three years and a half, and those of the upper jaw at four; continuing very sharp-pointed till six. At 10, the upper seem blunted, worn out, and long, the gum contracting itself as its years increase; the barer therefore they are, the older is the horse. From 10 to 13 or 14 years, little can be seen to indicate the age; but at that time some hairs of the eye-brows begin to turn grey. This mark, however, is equivocal, like that drawn from the depth of the eye-pits; horses from old stallions or mares, having grey hairs in the eye-brows when they are not above nine or ten years old. In some horses the teeth are of such a hardness as not to wear; and in such the black mark always subsists, being never effaced by time; but the age of these horses, which are called *beguts* by the French, is easily known; the hollow of the tooth being filled up, and at the same time the tushes very long. It has been farther observed, that this is more common in mares than in horses. The age of a horse may be also known, though less accurately,

 rately, by the bars in his mouth, which wear away as he advances in years.

When the horse is without blemish, the legs and thighs are clean, the knees straight, the skin and shank thin, and the back-sinew strong and well-braced. The sinews and the bones should be so distinct, as to make the legs appear thin and lathy, and not full round. The pastern joints should never be large and round; nor must there be any swelling near the coronet. The hock should be lean and dry, not puffed up with wind. With regard to the hoof, the coronet should be equally thick, and the horn shining and greyish. A white horn is a sign of a bad foot, for it will wear out in a short time; and likewise when the horn is thin, it is liable to be spoiled in shoeing, and by travelling hard on stony grounds. This is best known when the shoe is taken off; for then the verge all round the sole will appear thin, and the horse will wince at the least touch of the pincers.

A strong foot has the fibres of the hoof very distinct running in a direct line from the coronet to the toe, like the grain of wood. In this case, care must be taken to keep the foot moist and pliable. The greatest inconvenience attending a hard strong foot, is its being subject to rifts and fissures, which cleave the hoof quite through sometimes from the coronet down to the bottom.

A narrow heel is likewise a defect; and when it is not above two fingers in breadth, the foot is bad. A high heel causes a horse to trip and stumble often; and the low one, with long yielding pasterns; is very apt to be worn quite away on a journey. Too large a foot in proportion to the rest of the body, renders a horse weak and heavy.

The head of a horse should be small, and rather lean than fleshy. The ears should be small, erect, thin, sprightly and pointed. The forehead or brow, should be neither too broad nor too flat, and should have a star or snip thereon. The nose should rise a little, and the nostrils should be wide that he may breathe more freely. The muzzle should be small, and the mouth neither too deep nor too shallow. The jaws should be thin, and not approach too near together at the throat, nor too high upwards towards the onset, that the horse may have sufficient room to carry his head in an easy graceful posture. The eyes should be of a middle size, bright, lively, and full of fire. The tongue should be small, that it may not be too much pressed by the bit; and it is a good sign when his mouth is full of whith froth, for it shows that he will not soon be overheated.

The neck should be arched towards the middle, growing smaller by degrees from the breast and shoulders to the head. The hair of the main should be long, small, and fine; and if it be a little frizzled, so much the better. The shoulders should be pretty long; the withers thin, and enlarge gradually from thence downwards; but so as to render his breast neither too narrow nor too gross. A thick-shouldered horse soon tires, and trips and stumbles every minute; especially if he has a thick large neck at the same time. When the breast is so narrow that the fore-thighs almost touch, they are never good for much. A horse of a middle size should have the distance of five or six inches between his fore thighs, and there should be less distance between his feet than his thighs near the shoulders when he stands upright..

The body or carcase of a horse should be of a middling size in proportion to his bulk, and the back should sink a little below the withers, but the other parts should be straight, and no higher behind than before. He should also be home-ribbed; but the short ribs should not approach too near the haunches, and then he will have room to fetch his breath. When a horse's back is short in proportion to his bulk, and yet otherwise well limbed, he will hold out a journey, tho' he will travel slow. When he is tall, at the same time with very long legs, he is but of little value.

The wind should never be overlooked in the choice of a horse: and it may easily be known by his flanks, if he is broken-winded, when he stands quiet in the stable; because he always pinches them in with a very slow motion, and drops them suddenly. A thick-winded horse fetches in breath often, and sometimes rattles and wheezes. This may be always discovered when he is set to brisk exercises.

The temper of the horse should always be observed; a vicious horse generally lays his ears close to his pole, shows the whites of his eyes, and looks sullen and dogged. An angry horse may be known by his frowning look; and he generally seems to stand in a posture of defence: when he is very vicious, he pays no regard to the groom that feeds him: However, some horses that are ticklish will lay back their ears, and yet be of a good disposition. A fearful horse is apt to start, and never leaves it off till he is old and useless. A fretful horse is very unfit for a journey: and you may discover his temper as soon as he gets out of the stable. A dull, heavy, sluggish horse may be easily known, whatever tricks are used to rouse his spirits.

With regard to the colour of a horse, the bright bay, and indeed all kinds of bays in general, are accounted good colours. The chesnut horse is generally preferable to the sorrel, unless the former happens to be bald, or party-coloured, with white legs. Brown horses have generally black manes and tails, and their joints are of a rusty black. Those of this colour that are dappled, are much handsomer than the rest. Horses of a shining black, and well marked, without too much white, are in high esteem for their beauty. A star, or blaze, or white muzzle, or one or more feet tipped with white, are thought to be rather better than those that are quite black.

Of greys, the dappled are accounted best; though the silver grey make a more beautiful appearance, and often prove good. The iron grey with white manes and tails are thought not to be so hardy. Greys of every kind will turn white sooner or later; but the nutmeg grey, when the dappled parts incline to bay or chesnut, are said to be good hardy horses. Roan horses have a diversity of colours mixed together; but the white is more predominant than the rest. They are all generally hardy and fit for the road; and some are exceeding good. Those of a strawberry colour most resemble the sorrel, and they are often marked with white on the face and leg. When the bay is blended with it, he seems to be tinctured with claret; and some of these prove to be very good. Dun, fallow, and

Equus. cream-coloured horſes have a liſt down their backs; and their manes and tails are black. Dun horſes are ſeldom choſen by gentlemen, and yet they may be very uſeful to the country farmer. The ſallow and cream-coloured are more eſteemed, both for beauty and uſe. Thoſe horſes that are finely ſpotted with gay colours like leopards are a great rarity, and for that reaſon are only in the hands of great men.

There is ſome difference in horſes according to the different countries where they are bred. For inſtance, in France, thoſe of Bretagne are pretty ſtrong made, and have generally black hair, or brown bay; and they have good legs and feet, with a hardy mouth, and a head ſhort and fleſhy; but in general they are pretty clumſy. The horſes of Franche Compté are ſaid to have the legs of tigers; and the belly of a hind; but they are ſhort and thick, and of a middle ſize; being much more proper for drawing than riding. The horſes of Gaſcony are not unlike thoſe of Spain; but they are not ſo handſome nor ſo active, and therefore they are more proper to draw carriages. The Limoſin horſes are very vicious, and are good for little till they are ſix years old. Their colour is generally bay, or a bay brown. The horſes of Normandy are much like that of Bretagne; and thoſe of Poitou have good bodies, legs, feet, and eyes; but they are far from being handſome.

The horſes of Germany are much better and more handſome than thoſe of the Low Countries. They are of great uſe for carriages; but much more for the army, and for drawing the artillery. They have a great deal of hair, eſpecially about the legs. They are not large, but they are well ſet; and yet they have tender feet. The Hungarian horſes are excellent for the coach, as well as for riding: but they are large, though well proportioned; and they are of all colours, and in general very ſwift.

The Daniſh horſes are low, ſhort, and ſquare; but they have a fine head, and ſhort hair. The horſes of the Low Countries are very fit for the coach, and they are beſt known by the name of *Flanders-mares*. The Poliſh horſes are like the Daniſh; only they have not ſo fine a fore-head; their colour is generally a bright bay, and that of the outward peel of an onion; and they are fiery and vicious. The horſes of Switzerland are pretty much like thoſe of Germany; which is no wonder, ſince the Germans purchaſe a great number of them. The horſes of Piedmont are fiery, of a middle ſize, and of all ſorts of colours; their legs are good and handſome, their eyes fine, their ears ſmall, and their mouths good; but they do not carry their heads well.

The horſes of Naples and Italy are generally ill-made and lean; and yet they are good and uſeful, for they are light and proper for racing, though not for a long courſe; they never do well in a colder climate. The Spaniſh horſes are very well made and handſome, as well as very active and nimble; they have good eyes, handſome legs and heads, and are eaſily managed; they are alſo good for racing, if they are well kept: however, they are not ſo good in northern climates as in their own country. The Turkiſh horſes are of different ſhapes; but they are generally ſwift, tho' their mouths are bad. Moſt of them are white; tho' there are other colours; and they are large, hardy, ſtrong, and fit for the road. Equus.

The horſes of Barbary, commonly called *barbs*, have ſtrong hoofs, and are more proper for racing than any others whatever: ſome have ſaid they never grow old, becauſe they preſerve their vigour to the laſt. They are excellent ſtallions; and ſome of them are uſed as ſuch in Britain: however, the Arabian horſes are not quite ſo good as the Barbary, though ſome think they are both of the ſame kind; only thoſe that are uſed to the deſarts of Arabia are always in action. The horſes of the Gold Coaſt of Guinea are very few in number, and in other parts of that coaſt there are none at all; for many of the negroes, when they have been firſt brought over to the Weſt Indies have expreſſed great admiration at the ſight of a horſe, and even been afraid to come near one.

The horſes of the Cape of Good Hope were originally brought from Perſia; and they are generally ſmall, and of a cheſnut colour; for thoſe that are natives of that country are all wild, and could never yet be tamed. The horſes of China are good, and more particularly thoſe in the province of Yun Nan; for they are very vigorous, though a little low. The horſes of the Eluth Tartars are good and full of fire; and their ſize is much the ſame as the Poliſh horſes: they are afraid of nothing; not even of lions and tigers: but perhaps this may be owing to uſe. In the country of the Mogul they are very numerous, and of all colours: they are generally of the middle ſize, though there are ſome as large and as handſome as thoſe in Europe. The wild horſes of Tartary differ very little from the tame; but they are ſo ſwift, that they avoid the arrows of the moſt ſkilful hunters.

The breed of horſes in Great Britain is as mixed as that of its inhabitants: the frequent introduction of foreign horſes has given a variety that no ſingle country can boaſt of: moſt other countries produce only one kind; while theirs, by a judicious mixture of the ſeveral ſpecies, by the happy difference of ſoils, and by ſuperior ſkill in management, may triumph over the reſt of Europe, in having brought each quality of this noble animal to the higheſt perfection.

In the annals of Newmarket may be found inſtances of horſes that have literally outſtripped the wind, as the celebrated M. Condamine has lately ſhown in his remarks on thoſe of Great Britain. Childers is an amazing inſtance of rapidity; his ſpeed having been more than once exerted equal to 82½ feet in a ſecond, or near a mile in a minute.

The ſpecies uſed in hunting, is a happy combination of the former with others ſuperior in ſtrength, but inferior in point of ſpeed and lineage: an union of both is neceſſary; for the fatigues of the chaſe muſt be ſupported by the ſpirit of one, as well as by the vigour of the other.

No country can bring a parallel to the ſtrength and ſize of Britiſh horſes deſtined for the draught; or to the activity and ſtrength united of thoſe that form their cavalry. In London, there are inſtances of ſingle horſes that are able to draw on a plain, for a ſmall ſpace, the weight of the three tuns; but could with eaſe, and for a continuance, draw half that weight. The pack-horſes of Yorkſhire, employed in conveying the manufactures of of that country to the most remote parts of the kingdom, usually carry a burden of 420 pounds; and that indifferently over the highest hills of the north, as well as the most level roads. But the most remarkable proof of the strength of British horses, is to be drawn from that of their mill horses: some of these will carry at one load 13 measures, which at a moderate computation of 70 pounds each, will amount to 910; a weight superior to that which the lesser sort of camels will bear: this will appear less surprising, as these horses are by degrees accustomed to the weight; and the distance they travel no greater than to and from the adjacent hamlets.

The British cavalry, in the late campaigns (when they had opportunity), showed over those of the allies, as well as of the French, a great superiority both of strength and activity: the enemy was broken through by the impetuous charge of the squadrons; while the German horses, from their great weight and inactive make, were unable to second their efforts; though those troops were actuated by the noblest ardour.

The present cavalry of Britain only supports its ancient glory. It was eminent in the earliest times; the scythed chariots, and the activity and good discipline of their horses, even struck terror into Cæsar's legions: and the Britons, as soon as they became civilized enough to coin, took care to represent on their money the animal for which they were so celebrated. It is now impossible to trace out this species; for those which exist among the *indigenæ* of Great-Britain, such as the little horses of Wales and Cornwall, the hobbies of Ireland, and the shelties of Scotland, though admirably well adapted to the uses of those countries, could never have been equal to the work of war: but probably they had even then a larger and stronger breed in the more fertile and luxuriant parts of the island. Those employed for that purpose, or for the draught, are an offspring of the German or Flemish breed, meliorated by the soil and a judicious culture.

The English were ever attentive to an exact culture of these animals; and in very early times set a high value on their breed. The esteem that British horses were held in by foreigners so long ago as the reign of Athelstan, may be collected from a law of that monarch, prohibiting their exportation, except they were designed as presents. These must have been the native kind, or the prohibition would have been needless; for commerce was at that time too limited to receive improvement from any but the German kind, to which country their own breed could be of no value. But when the intercourse with the other parts of Europe was enlarged, they soon laid hold of the advantages this gave of improving the breed. Roger de Belesme, earl of Shrewsbury, is the first that is on record: he introduced the Spanish stallions into his estate in Pow-island, from which that part of Wales was for many ages celebrated for a swift and generous race of horses. Giraldus Cambrensis, who lived in the reign of Hen. II. takes notice of it; and Michael Drayton, cotemporary with Shakespear, sings their excellence in the sixth part of his Polyolbion. This kind was probably destined to mount the gallant nobility, or courteous knights for feats of chivalry, in the generous contests of the tilt-yard. From these sprung, to speak the language of the times, the flower of coursers, whose elegant form added charms to the rider, and whose activity and managed dexterity gained him the palm in that field of gallanary and romantic honour.

The increase of inhabitants, and the extent of the manufactures, together with the former neglect of internal navigation to convey those manufactures, multiplied the number of horses: an excess of wealth, before unknown in these islands, increased the luxury of carriages, and added to the necessity of an extraordinary culture of these animals: their high reputation abroad has also made them a branch of commerce, and proved another cause of their vast increase.

The all-wise Creator hath finely limited the several services of domestic animals towards the human race; and ordered that the parts of such, which in their lives have been the most useful, should after death contribute the least to our benefit. The chief use that the *exuviæ* of the horses can be applied to, is for collars, traces, and other parts of the harness; and thus, even after death, he preserves some analogy with his former employ. The hair of the mane is of use in making wigs; of the tail, in making the bottoms of chairs, floor-cloths, and chords: and to the angler in making lines.

TECHNICAL DESCRIPTION *of the Parts of a* HORSE. Plate CLXXXIX.

The Fore Part. 1. The forehead. 2. The temples. 3. Cavity above the eye. 4. The jaw. 5. The lips. 6. The nostrils. 7. The tip of the nose. 8. The chin. 9. The beard. 10. The neck. 11. The mane. 12. The fore-top. 13. The throat. 14. The withers. 15. The shoulders. 16. The chest. 17. The elbow. 18. The arm. 19. The plate vein. 20. The chesnut. 21. The knee. 22. The shank. 23. The main tendents. 24. The fetlock joint. 25. The fetlock. 26. The pastern. 27. The coronet. 28. The hoof. 29. The quarters. 30. The toe. 31. The heel.—*The Body.* 32. The reins. 33. The fillets. 34. The ribs. 35. The belly. 36. The flanks.—*The Hind Part.* 37. The rump. 38. The tail. 39. The buttocks. 40. The haunches. 41. The stifle. 42. The thighs. 43. The hock. 44. The kerb. 45. The point of the hock.

For the breeding, rearing, &c. of horses, see the articles, COLT, HORSE, and STALLION; for the method of training and managing them, see HORSEMANSHIP; and for their diseases and cure, see FARRIERY.

2. The *Asinus*, or *Ass*, has long slouching ears, short mane, tail covered with long hairs at the end. The body is usually of an ash colour, with a black bar cross the shoulders.

The *Koulan*, or ass in a wild state (the *onager* of the ancients), varies from the tame in several respects, and requires a more particular description. The forehead is very much arched: the ears are erect, even when the animal is out of order; sharp-pointed, and lined with whitish curling hairs; the irides are of a livid brown; the lips thick; and the end of the nose sloping steeply down to the upper lip: the nostrils are large and oval. It is much higher on its limbs than the tame ass, and its legs are much finer, but it again resembles it in the narrowness of its chest and body: it carries its head much higher; and its skull is of a surprising thinness. The mane is dusky, about three or four inches long, composed

Equus. ſed of ſoft woolly hair, and extends quite to the ſhoulders: the hairs at the end of the tail are coarſe, and about a ſpan long. The colour of the hair in general is a ſilvery white; the upper part of the face, the ſides of the neck and body, are of a flaxen colour; the hind part of the thighs are the ſame; the fore part divided from the flank by a white line, which extends round the rump to the tail: the belly and legs are alſo white: along the very top of the back, from the mane quite to the tail, runs a ſtripe of buſhy waved hairs of a coffee-colour, broadeſt above the hind part, growing narrower again towards the tail; another of the ſame colour croſſes it at the ſhoulders (of the males only), forming a mark, ſuch as diſtinguiſhes the tame aſſes: the dorſal band and the mane are bounded on each ſide by a beautiful line of white, well deſcribed by Oppian, who gives an admirable account of the whole. Its winter coat is very fine, ſoft, and ſilky, much undulated, and likeſt to the hair of the camel; greaſy to the touch: and the flaxen colour, during that ſeaſon, more exquiſitely bright. Its ſummer coat is very ſmooth, ſilky, and even, with exception of certain ſhaded rays that mark the ſides of the neck, pointing downwards.

Theſe animals inhabit the dry and mountainous parts of the deſerts of Great Tartary, but not higher than lat. 48. They are migratory, and arrive in vaſt troops to feed, during the ſummer, in the tracts eaſt and north of lake Aral. About autumn they collect in herds of hundreds, and even thouſands, and direct their courſe towards the north of India, to enjoy a warm retreat during winter. But Perſia is their moſt uſual place of retirement: where they are found in the mountains of Caſbin, ſome even at all times of the year. If we can depend on Barboga, they penetrate even into the ſouthern parts of India, to the mountains of Malabar and Golconda. According to Leo Africanus, wild aſſes of an aſh-colour are found in the deſerts of northern Africa. The Arabs take them in ſnares for the ſake of their fleſh. If freſh killed, it is hot and unſavory: if kept two days after it is boiled, it becomes excellent meat. Theſe people, the Tartars and Romans, agreed in their preference of this to any other food: the latter indeed choſe them young, at a period of life in which it was called *Laliſio*; (vide *Martial.* xiii. 27.) The epicures of Rome preferred thoſe of Africa to all others. The grown onagri were introduced among the ſpectacles of the theatre; and their combats were preferred even to thoſe of the elephants.

The manners of the wild aſs are very much the ſame with thoſe of the wild horſe and the dſhikketei. They aſſemble in troops under the conduct of a leader; and are very ſhy. They will, however, ſtop in the midſt of their courſe, and even ſuffer the approach of man at that inſtant, but will then dart away with the rapidity of an arrow diſmiſſed from the bow. This Herodotus ſpeaks to, in his account of thoſe of Meſopotamia; and Leo Africanus, in that of the African.

They are extremely wild. Holy writ is full of alluſions to their ſavage nature. "He ſcorneth the multitude of the city, neither regardeth he the crying of the driver," (Job xxxix. 7.). Yet they are not untameable. The Perſians catch and break them for the draught; they make pits, half-filled with plants to leſſen the fall, and take them alive. They break, and hold them in great eſteem, and ſell them at a high price. The famous breed of aſſes in the eaſt is produced from the koulan reclaimed from the ſavage ſtate; which highly improves the breed. The Romans reckoned the breed of aſſes produced from the onager and tame aſs to excel all others. The Tartars, who kill them only for the ſake of the fleſh and ſkins, lie in ambuſh and ſhoot them. They have been at all times celebrated for their amazing ſwiftneſs; for which reaſon the Hebreans called them *Pere* as they ſtyled them *Arod* from their braying. Their food is the ſalteſt plants of the deſerts, ſuch as the kalis, atriplex, chenopodium, &c.; and alſo the bitter milky tribe of herbs: they alſo prefer ſalt-water to freſh. This is exactly conformable to the hiſtory given of this animal in the book of Job; for the words "barren land", expreſſive of its dwelling, ought, according to the learned Bochart, to be rendered "ſalt places." The hunters lie in wait for them near the ponds of brackiſh water, to which they reſort to drink: but they are not of a thirſty nature, and ſeldom have recourſe to water. Theſe animals were anciently found in the Holy land, Syria, the land of Uz or Arabia Deſerta, Meſopotamia, Phrygia, and Lycaonia. But at preſent they are entirely confined to the countries above mentioned. Chagrin, a word derived from the Tartar ſoghré, is made of the ſkin of theſe animals, which grows about the rump, and alſo thoſe of horſes, which is equally good. There are great manufactures of it at Aſtracan and in all Perſia. It is a miſtake to ſuppoſe it to be naturally granulated, for its roughneſs is entirely the effect of art. The Perſians uſe the bile of the wild aſs as a remedy againſt the dimneſs of ſight: and the ſame people, and the Nogayan Tartars, have been known to endeavour the moſt infamous beſtialties with it, in order to free themſelves from the diſorders of the kidneys.

The tame or *domeſtic aſs*, is a humble, patient, and tranquil, animal. He ſubmits with firmneſs to ſtrokes and chaſtiſement; he is temperate both as to the quantity, and quality of his food; he contents himſelf with the rigid and diſagreeable herbage which the horſe and other animals leave to him and diſdain to eat: he is more delicate with regard to his drink, never uſing water unleſs it be perfectly pure. As his maſter does not take the trouble of combing him, he often rolls himſelf on the turf among thiſtles, ferns, &c. Without regarding what he is carrying, he lies down to roll as often as he can, ſeeming to reproach his maſter for neglect and want of attention. When very young, the aſs is a gay, ſprightly, nimble, and gentle animal. But he ſoon loſes theſe qualities, probably by the bad uſage he meets with, and becomes lazy, untractable, and ſtubborn. When under the influence of love, he becomes perfectly furious. The affection of the female for her young is ſtrong: Pliny aſſures us, that when an experiment was made to diſcover the ſtrength of maternal affection in a ſhe-aſs, ſhe run through the flames in order to come at her colt. Although the aſs be generally ill uſed, he diſcovers a great attachment to his maſter; he ſmells him at a diſtance, ſearches the places and roads he uſed to frequent, and eaſily diſtinguiſhes him from the reſt of mankind. The aſs has a very fine eye, an excellent ſcent, and a good ear. When overloaded, he hangs his head, and ſinks his ears:

ears: when too much teazed or tormented, he opens his mouth and retracts his lips in a disagreeable manner, which gives him an air of ridicule and derision. If you cover his eyes, he will not move another step; if you lay him on his side, and place his head so that one eye rests on the ground, and cover the other with a cloth, he will remain in this situation without making any attempt to get up. He walks, trots, and gallops in the same manner as the horse; but all his motions are slower. Whatever be the pace he is going at, if you push him, he instantly stops.

The cry of the horse is known by the name of *neighing;* that of the ass, by *braying,* which is a long, disagreeable noise, consisting of alternate discords from sharp to grave and from grave to sharp; he seldom cries but when pressed with hunger or love: the voice of the female is clearer and more piercing than that of the male.

The ass is less subject to vermin than other animals covered with hair; he is never troubled with lice, probably owing to the hardness and dryness of his skin; and it is probably for the same reason that he is less sensible to the whip and spur than the horse. The teeth of the ass fall out and grow at the same age and in the same manner as those of the horse; and he has nearly the same marks in his mouth.

Asses are capable of propagating when two years old. The females are in season during the months of May and June. The milk appears in the dugs ten months after impregnation; she brings forth in the twelfth month, and always one at a time. Seven days after the birth, the season of the female returns, and she is again in a condition to receive the male. The colt should be taken from her at the end of five or six months, that the growth and nourishment of the fetus may not be obstructed. The stallion or jack-ass should be the largest and strongest that can be found; he should be at least three years old, and never ought to exceed ten. The ass, like the horse, takes three or four years in growing, and lives till he be 25 or 30: he sleeps less than the horse, and never lies down to sleep but when excessively fatigued. He is more robust, and less subject to diseases, than the horse.

Travellers inform us that there are two sorts of asses in Persia; one of which is used for burdens, they being slow and heavy: the other is kept like horses for the saddle; for they have smooth hair, carry their head well, and are much quicker in their motion; but when they ride them, they sit nearer their buttocks than when on a horse: they are dressed like horses, and are taught to amble like them; but they generally cleave their nostrils to give them more room for breathing. Dr Russel likewise tells us they have two sorts in Syria; one of which is like ours: and the other very large, with remarkable long ears; but they are both put to the same use, which is, to carry burdens.

In America there were originally no asses at all, nor yet horses; but they were carried thither long ago, at first by the Spaniards, and afterwards by other nations, where they multiplied greatly; insomuch, that, in some places, there are whole droves of them that run wild, and are very hard to be caught. Asses in general carry the heaviest burdens in proportion to their bulk; and, as their keeping costs little or nothing, it is a great wonder that they are not put to more uses than they generally are among us. The flesh of the common ass is never eaten in these parts of the world; though some pretend their colts are tender, and not disagreeable.

3. The *Hemionus* of Pallas, or Wild Mule, is of the size and appearance of the common mule; with a large head, flat forehead growing narrow toward the nose, eyes of a middle size, the irides of an obscure ash-colour: 38 teeth in all, being two in number fewer than in a common horse: ears much longer than those of a horse, quite erect, lined with a thick whitish curling coat; neck slender, compressed; mane upright, short, soft, of a greyish colour; in place of the foretop, a short tuft of downy hair about an inch and three quarters long. The body is rather long, and the back very little elevated; the breast protuberant and sharp. The lims are long and elegant; the thighs thin, as in a mule's. Within the fore-legs there is an oval callus; in the hind legs none. The hoofs are oblong, smooth, and black; the tail is like that of a cow, slender, and for half of its length naked, the rest covered with long ash-coloured hairs. Its winter coat grey at the tips, of a brownish ash-colour beneath; about two inches long, in softness like the hair of a camel, and undulated on the back. Its summer coat is much shorter, of a most elegant smoothness, and in all parts marked most beautifully with small vortexes. The end of the nose is white; from thence to the foretop and inclining to tawny. The buttocks are white; as are the inside of the limbs and belly. From the mane a blackish testaceous line extends along the top of the back to the tail, broadest on the loins, and growing narrower towards the tail. The colour of the upper part of the body is a light yellowish grey, growing paler towards the sides. The length, from the tip of the nose to the base of the tail, is six feet seven inches; length of the trunk of the tail one foot four; of the hairs beyond the end, eight inches. The height of the animal is three feet nine. This species inhabits the deserts between the rivers Onon and Argun in the most southern part of Siberia, and extends over the vast plains and deserts of western Tartary, and the celebrated sandy desert of Gobi, which reaches even to India. In Siberia they are seen only in small numbers, as if detached from the numerous herds to the south of the Russian dominions. In Tartary they are particularly conversant about Taricnoor, a salt lake at times dried up. They shun wooded tracts and lofty snowy mountains. They live in separate herds, each consisting of a chief, a number of mares and colts, in all to the number of about 20; but seldom so many, for commonly each male has but five and sometimes fewer females. They copulate towards the middle or end of August: and bring for the most part but one at a time, which by the third year attains its full growth, form, and colour. The young males are then driven away from their paternal herds, and keep at a distance till they can find mates of their own age which have quitted their dames. These animals always carry their heads horizontally; but when they take to flight, hold them upright, and erect their tail. Their neighing is deeper and louder than that of a horse. They fight by biting and kicking, as usual with the horse: they are fierce and untameable; and even those which

have been taken young, are so intractable as not to be broken by any art which the wandering Tartars could use. Yet was it possible to bring them into fit places, and to provide all the conveniencies known in Europe, the task might be effected: but it is doubted whether the subdued animal would retain the swiftness it is so celebrated for in its state of nature. It exceeds that of the antelope; it is even proverbial; and the inhabitants of Thebet, from the fame of its rapid speed, mount on it Chammo their god of fire. The Mongalians despair of ever taking them by the chace; but lurk behind some tomb, or in some ditch, and shoot them when they come to drink or eat the salt of the desert. They are excessively fearful animals, and provident against danger. A male takes on him the care of the herd, and always is on the watch. If they see a hunter, who by creeping along the ground has got near them, the centinel takes a great circuit, and goes round and round him, as discovering somewhat to be apprehended. As soon as the animal is satisfied, it rejoins the herd, which sets off with great precipitation. Sometimes its curiosity costs it its life; for it approaches so near as to give the hunter an opportunity of shooting it. But it is observed, that in rainy or in stormy weather, these animals seem very dull, and less sensible of the approach of mankind. The Mongalians and Tungusi, according to Du Halden, kill them for the sake of the flesh, which they prefer to that of horses, and even to that of the wild boar, esteeming it equally nourishing and wholesome. The skin is also used for the making of boots. Their senses of hearing and smelling are most exquisite: so that they are approached with the utmost difficulty. The Mongalians call them *dshikketaei*, which signifies "the eared;" the Chinese, *yo to tse*, or "mule." In ancient times the species extended far to the south. It was the hemionos or half ass of Aristotle, found in his days in Syria, and which he celebrates for its amazing swiftness and its fecundity, a breeding mule being thought a prodigy; and Pliny, from the report of Theophrastus, speaks of this species being found in Cappadocia, but adds that they were a particular kind.

The domestic MULES of present times (*equus mulus* of Gesner and Linnæus) are the offspring of the horse and the ass, or ass and mare; are very hardy, and have more the form and disposition of the ass than the horse. The finest are bred in Spain; very large ones in Savoy.

4. The ZEBRA. This animal has the figure and gracefulness of the horse, joined to the swiftness of the stag. He is about seven feet long, from the point of the muzzle to the origin of the tail, and about four feet high. The colour of his skin is beautiful and uniform, consisting of alternate parallel rings of black and white, disposed in the most regular manner, as represented in the plate. He is generally less than the horse and larger than the ass. The zebra is found no where but in the eastern and southern provinces of Africa, from Ethiopia to the Cape of Good Hope, and from the Cape of Good Hope to Congo. The Dutch have been at great pains to tame and use them for domestic purposes, but with little success. He is hard-mouthed, and kicks when any person attempts to touch or come near him. He is restless and obstinate as a mule: but perhaps the wild horse is naturally as untractable as the zebra; for it is probable, if he were early accustomed to obedience and a domestic life, he would become as docile as the horse.

5. The quacha, or quagga, is striped like the former on the head and body, but with fewer lines. The flanks are spotted; the rump is plain; the ground colour of the head, neck, body, and rump, a bright bay; the belly, thighs, and legs are white, and free from all marks. This species, till of late, has been supposed to be the female of the zebra; but recent observations prove that the male and female zebra are marked alike. This differs likewise in being thicker and stronger made, and in being more tractable; for instance, one had been so far broken as to draw in a cart. The Hottentots also distinguish them from the former, by the names of *quagga* and *opeagha*.

ERA, in chronology. See ÆRA.

ERANARCHA, a public officer among the ancient Greeks, whose business was to preside over and direct the alms and provisions made for the poor. Cornelius Nepos, in his life of Epaminondas, describes his office thus: When any person was reduced to poverty, taken captive, or had a daughter to marry, which he could not effect for want of money, &c. the eranarcha called an assembly of friends and neighbours, and taxed each according to his means and estate, to contribute towards his relief.

ERANTHEMUM, in botany: A genus of the monogynia order, belonging to the diandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is quinquefid, with the tube filiform; the antheræ without the tube; the stigma simple.

ERASISTRATUS, a celebrated physician, grandson to the philosopher Aristotle. He discovered by the motion of the pulse the love which Antiochus had conceived for his mother-in-law Stratonice, and was rewarded with 100 talents for the cure by the father of Antiochus. He was a great enemy to bleeding and violent physic.

ERASMUS (Desiderius), born at Rotterdam in 1467. He lost his father and mother at 14 years of age; and was committed to the care of certain guardians, who would force him to be an ecclesiastic, which he refused for a long time. However, he was obliged to assume the religious habit among the canons regular in the monastery of Stein near Tergou; but afterwards obtained a dispensation from his vows. He was the most learned man of the age in which he lived; and contributed, by his example and his writings, to the restoration of learning in the several countries in which he occasionally resided, viz. Italy, Switzerland, Holland, France, and England: with the last he was most satisfied; and found the greatest encouragement from Henry VIII. Sir Thomas More, and all the learned Englishmen of those days. He published a great many books; and died at Basil in 1536. He was buried honourably, and his memory is still held in veneration. He had, however, many enemies; and as he did not embrace the reformation, and yet censured many things in popery, he hath been treated injuriously both by Catholics and Protestants. The works of Erasmus in 10 vols folio were published at Leyden in 1706, in a very handsome manner, under the care of of M. Le Clerc. Dr Jortin published his life in one vol. 4to, 1758.

ERASTIANS, a religious sect or faction which arose in England during the time of the civil wars in 1647, thus called from their leader Thomas Erastus, whose distinguishing doctrine it was, that the church had no right to discipline, that is, no regular power to excommunicate, exclude, censure, absolve, decree, or the like.

ERATO (from ερaω *I love*), in mythology, the name of one of the nine muses who presided over love-poetry. To this muse some have ascribed the invention of the lyre and lute; and she is represented with a garland of myrtles and roses, holding a lyre in one hand and a bow in the other, and at her side a Cupid with his torch. There is also a Nereid of the ame name.

ERATOSTHENES, a Cyrenæan philosopher, historian, and poet; called for his learning *Plato Minor*. He was keeper of the famous library at Alexandria; and was greatly in favour with Ptolemy Euergetes, by whose order he wrote a history of the Theban kings of Egypt, which succession was entirely omitted by Manetho. He thus fixed the Egyptian chronology, and his authority is by many preferred to that of Manetho. He wrote many other things, a catalogue of which is to be seen in Fabricius, Vossius, &c. but his only piece now remaining entire is a description and fabulous account of the stars. He starved himself in old age through grief for the dimness of his sight, about the 10th or 12th year of Ptolemy Epiphanes, 194 B. C.

ERATOSTRATUS, an Ephesian who burnt the famous temple of Diana the same night that Alexander the Great was born. This burning, as some writers have observed, was not prevented or seen by the goddess of the place who was then present at the labours of Olympia, and at the birth of the conqueror of Persia. Eratostratus did this villainy merely to eternize his name by so uncommon an action.

EREBUS Ερεβος, from ערב *night*), in mythology, a term denoting darkness. According to Hesiod, Erebus was the son of Chaos and the night, and the father of the day. This was also the name of part of the *inferi* among the ancients: they had a peculiar expiation for those who were detained in Erebus.

Erebus was properly the gloomy region, and distinguished both from Tartarus the place of torment, and Elysium the region of bliss: according to the account given of it by Virgil, it forms the third grand division of the invisible world beyond the Styx, and comprehends several particular districts, as the *limbus infantum*, or receptacle for infants; the *limbus* for those who have been put to death without cause; that for those who have destroyed themselves; the fields of mourning, full of dark groves and woods, inhabited by those who died for love; and beyond these, an open champaign country for departed warriors.

ERECTION, in a general sense, the art of raising or elevating any thing; as the erection of a perpendicular, &c. It is also used in a figurative sense: as the erection of a bishopric, marquisate, &c.

Erection is particularly used by medical writers for the state of the penis when swelled and distended by the action of the muscles called *erectores*. See Anatomy, p. 739.

There is also an erection of the clitoris which is performed by muscles for that purpose.

EREMIT. See Hermit.

ERETRIA (anc. geog.), a town of Eubœa, situated on the Euripus, in the south-west of the island. A very ancient city, and the largest of the island, after Chalcis. After being demolished by the Persians, it was restored on an adjoining spot, according to Strabo, who mentions a school of Eretrian philosophers there. The Abantes of Homer were of Eubœa.

ERFORT, a town of Germany, in the circle of Upper Saxony, the capital of Thuringia, and subject to the elector of Mentz. It is defended by good ramparts; and has a castle on an eminence which commands the town. Its inhabitants are almost all Lutherans, but its principal churches belong to the Catholics. There are several handsome structures, both public and private; but the houses in general are but indifferently built. E. Long. 11. 14. N. Lat. 50. 49.

ERGASTULUM, among the Romans, was a prison, work-house, or house of correction, where slaves by the private authority of their masters were confined and kept for their offences to hard labour. The Greeks had a place of confinement of this sort called Σωφρονιστηριον.

ERGOT, in farriery, is a stub, like a piece of soft horn, about the bigness of a chesnut placed behind and below the pastern-joint, and commonly hid under the tuft of the fetlock.

ERICA, heath, in botany: A genus of the monogynia order, belonging to the Octandria class of plants; and in the natural method ranking under the 18th order, *Bicornes*. The calyx is tetraphyllous; the corolla quadrifid; the filaments inserted into the receptacle; the antheræ bifid; the capsule quadrilocular. Of this there are four species, natives of Britain; which are so well known, that no description needs be given of them. In the Highlands of Scotland this plant is made subservient to a great variety of purposes. The poorer inhabitants make walls for their cottages with alternate layers of heath and a kind of mortar made of black earth and straw. The woody roots of the heath are placed in the centre; the tops externally and internally. They make their beds of it, by placing the roots downwards; and the tops only being uppermost, they are sufficiently soft to sleep upon. Cabbins are also thatched with it. In the island of Ilay, ale is frequently made by brewing one part of malt and two of the tops of young heath; sometimes adding hops. Boethius relates that this liquor was much used by the Picts. Woollen cloth boiled in alum water, and afterwards in a strong decoction of heath-tops, comes out of a fine orange colour. The stalks and tops will tan leather. Besoms and faggots to burn in ovens are also made of this plant. It is also used for filling up drains that are to be covered over. Sheep and goats will sometimes eat the tender shoots, but they are not fond of them. Cattle not accustomed to feed on heath, give bloody milk; but they are soon relieved by drinking plentifully of water. Horses will eat the tops. Bees extract a great deal of honey from the

the flowers; and, where heath abounds, the honey has a reddish cast. There are many exotic species with which greenhouse collections are enriched and adorned, as the triflora, tubiflora, australis, &c.

ERIDANUS (anc. geog.) a river of Attica, falling into the Ilissus.—Another Eridanus, the more ancient name of the Padus, an appellation ascribed by Pliny to the Greeks; followed in this by Virgil. It rises in Mount Vesulus, in the Alpes Cottiæ, and dividing the Cisalpine Gaul into the Cispadana and Transpadana, and swelled on each hand with no inconsiderable rivers from the other Alps and the Appenine, falls at seven mouths into the Adriatic. Famous in mythology, from the story of Phaeton; whose sisters, the Heliades, were here changed into poplars, according to Ovid.

Eridanus, in astronomy, a constellation of the southern hemisphere, in form of a river. The stars in the constellation Eridanus, in Ptolemy's catalogue, are 34; in Tycho's, 19; and in the British Catalogue, 84.

ERIE, a vast lake to the westward of Pennsylvania, in North America, situated between 80° and 87° W. Long. and between 41° and 42° N. Lat.

ERIGENA, or Scotus, (John), a famous scholastic divine, born about the beginning of the ninth century; but where, is a matter of dispute among authors. Bale and Pits say he was born at St David's in Wales; Dempster, Mackenzie, and Henry, that he was born at Ayr in Scotland; which they infer from his names *Erigina* and *Scotus*, by the latter of which he was generally distinguished by his cotemporary writers. But Du Pin and Sir James Ware assert that he was by birth an Irishman; Ireland being in those days called *Scotia*, and by the natives *Erin*. They agree, however, in relating that he travelled to Athens, where he acquired a competent knowledge of the Greek and other oriental languages; and that he afterwards resided many years in the court of Charles the Bald, king of France, who, on account of his singular abilities, treated him as his intimate friend and companion. He slept frequently in the royal apartment; and was constantly admitted to the king's table. "We may judge (says a modern historian) of the freedom which he used with Charles, by the following repartee. As the king and Scotus were sitting one day, at table, opposite to each other, after dinner, drinking a cheerful glass, the philosopher having said something that was not quite agreeable to the rules of French politeness, the king in a merry humour asked him, Pray what is between a *Scot* and a *sot?* To which he answered, "Nothing but the table." See *Henry's History of Great Britain*, vol. I. p. 344. who quotes this story from *Hovedeni Annal. ad an.* 86. Quer. What language were they talking when this *bon mot* was uttered?

During his residence with Charles, he wrote several books of scholastic divinity; which, though absurd enough, were at that time not sufficiently so to secure him from the imputation of heterodoxy; and on that account the pope commanded Charles the Bald to send him to Rome; but the king had too great a regard for his companion to trust him with his holiness. One of the chief controversies in which Scotus was engaged, and with which the pope was much offended, was concerning the real presence and blood of Christ in the wafer. His opinion of this weighty matter is expressed in these few words: "What we receive corporally is not the body of our Lord; but that which feeds the soul and is only perceived by faith." He was also engaged in two other controversies of equal importance, but of a somewhat less delicate nature. The first was, Whether any part of the eucharist be evacuated by stool? and the second, Whether Christ was born of the Virgin Mary *aperta vulva;* Paschalius was of opinion, that this could not be without some injury to her perpetual virginity; and therefore believed that Christ came into the world *per vulvam clausam*, as he came into the place where his disciples were assembled, through the door and not through the wall, without opening the door. Concerning the first of these delicate questions, Scotus with several others declared, that part of the eucharist was certainly evacuated by stool? for which they were honoured with the appellation of *Stercorists*. And as to the second question, he said, that the *vulva clausa* was a dangerous opinion: for it would thence follow, that he was not born, but issued; *non est nasci sed erumpi*. See Mackenzie, vol. I. p. 55.

Whether this John Scotus returned to England, or ended his days in France, is a matter of doubt. Some historians tell us, that he left France in the year 864; and that, after residing about three years in Oxford, he retired to the abbey of Malmsbury, where his scholars stabbed him with their penknives. There is no foundation for this story. Probably he died about the year 874; but whether in France or England, is uncertain, and of little importance. Some have related, that he was invited to England by king Alfred: but in this they confound him with John, abbot of Etheling, who was assassinated in 895; and to this mistake the various accounts concerning this author are to be attributed. Regardless of his history, he appears from his writings to have been a man of parts, and, in point of learning, superior to any of his cotemporaries. He wrote, 1. *De divisione naturæ*, lib. v. 2. *De prædestinatione Dei*. 3. *Excerpta de differentiis & societatibus Græci Latinique verbi*. 4. *De corpore et sanguine Domini*. 5. *Ambigua S. Maximi seu scholia ejus in difficiles locos S. Gegorii Nazianzeni, Latine versa*. 6. *Opera S. Dionysii quatuor in Latinam ling. conversa*. All published. 7. *De visione Die*, and several other works, in manuscript, preserved in different libraries.

ERIGERON, flea-bane, in botany: a genus of the polygamia superflua order, belonging to the syngenesia class of plants; and in the natural method raking under the 42th order *Compositæ*. The receptacle is naked; the pappus hairy; the florets of the radius are linear, and very narrow. There are five species; of which the most remarkable is the viscosum, or male flea-bane of Theophrastus, and greater flea-bane of Dioscorides. It is a native of the south of France and Italy; and hath a perennial root, from whence arise many upright stalks near three feet high. The leaves in warm weather sweat out a clammy juice; the flowers are produced single upon pretty long footstalks, are of a yellow colour, and have an agreeable odour. The plants are easily propagated by seeds; and thrive best in a dry soil and sunny exposure.

ERIGONE, in fabulous history, daughter to Icarius,

rius, died of grief for her father's death, was tranſlated into heaven, and made the ſign Virgo.

ERINACEUS, or HEDGEHOG, in zoology; a genus of quadrupeds belonging to the order of feræ, the characters of which are theſe: They have two fore-teeth in the upper jaw, at a conſiderable diſtance from one another, and two in the under jaw, leſs diſtant; and they have two recumbent dog-teeth, one on each ſide. The hedge-hog has a very uncommon method of defending himſelf from the attacks of other animals: being poſſeſſed of little ſtrength or agility, he does not attempt to fly from or aſſail his enemies; but erects his briſtles, and rolls himſelf up like a ball, expoſing no part of his body that is not furniſhed with ſharp weapons of defence; he will not unfold himſelf, unleſs thrown into water; the more he is frightened or haraſſed, the cloſer he ſhuts himſelf up; and frequently diſcharges his urine, which has a very fetid and lothſome ſmell. While in this ſtate, moſt dogs, inſtead of biting him, ſtand off and bark, not daring to ſeize him; or, if they attempt it once, their mouths are ſo prickled with his briſtles, that they cannot be prevailed upon to attempt it a ſecond time. Both the male and female are covered with briſtles from the head to the tail. Theſe briſtles are of great uſe in defending them from other animals; but muſt be very inconvenient when they incline to copulate. This operation they cannot perform in the manner of other quadrupeds; but do it face to face, either ſtanding on end, or the female lying on her back. The females come in ſeaſon in the ſpring, and bring forth their young in the beginning of ſummer. They commonly bring forth three or four, and ſometimes five at a time. The young ones are of a whitiſh colour, and only the points of the briſtles appear above the ſkin. It is impoſſible to tame them: the mother and her young have frequently been confined together, and furniſhed with plenty of proviſions; but, inſtead of nouriſhing them, ſhe uniformly devoured them one after another. Males and females have likewiſe been kept in one apartment, where they lived, but never copulated. Hedge-hogs feed upon fallen fruits, ſome roots, and inſects: they are very fond of fleſh-meat, whether raw or roaſted. They frequent woods, and live under the trunks of old trees, in the chinks of rocks, or under large ſtones. Naturaliſts allege, that they go into gardens, mount the trees, and come down with pears, apples, or plums, ſtuck upon their briſtles. But this is a miſtake: although kept in a garden, they never attempt to climb trees, or ſtick even fallen fruit upon their briſtles, but lay hold of their food with their mouth. They never come out of their holes in the day, but go about in queſt of food during the night. They eat but little, and can live very long without taking any nouriſhment. They do not lay up any ſtore of proviſions in harveſt; ſuch an inſtinct would be uſeleſs, as they ſleep all the winter. They lie under the undeſerved reproach of ſucking cattle and hurting their udders; but the ſmallneſs of their mouths renders that impoſſible. There are three ſpecies, viz.

Plate CLXXXV

1. The europæus, or common hedgehog, with round ears, and creſted noſtrils. It is about nine inches long; the upper part of the body is totally covered with ſharp prickles, and the under part is covered with hair. The hedgehog, even when ſtanding on his legs, has a very ugly aſpect. His body is an oblong maſs, convex above, terminated on the fore-part by a very ſharp muzzle, and mounted on four ſhort legs, of which nothing appears but the feet, and the tail is not diſcernible. His ears are broad, round, and ſhort; and his eyes are ſmall and protuberant. The length of his body, from the point of the muzzle to the anus is about nine inches.—2. The inauris, or white hedge-hog, has no external ears. It is a native of America. 3. The malaccenſis has hanging ears, and is a native of Aſia.

ERINGO, in botany. See ERYNGIUM.

ERINUS, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is pentaphyllous; the limb of the corolla quinquefid and equal; with its lobes emarginated, and the upper lip very ſhort and reflexed; the capſule bilocular. There are ſix ſpecies, none of them natives of Britain. They grow from two inches to four feet in height, and are adorned with flowers of a white or purple colour. They are propagated by ſeeds, but in this country generally require to be kept in a ſtove.

ERIOCAULON, in botany: a genus of the trigynia order, belonging to the triandria claſs of plants; and in the natural method ranking with the ſixth order, *Enſatæ*. The common calyx is an imbricated capitulum or knob; there are three equal petals; and the ſtamina are on the germen.

ERIOCEPHALUS, in botany: A genus of the polygamia neceſſaria order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is ſomewhat villous; there is no pappus; the calyx is decaphyllus and equal; the radius has five florets.

ERIOPHORUM, in botany: a genus of the monogynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the third order, *Calamariæ*. The glumes are paleaceous and imbricated all round; there is no corolla; and only one ſeed furniſhed with a very long down.

ERITHALIS, in botany: a genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The corolla is quinquepartite; the calyx urceolated or bladder-like, the berry decemlocular inferior.

ERIVAN, a city of Perſia, in Aſia, and capital of Perſian Armenia. It is a large, dirty, ill-looking place, in which are no handſome buildings, the houſes being very mean, and raiſed with earth or mud; but it is full of gardens or vineyards. It is ſituated in a plain which is ſurrounded on all ſides with mountains. Two rivers paſs near it, the Zengui to the north-weſt, and the Queur Bulac to the ſouthweſt. The fortreſs may paſs for a town of itſelf; it is of an oval form, and is four miles in circumference, containing about 800 houſes. It is inhabited by none but the native Perſians. The Armenians have ſhops in it, where they work and trade in the day-time, but at night return to their habitations in the city. The fortreſs is ſurrounded with three walls, made with bricks dried in the ſun, which have battlements, and are flanked with towers,

towers, and defended with ramparts. On the north-east there is a dreadful precipice, above 200 yards in depth, at the bottom of which the river runs. The garrison usually consisted of 2000 men; but how many there are since the revolution, is hard to say. The palace of the governor of the province is within the fortress. The city is about a cannon's shot distant from the fortress, and the space between is full of houses and markets. E. Long. 44. 50. N. Lat. 40. 20.

ERIPHYLE (fab. hist.), a sister of Adrastus king of Argos, who married Amphiaraus. She was daughter of Talaus and Lisimache. When her husband concealed himself that he might not accompany the Argives in their expedition against Thebes, where he knew he was to perish, Eriphyle suffered herself to be bribed by Polynices with a golden necklace which had been formerly given to Hermione by the goddess Venus, and she discovered where Amphiaraus was. This treachery of Eriphyle compelled him to go to the war; but before he departed, he charged his son Alcmæon to murder his mother as soon as he was informed of his death. Amphiaraus perished in the expedition; and his death was no sooner known than his last injunctions were obeyed, and Eriphyle was murdered by the hands of her son.

ERIS, the goddess of discord among the Greeks. She is the same as the *Discordia* of the Latins.

ERISICHTHON (fab. hist.), a Thessalian, son of Triops, who derided Ceres and cut down her groves. This impiety irritated the goddess, who afflicted him with continual hunger. He squandered all his possessions to gratify the cravings of his appetite, and at last he devoured his own limbs for want of food. Some say that his daughter had the power of transforming herself into whatever animal she pleased, and that she made use of that artifice to maintain her father, who sold her, after which she assumed another shape, and became again his property.

ERMIN, in zoology. See MUSTELA.

ERMIN, or *Ermine*, in heraldry, denotes a white field or fur, powdered or interspersed with black spots, called *powdering*. It is supposed to represent the skin of an animal of the same denomination (See MUSTELA). There is however no animal whose skin naturally corresponds to the herald's ermin.

The animal is milk white; and so far is it from having spots, that tradition reports, that it will rather die or be taken than sully its whiteness. Whence its symbolical use.

But white skins having for many ages been used for the linings of the robes of magistrates and great men; the furriers at length, to add to their beauty, used to sew bits of the black tails of those creatures upon the white skins, to render them the more conspicuous. Which alteration was introduced into armoury.

The sable spots in ermin are not of any determinate number, but they may be more or less at the pleasure of the painter or furrier.

ERMIN, an order of knights, instituted in 1450 by Francis I. duke of Bretagne, and formerly subsisting in France. The collar of this order was of gold, composed of ears of corn in saltier; at the end of which hung the ermin, with this inscription, *a ma vie*. But the order expired when the dukedom of Bretagne was annexed to the crown of France.

ERMINES, in heraldry, the reverse of ermine, i. e. white spots on a black field.

ERMINITES, in heraldry, should signify little ermines, but it is otherwise; for it signifies a white field powdered with black, only that every such spot hath a little red hair on each.—Erminites also signify a yellow field powdered with black, which the French express much better by *or, semee d'ermine de sable*.

ERMINOIS, in heraldry, signifies the field or, and the spots black.

EROORO, in ornithology. See ALCEDO, of which it is a species.

EROS (of ερως "love"), in mythology, one of two chiefs over all the other Cupids, being the cause of love. See ANTEROS.

EROTIA, a festival in honour of Eros the god of love. It was celebrated by the Thespians every fifth year with sports and games, when musicians and others contended. If any quarrels or seditions had arisen among the people, it was then usual to offer sacrifices and prayers to the god, that he would totally remove them.

EROTIC (derived from ερως "love;" whence ερωτικος), is applied to any thing which has a relation to the passion of love.

In medicine we find the phrase *delirium eroticum* used for a kind of melancholy contracted through excess of love.

EROSION, among physicians, denotes much the same with CORROSION, only in a stronger degree.

EROTESIS. See ORATORY, n° 94.

ERPENIUS (Thomas), in Dutch THOMAS of ERPEE; a celebrated professor of the Arabic language, was born at Gorcum in Holland, in 1584, and educated at Leyden. He applied himself to the oriental languages at the persuasion of Joseph Scaliger; and afterwards travelled into England, France, Italy, and Germany, and every where obtained the esteem of the learned. On his return to Holland, he was made professor of Arabic in the university of Leyden, and died there in 1624. He published a great many excellent works, which spread his reputation through the whole learned world. It is said, that the king of Morocco admired so greatly the letters Erpenius wrote to him in Arabic in the name of the United Provinces, that he could not cease reading them, and showing them to those who spoke that language naturally.

ERRATIC, in general, something that wanders, or is not regular: hence it is the planets are called *erratic stars*.

ERRHINES, in pharmacy, medicines which when snuffed up the nose promote a discharge of mucus from that part.

Among the milder kinds of the errhines we may reckon majorum, basilicon, thyme, hyssop, savory, marum syriacum, the tops of origanum, flowers of lilies of the valley, and gum benzoin, the resin of guaiacum, fine raspings of aloes wood, dry volatile salt of sal ammoniac perfumed with oil of majorum, as also white vitriol. On the contrary, violent errhines are, euphorbium, the powder of white hellebore, and, in a milder degree, several sorts of snuffs, precipitate mercury, and pepper.

Errhines are more friendly to the constitution and nerves

nerves than sternutatories, by their subtile, acrid, and volatile salt gently stimulating the pituitary membrane, and drawing the mucid humour from it. They are also much safer than sternutatories in their effects.

Errhines prepared of cephalic herbs are of singular service in oppressive pains of the head, a hermicrania, lethargic disorders, weaknesses of memory, stuffings of the head, and coryza, mucous defluxions of the eyes, drowsiness, vertigoes, and in cases where the malignant humours generated by the lues venerea are lodged in the membranes of the nostrils.

ERROR, in philosophy, a mistake of our judgment, giving assent to that which is not true.

Mr Locke reduces the causes of error to these four; first, want of proofs; secondly, want of ability to use them; thirdly, want of will to use them; and, fourthly, wrong measures of probability.

He observes upon the first of these causes of error, that the greatest part of mankind want conveniences and opportunities of making experiments and observations themselves, or of collecting the testimony of others, being prevented by the necessity of their condition. Upon the second of these causes, he observes, that there are many, who, from the state of their condition, might bestow time in collecting proofs, but yet are not able to carry a train of consequences in their heads, nor weigh exactly the preponderancy of contrary proofs and testimonies, merely from the difference in mens understandings, apprehensions, and reasonings. Thirdly, he remarks, that though some have opportunities and leisure enough, and want neither parts, learning, nor other helps, that they never come to the knowledge of several truths within their reach, either upon account of their attachment to pleasure or business; or otherwise because of their laziness or aversion to study. The fourth cause of error, *viz.* wrong measures of probability, he imputes, 1. To the practice of taking for principles propositions that are not in themselves certain and evident, but on the contrary, doubtful and false. 2. To received hypotheses. 3. To predominant passions or inclinations, And, 4. To authority, or giving up our assent to the common received opinions either of our friends or party, neighbours or country.

The causes of error in philosophy, or the reasons why all former philosophers have through so many ages erred, according to Lord Bacon, are these following, 1. Want of time suited to learning. 2. The little labour bestowed upon natural philosophy. 3. Few entirely addicted to natural philosophy. 4. The end of the sciences wrong fixed. 5. A wrong way chosen. 6. The neglect of experiments. 7. Regard to antiquity and authority. 8. Admiration of the works in use. 9. The artifice of teachers and writers in the sciences. 10. Ostentatious promises of the moderns. 11. Want of proposing worthy tasks. 12. Superstition and zeal being opposite to natural philosophy, as thinking philosophy dangerous, on account of the school-theology; from the opinion that deep natural inquiries should subvert religion. 13. Schools and academies proving unfavourable to philosophy. 14. Want of rewards. And, 15. Despair, and the supposition of impossibility.

Error Loci. Boerhaave is said to have introduced the term, from the opinions that the vessels were of different sizes for the circulation of blood, serum, and lymph; and that when the larger-sized globules were forced into the lesser vessels by an error of place, they were obstructed. But this opinion does not seem well grounded.

ERUCA, in general, denotes caterpillars of all kinds.

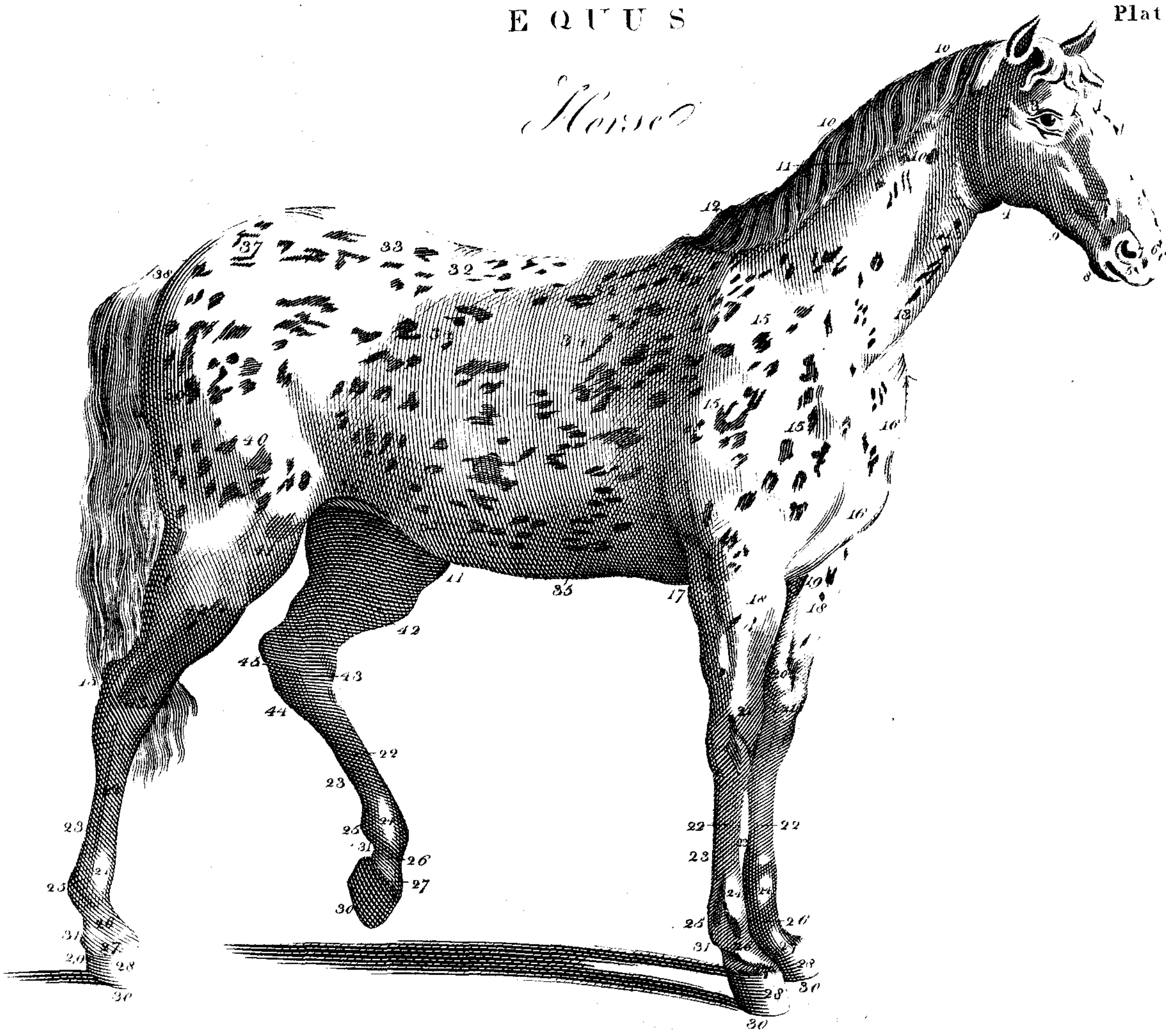
The caterpillar state is that through which every butterfly must pass before it arrives at its perfection and beauty: and, in the same manner, all the known winged animals, except only the puceron, pass through a reptile state; none of them, except this, being produced in their winged form. The change from caterpillar to butterfly was long esteemed a sort of metamorphosis; a real change of one animal into another: but this is by no means the case. The egg of a butterfly produces a butterfly, with all the lineaments of its parent; only these are not disclosed at first, but for the greater part of the animal's life they are covered with a sort of case or muscular coat, in which are legs for walking, which only suit in this state; but its mouth takes in nourishment, which is conveyed to the included animal; and after a proper time this covering is thrown off, and the butterfly, which all the while might be discovered in it by an accurate observer with the help of a microscope, appears in its proper form. Before it passes into this state, however, there requires a state of rest for the wings to harden, and the several other parts to acquire their proper firmness; this is transacted in a time of perfect rest, when the animal lies in what is called the *nymph* or *chrysalis* state, in appearance only a lump of inaminate matter. There is a settled and determined time for each of these changes, in every species; but, in the several different kinds the periods are very different.

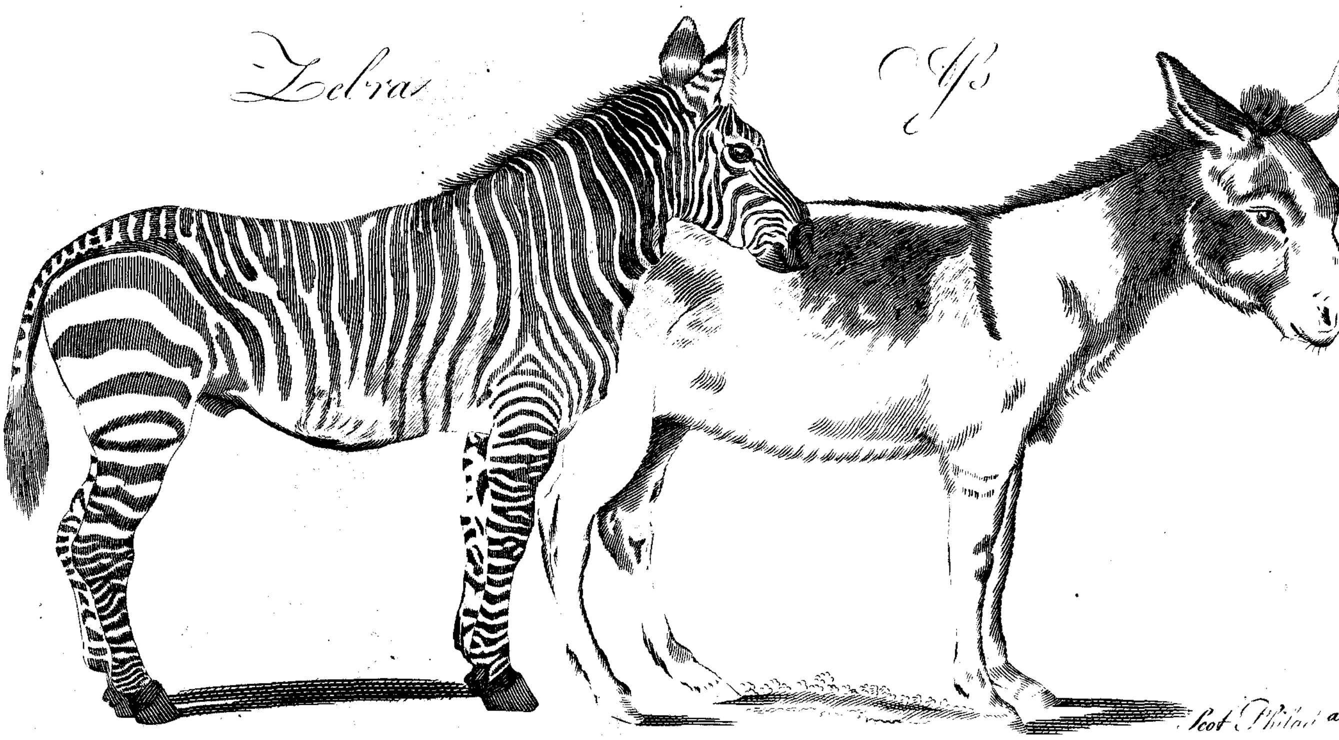
There is no sign of sex in the animal while in the caterpillar state: the propagation of the species is the business of the creature in its ultimate perfection; and till that, these parts are never excluded: one female butterfly, when she has been impregnated by the male, wil produce 300 or 400 eggs, or even more.

There is no way of knowing the sexes of these little creatures by viewing the parts; but the whole figure and manner of the animal makes the difference. The females are always larger than the males; they are also more slow in their motions; and some of them have no wings, or, at the most, only very small ones. The males, however, have a sort of beards more beautiful than the antennæ or horns of the females; the female is much stronger as well as bigger than the male; and not unfrequently, in case of danger or disturbance, she flies away with him in time of copulation.

On dissecting the female, her uterus affords an astonishing sight. The number of eggs in the tubes is amazing: but these have not all the same figure; and, in some species, as the silk-worm, &c. the eggs are of a beautiful blue; if any yellowish ones are seen among them, they are judged to be defective.

The care of all the butterfly tribe to lodge their eggs in safety is surprising. Those whose eggs are to be hatched in a few weeks, and who are to live in the caterpillar state during part of the remaining summer, always lay them on the leaves of such plants as will afford a proper nourishment; but, on the contrary, those whose eggs are to remain unhatched till the following spring, always lay them on the branches of trees


Horse


Zebra
Ass
Scot Philada

Eruca.

trees and shrubs, and usually are careful to select such places as are least exposed to the rigour of the ensuing season, and frequently cover them from it in an artful manner. Some make a general coat of a hairy matter over them, taking the hairs from their own bodies for that purpose, others hide themselves in hollow places in trees, and in other sheltered cells, and there live in a kind of torpid state during the whole winter, that they may deposit their eggs in the succeeding spring, at a time when there will be no severities of weather for them to combat. The day-butterflies only do this, and of these but a very few species; but the night ones, or phalenæ, all without exception, lay their eggs as soon as they have been in copulation with the male, and die immediately afterwards.

It is well known, that the common and natural food of these creatures is the leaves and verdure of vegetables; yet, as weak and harmless as they seem, they will many of them destroy their fellows whenever they get an opportunity. M. Reaumur gives us an instance of this in 20 caterpillars of the oak, which he kept in a box with a sufficient quantity of their natural food: yet their numbers daily decreased, till at last there remained only one. This is, however, only the case in some few species, the generality of these animals being very peaceable, many species living together in the same place without molesting one another. These species, however, though freed from such dangers, are exposed to others of a much more terrible kind; the worms or maggots of several sorts of flies are frequently found about them, some preying upon their outside, others lodged within them under the skin, but both kinds eating the poor defenceless creature up alive. Those which feed on the outsides are easily discovered, the others are more hid; and frequently the caterpillar, which seems very hearty and vigorous, and very fleshy, shall be found, upon opening, to be a mere skin, the internal parts being found to be all eaten away, and all the food that he swallows serving only to feed a vast number of worms, or maggots, which crawl about at liberty within him. These devouring worms are of many different species; some being of the gregarious, some of the solitary kinds, and some spinning webs of their own silk to transform themselves in; others undergoing that change without any such covering. The beautiful cabbage-caterpillar is one of those unhappy kinds which frequently are infested with the gregarious kinds, large numbers of which spin themselves webs one after another, and afterwards come out in the shape of the parent fly to whose eggs they owed their origin.

These intestine enemies are a sure prevention of the butterfly's appearing at its proper time; and as many of the former naturalists, who know what butterfly to expect from a peculiar species of caterpillar which they preserved, often saw a parcel of flies come out in the place of it, they having no idea that the fly had laid its eggs in the flesh of the poor creature, supposed that this was one of its natural transformations, and that certain species of caterpillars sometimes produced butterflies, sometimes small flies.

These, and many other destroyers, among which the birds are to be reckoned in the principal place, serve a noble purpose in preventing the too great number of these mischievous animals. Their usual habitation being the leaves and flowers of plants, they are, in their feeding, much exposed to all those destroyers: yet nature has taken care to preserve a great number, by making many of them so exactly of the colour of the leaves they feed on, that they are not easily distinguished from them; and by giving others a caution of keeping on the under part of the leaves; and being by that means out of sight. But some species are much less exposed, and of much more mischief to the plants they feed on, by devouring more essential parts of them. Of these some eat the roots and others the interior part of the trunk, destroying the vessels that imbibe, and those that distribute the juices. These are different from the common caterpillars; in that their skin is much less rough and hard; and these are secure from our observation, and in general from their great destroyers the birds. They are not, however, absolutely safe from the common dangers of the other species; for there is a kind of worms that find their food and habitation even in the bodies of these.

The root-caterpillars, and those which live within the branches of plants, are much more easily found out. The roots of scrophularia, and the stalks of lettuces, and some other plants, afford caterpillars which seem all of the same species. Those found in the lettuces are extremely plentiful some years, and destroy vast quantities of that plant. These usually have their first habitation in the stalk, near the root.

Nothing more surprises us, in regard to insects, than their industry; and in this the caterpillars yield to no kind, not to mention their silk, the spinning of which is one great proof of it. The sheaths and cases which some of these insects build for the passing their transformations under, are, by some, made of the silk, with their own hair, mixed with pieces of bark, leaves, and other parts of trees, with paper, and other materials; and the structure of these is well worthy our attention.

There are others whose workmanship, in this article, far exceeds these. There is one which builds in wood, and is able to give its case a hardness greater than that of the wood itself in its natural state. This is the strange horned caterpillar of the willow, which is one of those that eat their *exuviæ*. This creature has extremely sharp teeth, and with these it cuts the wood into a number of small fragments: these fragments it afterwards unites together into a case, of what shape it pleases, by means of a peculiar silk; which is no other than a tough and viscous juice, which hardens as it dries, and is a strong and firm cement. The solidity of the case being thus provided for, we are to consider, that the caterpillar inclosed in it is to become a butterfly; and the wonder is, in what manner a creature of this helpless kind, which has neither legs to dig nor teeth to gnaw with, is to make its way out of so firm and strong a lodgement as this is in which it is hatched. It has been supposed by some, that the butterfly, as soon as hatched, discharged a liquor which softened the viscous matter that holds the case together, and so its several fragments falling to pieces, the way out lies open. This is evidently the truth of the case; though those who supposed it, did it by mere conjecture: for, on a strict examination, this liquor is always to be found in the animal, and is of the most proper kind for such a service. Reaumur judged, from the effects, that this liquor

quor muſt be of a ſingular nature, and very different from the generality of animal fluids: and in diſſecting this creature in the caterpillar ſtate, there will always be found near the mouth, and under the œſophagus, a bladder of the bigneſs of a ſmall pea, full of a limpid liquor, of a very quick and penetrating ſmell, and which, upon divers trials, proves to be a very powerful acid; and among other properties, which it has in common with other acids, ſenſibly ſoftens the glue of the caſe, on a common application.

It is evident that this liquor, beſides its uſe to the caterpillar, remains with it in the chryſalis ſtate, and is the very thing that gives it a power of diſſolving the ſtructure of the caſe, and making its way through in a proper manner at the neceſſary time. Dr Boerhaave has adopted the opinion, that there are no true acids in animals, except in the ſtomach or inteſtines; but this familiar inſtance proves the error of that determination. Phil. Tranſ. abr. ix. p. 39, &c.

Another very curious and myſterious artifice, is that by which ſome ſpecies of caterpillars, when the time of their changing into the chryſalis ſtate is coming on, make themſelves lodgements in the leaves of the trees, by rolling them up in ſuch a manner as to make themſelves a ſort of hollow cylindric caſe, proportioned to the thickneſs of their body, well defended againſt the injuries of the air, and carefully ſecured for their ſtate of tranquillity.

Beſides theſe caterpillars, which in this manner roll up the leaves of plants, there are other ſpecies which only bend them once; and others which, by means of thin threads, connect many leaves together to make them a caſe. All this is a very ſurpriſing work, but all much inferior to this method of rolling.

The different ſpecies of caterpillars have different inclinations, not only in their ſpinning and their choice of food, but even in their manners and behaviour one to another. Some never part company from the time of their being hatched to their laſt change; but live and feed together, and undergo together their laſt change into the chryſalis ſtate. Others ſeparate one from another as ſoon as able to crawl about, and each hunts its fortune ſingle; and there are others which regularly live to a certain time of their lives in community, and then ſeparate each to ſhift for itſelf, and never to meet again in that ſtate. *Reaumur, Hiſt. Inſect.* vol. ii. *paſſim.*

Caterpillars are very deſtructive and pernicious in gardens, particularly thoſe of two ſpecies. The one of theſe is that which afterwards becomes the common white butterfly. This is of a yellowiſh colour, ſpotted with black; and infeſts the leaves of cabbages. cauliflowers, and the indian creſs, of which it eats off all the tender parts, leaving only the fibres entire; ſo that whole plantations are often ſeen deſtroyed by them in autumn, eſpecially ſuch as are near large buildings, or are crowded with trees. There is no remedy againſt this evil but the pulling the creatures off before they are ſpread from their neſts, and watching the butterflies, which are daily, in the hot weather, depoſiting their eggs on theſe plants. Theſe, however, feed principally on the outſide of the leaves of the plants, and are therefore the eaſier taken off; but the other kind lies near the centre, and therefore is with much more difficulty diſcovered. This is much larger; and the ſkin is very tough, and of a brown colour. It is called by the gardeners a *grub*, and is extremely pernicious. The eggs which produce it are uſually depoſited in the very heart or centre of the plant, particularly in cabbages; and the creature, when formed, and grown to ſome ſize, eats its way through all the blades, and leaves its dung in great quantity behind it, which ſpoils the cabbage. This inſect alſo burrows under the ſurface of the ground, and makes ſad havock among young plants, by eating off their tender ſhanks, and drawing them into its holes. This miſchief is chiefly done in the night; but wherever a plant is ſeen thus deſtroyed, if the earth be ſtirred with a finger an inch deep, the creature will be certainly found, and this is the only way of deſtroying them, *Miller*.

When theſe animals attack fruit-trees, the beſt method of driving them off is to boil together a quantity of rue, wormwood, and the common tobacco, of each equal parts, in common water; to make the liquor very ſtrong, and ſprinkle it on the leaves and young branches every night and morning, during the time when the fruit is ripening. See alſo the article CATERPILLAR.

In Dr Hawkeſworth's Account of the Voyages to the South Sea, vol. iii. p. 520. we have the following account of a kind of ſmall green caterpillar, which the voyagers found in great numbers on the true Weſt Indian mangroves. Their bodies were thick ſet with hairs, and they were ranging on the leaves ſide by ſide like files of ſoldiers, to the number of 20 or 30 together. When they touched them, they found that the hairs on their bodies had the quality of a nettle, and gave them a much more acute though leſs durable pain.

Erucæ Aquitacæ, Water Caterpillars. It may ſeem incredible, that there is any ſuch thing as a caterpillar whoſe habitation is under water; but experience and obſervation prove, that there are ſuch, and that they feed on the water plants as regularly as the common kinds do on thoſe at land. Theſe are not named at random like many of the aquatic animals of the larger kinds, as the ſea-wolf, the ſea-horſe, &c. which might as well be called any thing elſe as *wolves* and *horſes*; but they are properly what they are called, and do not reſpire in the manner of the fiſh-tribe, but by their ſtigmata as other caterpillars. M. Reaumur, in his obſervations, met with two ſpecies of theſe; the one upon the potamogiton or pond-weed, the other upon the lenticula or duck-meat. Theſe are both very induſtrious animals; but the firſt being much the largeſt, its operations are more eaſily diſtinguiſhed.

This, though truly an aquatic animal, ſwims but badly, and does not at all love to wet itſelf. The parent butterfly lays her egg on the leaf of a certain plant; and as ſoon as the young caterpillar is hatched, it gnaws out a piece of the leaf, of a roundiſh ſhape. This it carries to another part of the ſame leaf, and lays it in ſuch a manner, that there may be a hollow between, in which it may lodge. It then faſtens down this piece to the larger leaf with ſilk of its own ſpinning; only leaving certain holes at which it can put out its head, and get to gnaw any of the leaves that are near. It eaſily gets out, though the aperture be naturally

naturally ſmall, ſince a little force from its body bends up the upper leaf and down the lower, both being flexile; and when the creature is out, it has a ſort of down that defends it from being wetted, and the natural elaſticity of the leaves and of the ſilk joins the aperture up again, ſo that no water can get in. The leaves of this kind of plant are alſo naturally very ſlippery, and not eaſily wetted by water. It ſoon happens that this habitation becomes too ſmall for the animal, in which caſe it makes juſt ſuch another; and after that, at times, ſeveral others; each being only made fit for it at the ſize it is then of. The changes of this creature into the chryſalis and butterfly ſtates are in the common method. The butterfly gets out of a chryſalis which was placed on the ſurface of the water; the lightneſs of the animal eaſily ſuſtains it on the water till its wings are dried, and then it leaves that element, never to return to it again.

Erucæ *Sylveſtris*, *Wood-caterpillars*; the name of a ſort of caterpillars which do not live, after the manner of others, on leaves of trees or plants, or open to our obſervation; but under the bark, in the trunk and branches, and in the roots of trees, and ſometimes in the body of fruits.

Theſe are eaſily diſtinguiſhed from thoſe worms and maggots which are found in roots and fruits, and owe their origin to flies of another kind; but are liable to be confounded with a ſort of animals, called by M. Reaumur, *falſe* or *baſtard caterpillars*, which carry a great reſemblance in their figure to real caterpillars, but which have more legs than any of the true ones have, and are finally transformed into four-winged flies, which are not true butterflies.

The butterflies which are the parents of thoſe caterpillars that lie immured in trees or fruits, lay their eggs on the ſurface; and the young caterpillars, when hatched, eat their way in. What appears ſomething ſurpriſing, however, in this, is, that there uſually is only one caterpillar in a fruit which is large enough to afford food to a great number; and if there are ſometimes found two creatures within, one is uſually a caterpillar, the other a worm of ſome other kind. The whole occaſion of which is, that the operation of penetrating into the fruit is ſo difficult to the young animal, that it ſeldom ſucceeds in it; and tho' the butterfly depoſits many eggs on each fruit, and theſe all hatch, yet it is only here and there one on a fruit that can find the way into it.

Theſe creatures, when once lodged in their priſon, have nothing to do but to eat up the ſubſtances which incloſe them, leaving the outer hard ſhell unhurt, which ſtill ſerves as a caſe for them. This is a very frequent caſe in the grains of corn, where the farinaceous ſubſtance ſerves as aliment, and the hard outer ſkin becomes a firm hollow caſe afterwards for the animal. The farinaceous ſubſtance in this caſe uſually, proves enough for the animal in its caterpillar ſtate; but if it does not, the creature has recourſe to a very ſingular expedient: it eats again its own excrements; and finds its now ſtronger ſtomach able to ſeparate nouriſhment from that very matter which had before paſſed off from its weaker ſtomach undigeſted.

Of theſe ſpecies of caterpillars, ſome go out of their priſon in order to change into their chryſalis, and thence into their butterfly ſtate; but the greater number remain there, and paſs through all their changes within. Theſe caterpillars, like all the other kinds, have certain fleſh-eating worms, whoſe parents are of the fly-kind, for their terrible enemies and deſtroyers; and it is not unfrequent, on opening one of theſe ſpoiled fruits, inſtead of the expected caterpillar, to find a fly juſt ready to come out: this has been produced from the chryſalis of a worm, which had before found its way into the fruit, and eat up the caterpillar, which was the original poſſeſſor of the place.

ERUDITION, denotes learning or knowledge; and chiefly that of hiſtory and antiquity, of languages and of books, which is the reſult of hard ſtudy and extenſive reading. The Scaligers were men of deep erudition; the writings of M. Launoy, a prieſt of the Oratory, are full of erudition.

Mr Locke ſays, it is of more uſe to fill the head with reflections than with points of erudition. If the mind be not juſt and right, ignorance is better than erudition, which only produces confuſion and obſcurity. M. Blazac calls a heap of ill choſen erudition the luggage of antiquity.

ERUPTION, in medicine, a ſudden, and copious excretion of humours, as pus or blood ſignifies alſo the ſame with exanthema, any breaking out, as the puſtules of the plague, ſmall pox, meaſles, &c.

Eruption *of Volcanoes*. See Ætna, Etna, Vesuvius, Volcano, &c.

ERVUM, the lentil: A genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The calyx is quinquepartite, the length of the corolla. There are ſix ſpecies; of which the moſt remarkable is the lens, or common lentil. It is cultivated in many parts of England, either as fodder for cattle, or for the ſeeds which are frequently uſed in meagre ſoups. It is an annual plant, and riſes with weak ſtalks about 18 inches high, garniſhed with winged leaves compoſed of ſeveral pairs of narrow lobes, terminated by a claſper or tendril, which faſtens to any neighbouring plant, and is thereby ſupported: the flowers come out three or four together, upon ſhort footſtalks from the ſide of the branches. They are ſmall, of a pale purple colour, and are ſucceeded by ſhort flat pods, containing two or three ſeeds which are flat, round, and a little convex in the middle. The ſeeds of this plant are moſt commonly ſown in the month of March, where the land is dry; but in moiſt ground, the beſt time is in April. The uſual quantity of ſeed allowed for an acre of land is from one buſhel and a half to two buſhels. If theſe are ſown in drills in the ſame manner as peaſe, they will ſucceed better than when ſown in broadcaſt; the drills ſhould be a foot and a half aſunder, to allow room for the Dutch hoe to clean the ground between them; for if the weeds are permitted to grow among them, they will get above the lentils and ſtarve them.

There is another ſort of lentil alſo cultivated in this country under the name of *French lentil*. It is twice the ſize of the former, both in plant and ſeed; and is much better worth cultivation than the other. It ſhould be ſown in March, after a ſingle ploughing, in the ground that bore corn the year before. Manure is not abſolutely neceſſary, though it will undoubtedly increase the crop. Its grass is said to be very copious; it may be mowed many times in the year, and affords a healthy as well as an agreeable food to horses, cows, and sheep: the milk of cows fed with it is said to be very copious and good. Long and numerous pods ripen about the beginning of winter, which afford a new kind of legumen, to be eaten as common lentils when fresh, it makes admirable pease-soup; dry, it is greedily eaten by the poultery. The dried herb is also a good resource for cattle in winter. It grows on any kind of ground.

ERYMANTHUS, a mountain, river, and town of Arcadia, where Hercules killed a prodigious boar, which he carried on his shoulders to Eurystheus; who was so terrified at the sight, that he hid himself in a brazen vessel.

ERYNGIUM, SEA-HOLLY, or *Eryngo:* A genus of the digynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 45th order, *Umbellatæ.* The flowers are collected into a round head, and the receptacle is paleaceous. There are nine species; most of which are hardy herbaceous perennials, producing erect stalks from one to two or three feet high; with simple, entire, or divided prickly leaves; and the stalks terminated by roundish aggregate heads of equinquepetalous flowers, of white, blue, or purple colours. They all flower mostly in July, and the seeds ripen in September. They are propagated by seeds sown in a bed or border, either in spring or autumn. The plants are to be removed the autumn after they come up, into those places where they are designed to remain. The leaves of one of the species (viz. the maritimum, which grows naturally on the sea-coasts of England and Scotland) are sweetish, with a light aromatic warmth and pungency. The roots are accounted approdisiac, and are ordered to be kept candied in the shops. The young flowering shoots eaten like asparagas are very grateful and nourishing.

ERYSIMUM, HEDGE-MUSTARD: A genius of the siliquosa order, belonging to tetradynamia class of plants; and in the natural method ranking under the 39th order, *Siliquosæ.* The siliqua is long, linear, and exactly tetragonal; the calyx close. There are six species: of which the most remarkable is the officinale, hedge-mustard, or bank-cresses. It grows naturally in Britain under walls, by the sides of highways, and among rubbish. It is warm and acrid to the taste; and when cultivated, is used as a vernal pot-herb. Birds are fond of the seeds; sheep and goats eat the herb; cows, horses, and swine refuse it. The seeds are said to promote expectoration, excite urine and the other fluid secretions, and to attenuate and dissolve viscid juices, &c. This they are supposed to perform by an acrimonious stimulating quality; but the taste discovers in them only an herbaceous softness void of acrimony: the seeds indeed are considerably pungent, and the roots in some small degree.

ERYSIPELAS, in medicine, an eruption of a fiery or acrid humour, from which no part of the body is exempted, though it chiefly attacks the face. See MEDICINE-*Index.*

ERYTHEA, or ERYTHIA, an island adjoining, according to the ancients, either to or a part of Gades; no where now to be found by the description given of it by ancient authors. The poets feign this to be the habitation of the fabulous Geryon, disarmed by Hercules, who drove away his cattle.

ERYTHRÆ (anc. geog.), a port town of Ætolia, on the Corinthian bay. Another Erythræ of Bœotia, near Platæa and mount Cithæron. A third Erythræ, a town of Ionia in the Hither Asia, situated in the peninsula, at its extremity, with a cognominal port. The Erythræans laid claim to the Sibyl Herophile, as their country-woman, surnamed thence *Erythræa.* Erythræ was famous for an ancient temple of Hercules.

ERYTHRÆA, a town of Crete, situated in the south-east of the island, at the promontory Erythræum.

ERYTHRÆUM MARE, erroneously called *Rubrum* by the Romans. Thus the ocean that washes Arabia, and Persia and extends a great way farther, is denominated. Hence it is, Herodotus says, that the Euphrates and Tigris fall into the Mare Erythræum. He also calls it the *South Sea,* on which the Persians dwell. It takes its name, not from its colour, the error of the Romans who translated *Erythræum,* "Rubrum;" but from *Erythras,* son of Perseus and Andromeda, whose kingdom lay on the confines of that sea; whence its name *Erythræum.*

ERYTHRINA, CORAL-TREE: A genus of the decandria order, belonging to the diadelphia class of plants; and in the natural method ranking under the 32d order, *Papilionaceæ.* The calyx is bilabiate, the one lip above, the other below; the vexillum of the corolla is very long and lanceolated. There are four species, all of them shrubby flowering exotics for the stove, adorned chiefly with trifoliate or three-lobed leaves, and scarlet spikes of papilionaceous flowers. They are all natives of the warm parts of Africa and America; and must always be kept in pots, which are to remain constantly in stoves in Britain. They are propagated by seeds, which are annually exported thither from Africa and America. They are to be sown half an inch deep in pots of light rich earth, which are then to be plunged in the bark-bed of the stove; and when the plants are two inches high, they are to be separated into small pots, plunging them also in the bark-bed, giving them frequent waterings, and as they increase in growth shifting them into larger pots. The inhabitants of Malabar make sheath of the wood, for swords and knives. They use the same, together with the bark, in washing a sort of garments which they call sarasses; and make of the flowers the confection caryl. The leaves pulverized and boiled with the mature cocoa-nut, consume venereal buboes, and ease pains in the bones; bruised and applied to the temples, they cure the cephalea and ulcers: mixed with the sugar called *jagra,* they mitigate pains in the belly, especially in women; and the same effect follows from the use of the bark levigated with vinegar, or swallowing the kernel stripped of its red pellicle. The juice of the leaves taken with oil mitigates venereal pains; drank with an infusion of rice, it stops fluxes: made into a cataplasm with the leaves of betal it destroys worms in old ulcers; and worked with oil, it cures the psora and itch.

ERYTHRINUS, in ichthyology, a species of SPARUS.

ERYTHROIDES, in anatomy, the first of the proper tunics or coats which cover the testicles.

ERYTHRONIUM, DOG'S-TOOTH VIOLET: A genus

nus of the monogynia order, belonging to the hexandria clafs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. The corolla is hexapetalous and campanulated; with a nectarium of two tubercles adhering to the inner bafe of every other petal. There is only one fpecies, which however, admits of feveral varieties in its flowers, as white, purple, pale red, dark red, crimfon, and yellow. The plants are low and herbaceous, with a purple ftalk and hexapetalous flowers. All the varieties are hardy and durable; and may be planted in fmall patches in borders, where they will make a good appearance. They rarely perfect their feeds in this country, but may be propagated by offsets. In Siberia, according to Gmelin, they dry and mix the root of this plant with their foups. It grows there in great abundance: and is called by the people of the country *befs*.

ERYTHROXYLON, in botany: A genus of the trigynia order, belonging to the decandria clafs of plants; and in the natural method ranking with thofe the order of which is doubtful. The calyx is turbinated; the petals of the corolla have each a nectariferous emarginated fcale at the bafe; the ftamina are connected at the bafe; the fruit a bilocular plum.

ERYX, a fon of Butes and Venus, who relying upon his ftrength, challenged all ftrangers to fight with him in the combat of the ceftus. Hercules accepted his challenge after many had yielded to his fuperior dexterity; and Eryx was killed in the combat, and buried on the mountain, where he had built a temple to Venus. Virg. Æn. 5. v. 402. A mountain of Sicily near Drepanum, which received its name from Eryx, who was buried there. This mountain was fo fteep, that the houfes which were built upon it feemed every moment ready to fall. Dædalus had enlarged the top, and inclofed it with a ftrong wall. He alfo confecrated there to Venus Erycina a golden heifer, which refembled life fo much, that it feemed to exceed the power of art.

ERZERUM, or ERZERON, a city of Turkey in Afia, and capital of Armenia, or Turkomania. It is a pretty large town, five days journey from the Black Sea, and ten from the frontiers of Perfia. It ftands in a delightful plain, at the foot of a chain of mountains, which hinder the Frat, or Euphrates, from falling into the Black Sea. A neighbouring hill fupplies very fine fprings, which not only water the fields, but the ftreets of the town. Erzerum is furrounded with double walls, defended by pentagonal towers; but the ditches are neither deep nor well kept up. The beglerbeg, or bafhaw of the province, lives in the feraglio, which is very ill built. They reckon that there are 18000 Turks at Erzerum, 6000 Armenians, and 10,000 Greeks. The Armenians have a bifhop and two churches; and the Greeks have alfo a bifhop, but the church is a miferable place. The laft are moftly braziers, inhabiting the fuburbs, who work the copper brought from the neighbouring mountains. They drive a great trade in copper utenfils and furs, particularly martin's fkins. Five or fix days journey from the town there are oaks that produce plenty of gall-nuts, which are brought hither. This place is a thoroughfare and refting place of all the merchants trading to the Indies, efpecially when the Arabs are watching for their prey round Aleppo and Bagdad. E. Long. 40. 50. N. Lat. 29. 46.

ESARHADDON, the fon of Sennacherib, and his fucceffor in the kingdom of Affyria. He is faid to have reigned 29 years at Nineveh, from the year 3294 to 3322; befides which he reigned 13 years at Babylon, in all 42 years. He died in the year of the world 3336, and was fucceeded by Saofduchinus. Efarhaddon, in the opinion of Sir Ifaac Newton, feems to be the Sardanapalus who died, as Clectarchus fays, of old age, after the revolt of Syria; the name *Sardanapalus* being derived from *Afferhadon Pul*.

ESCALADE, or SCALADE, a furious attack of a wall or a rampart; carried on with ladders, to pafs the ditch or mount the rampart; without proceeding in form, breaking ground, or carrying on regular works to fecure the men.

When the troops are prepared to pafs the ditch, either with the affiftance of boards, hurdles, and fafcines, when it is muddy, or with fmall boats of tin, or, bafkets covered with fkins or oil-cloth, when it is deep and filled with water, a party muft be placed on the counterfcarp, oppofite to the landing-place, ready to fire at the garrifon if they are alarmed, and oppofe the mounting on the rampart. If the ditch is dry, the ladders are fixed in fome place fartheft diftant from the centry; and as foon as they get upon the rampart, they put themfelves in order to receive the enemy; if the centry fhould be furprifed and filently overcome, the detachment haftens to break open the gate, and to let in the reft of the party. If the ditch is wet, the rampart high, and provided with a revetement, it will be difficult to furprife the town in this way; but if there is no revetement, the troops may hide themfelves along the outfide of the rampart till all are over. Since the invention and ufe of gunpowder, and the walls of cities have been flanked, they are feldom taken by efcalade.

ESCALLONIA, in botany: a genus of the monogynia order, belonging to the pentandria clafs of plants. The fruit is bilocular and polyfpermous; the petals diftant and tongue-fhaped; the ftigma headed.

ESCAPE, in law, a violent or privy evafion out of fome lawful reftraint, without being delivered by due courfe of law. There are two forts of efcapes, voluntary and negligent. Voluntary, when a man arrefts another for felony, or other crime, and afterwards lets him go freely by confent; in which cafe, the party that permits fuch efcape is held guilty, committed, and muft anfwer for it. Negligent efcape, on the contrary, is where one is arrefted, and afterwards efcapes againft the will of the perfon that arrefted him, and is not purfued with frefh fuit, and retaken before the perfon purfuing hath loft fight of him. By ftat. 8 and 9 Will. III. c. 26. the keepers of prifons conniving at efcapes fhall forfeit 500 l. and in civil cafes the fheriff is anfwerable for the debt.

ESCHALOT, or SHALLOT. See ALLIUM.

ESCHAR, in furgery, the cruft or fcab occafioned by burns or cauftic medicines.

ESHARA, in natural hiftory, the name of a fpecies of coralline, &c. the characters of which are thefe: they are of a ftony or coral-like hardnefs, and refemble a woven cloth in their texture; and the microfcope informs us, that they confift of arrangements of very fmall cells, whofe furfaces appear much in that form.

Linnæus

Linnæus makes it a ſpecies of millepora, in the claſs of lithophytes See Plate CXLVIII. fig. 9. 10.

The narrow-leaved hornwrack, fig. 9 divides as it riſes, into narrow leaves made up of regular rows of oblong ſquare ſhaped cells placed alternately by each other, and oppoſite to an equal number on the other ſide of the leaf, like an honeycomb: from theſe leaves proceed other ſtill ſmaller foliaceous ramifications, many of which ſeem to be connected at the lower part by tubuli, as in the corallines; by which means they can ply to and fro more freely in the water.—*e*, Gives the natural appearance of this coralline. E repreſents two leaves with their tubuli and cells magnified. E 1 is a croſs ſection of one of the leaves at E, ſhowing the partition and inner form of their cells.

The broad-leaved hornwrack, fig. 10. when freſh taken out of the ſea, is of a ſpongy ſoft texture, and ſmells very fiſhy; but when it has lain for ſome time on the ſhore, it becomes ſtiff and horny, like ſome ſort of withered leaves. Both ſurfaces, when examined by glaſſes, appear to be covered with cells; and, when a piece of it is cut acroſs, one may diſcover the thin membrane that ſerves as a baſe to the cells of each ſurface. The form of the cells is very remarkable, each one being arched at the top, and contracted a little at the lower part of the ſides to make way for the arches of the two next adjoining cells; ſo that by this particular conſtruction no room is loſt. The entrance of the cells is immediately under the arch of each cell, and the walls of the cells ſeem to be fortified with ſpines. Juſſieu diſcovered ſmall polypes extending themſelves out of theſe cells, which he has deſcribed in the memoirs of the Academy of Sciences 1742.—*f*, Gives the matural appearance of a leafy branch of this coralline. F is a part of a leaf magnified to ſhow the ſuperficial figure of the cells, and the manner in which they are diſpoſed. F 1 ſhows a croſs ſection of a leaf, and diſcovers the ſeveral partitions of the cells.

At the entrance of many of the cells a ſmall teſtaceous body like a bivalve ſhell is diſcovered: F 2, the figure of the cell, with the ſhell in it; it is of a tranſparent amber colour, ſo clear that one may ſee the dead animal through it, repreſented by the black ſpot.

ESCHEAT, in law, ſignifies any lands or tenements that caſually fall to a lord within his manor. It is one of the conſequences of tenure in chivalry: (See *Feodal Syſtem*, *Knight-Service*, and Tenure). It is the determination of the tenure or diſſolution of the mutual bond between the lord and tenant, from the extinction of the blood of the latter by either natural or civil means: if he died without heirs of his blood, or if his blood was corrupted and ſtained by commiſſion of treaſon or felony; whereby every inheritable quality was entirely blotted out and aboliſhed. In ſuch caſes the land eſcheated or fell back to the lord of the fee; that is, the tenure was determined by breach of the original condition, expreſſed or implied in the feodal donation. In the one caſe, there were no heirs ſubſiſting of the blood of the firſt feudatory or purchaſer, to which heirs, alone the grant of the feud extended: in the other, the tenant, by perpetrating an atrocious crime, ſhowed that he was no longer to be truſted as a vaſſal, having forgotten his duty as a ſubject; and therefore forfeited his feud, which he held under the implied condition that he ſhould not be a traitor or a felon. The conſequence of which in both caſes was, that the gift being determined, reſulted back to the lord who gave it.

The word *eſcheat* is ſometimes uſed for the place or circuit within which the king or other lord is entitled to eſcheats; alſo for a writ to recover the ſame from the perſon in poſſeſſion after the tenant's death.

Escheat, in Scots law, is that forfeiture which is incurred upon a perſon's being denounced a rebel. See Law, Part III. N° clxvi .12.

ESCHEVIN, or Echevin *(Scabinus)*, in the French and Dutch policy, a magiſtrate elected by the inhabitants of a city, to take care of their common concerns, the good order, conveniency, and decoration of the city, &c.

At Paris there is a prevot and four *eſchevins*; in moſt other cities a mayor and *eſchevins*. In Languedoc, Province, and Dauphiné, they are called *conſuls*; at Toulouſe, *capitouls*; and *jurats* at Bourdeaux.

Anciently the *eſchevins* were the aſſeſſors and counſellors of the comites or judges of cities; on which account they were called in ſome places *pairs, pares*; they even took cognizance of petty cauſes themſelves.

Du-Cange obſerves, that the judges and their aſſeſſors, who were choſen by the inhabitants, were called *ſcabini* "eſchevins," and their college *ſcabinagium* or "eſchevinage."

In Holland, the *ſcabins* or *eſchevins* judge of all civil affairs at firſt hand. They alſo take cognizance of criminal matters; and if the criminal confeſs himſelf guilty, they can ſee their ſentence executed without appeal. They can even give torture. The number is not the ſame in all cities; at Amſterdam there are nine, at Rotterdam ſeven, &c.

ESCHRAKITES, or Esrakites, a ſect of philoſophers, among the Mahometans, who adhere to the doctrines and opinions of Plato. The word is derived from the Arabic שרק *ſchraca*, which in the fourth conjugation אשרק *aſchraca*, ſignifies "to ſhine, glitter like the ſun;" ſo that *Eſchrakite* ſeems to import "illumined."

The *Eſchrakites*, or Mahometan Platoniſts, place their higheſt good and happineſs in the contemplation of the Divine Majeſty; deſpiſing the groſs imaginations of the Alcoran touching paradiſe. They are very careful in avoiding all vice; they preſerve an equal an eaſy temper, love muſic, and divert themſelves with compoſing little poems or ſpiritual ſongs. The ſhaeicks or prieſts, and the chief among the preachers of the imperial moſques, are Eſchrakites.

ESCLAIRCISSEMENT, a French term, adopted in our language, ſignifying the explaining or clearing up of ſome difficulty or obſcurity.

ESCORT, a French term, ſometimes uſed in Engliſh authors, to denote a convoy or company of armed men attending ſome perſon or thing, in a journey or voyage, to defend or ſecure it from inſults. Some derive the word from the Latin *cohors*.

ESCOUADE, or Squad, is uſually the third or fourth part of a company of foot; ſo divided for mounting guards, and for the more convenient relieving

lieving of one another. It is equivalent to a brigade of a troop of horse. See BRIGADE.

ESCUAGE, in ancient customs, a kind of knight-service, called *service of the shield*, by which the tenant was bound to follow his lord to the wars at his own charge. See the articles CHIVALRY, *FEODAL System*, and *KNIGHT-Service*.

ESCULAPIUS. See ÆSCULAPIUS.

ESCULENT, an appellation given to such plants or the roots of them as may be eaten: such are beets, carrots, artichokes, leeks, onions, parsnips, potatoes, radishes, scorzonera, &c.

ESCURIAL, a royal residence of Spain, situated about 15 miles north-west of Madrid. It is the largest and most superb structure in the whole kingdom, and perhaps one of the finest in Europe. The word is Arabic, meaning "a place full of rocks." It is built in a dry barren spot, surrounded with rugged mountains, insomuch that every thing which grows there is owing to art. This place was chosen, it is said, for the sake of the stone wherewith the fabric is built, which is got from a mountain just by, and is very durable, and the design of erecting it was to commemorate a victory which Philip II. obtained over the French (but by the assistance of the English forces) at St Quintin, on St Laurence's day, in the year 1557. The Spanish description of this structure forms a sizeable quarto volume, and it is said that its founder expended upon it six millions of ducats. The apartments are decorated with an astonishing variety of paintings, sculpture, tapestry, ornaments of gold and silver, marble, jasper, gems, and other curious stones, surpassing all imagination. This building, besides its palace, contains a church, large and richly ornamented; a mausoleum; cloisters; a convent; a college and a library, containing about 30,000 volumes; besides large apartments for all kinds of artists and mechanics, noble walks, with extensive parks and gardens, beautified with fountains and costly ornaments. The fathers that live in the convent are 200, and they have an annual revenue of 12,000 l. It was begun by Philip in 1562, five years after the battle; and completed in 22 years. It consists of several courts and quadrangles, which altogether are disposed in the shape of a gridiron, the instrument of the martyrdom of St Laurence; the apartment where the king resides forms the handle. The building is a long square of 640 by 580, and the height up to the roof is all round 60 feet, except on the garden side, where the ground is more taken away. At each angle is a square tower 200 feet high. The number of windows in the west front is 200; in the east front 366. The orders employed are Doric and Ionic. There are three doors in the principal front. Over the grand entrance are the arms of Spain, carved in stone: and a little higher in a nich, a statue of St Laurence in a deacon's habit, with a gilt gridiron in his right hand, and a book in his left. Directly over the door is a basso relievo of two enormous gridirons in stone. This vast structure, however, with its narrow high towers, small windows, and steep sloping roof, exhibits a very uncouth style of architecture; at the same time that the domes, and the immense extent of its fronts, render it a wonderfully grand object from every point of view. The church, which is in the centre of all, is large, awful, and richly but not affectedly ornamented. The cupola is bold and light. The high altar is composed of rich marbles, agates, and jaspers of great rarity, the produce of this kingdom. Two magnificent *catafalquas* fill up the side arcades of this sanctuary: on one the emperor Charles V. his wife, daughter, and two sisters, are represented in bronze, larger than life, kneeling; opposite are the effigies of Philip II. and of his three wives, of the same materials, and in the same devout attitude. Underneath is the burial-place of the royal family, called the *Pantheon*. Twenty-five steps lead down to this vault, over the door of which is an inscription, denoting, that

Hic locus, sacer mortalitatis exuviis Catholicorum Regum, &c.

was intended by Charles the emperor, resolved upon by Philip II. begun by Philip III. and completed by Philip IV. The mausoleum is circular, 36 feet diameter, incrustated with fine marbles in an elegant taste. The bodies of the kings and queens lie in tombs of marble, in niches, one above the other. The plan of these sepulchres is grand, and executed with a princely magnificence; but, as a modern traveller observes, in a stile rather too gay, too light, and too delicately fitted up for the idea we are apt to form of a chapel destined for the reception of the dead. The collection of pictures dispersed about various parts of the church, sacristy, and convent, has been considered as equal, if not superior, to any gallery of Europe except that of Dresden. Formed out of the spoils of Italy, and the wasted cabinet of that unfortunate dilettante Charles I. of England, it contains some of the most capital works of the greatest painters that have flourished since the revival of the art. In the sacristy is an altar called *La santa Forma*; this is a kind of tabernacle or *custioda* of gems, marbles, woods, and other precious materials, inlaid in gilt bronze; in which, rather than in the excellence of the workmanship or taste of the design, consists the merit of this rock of riches. Before it hangs a curtain, on which Coello has represented Charles II. and all his court in procession, coming to place this *Forma*. This is esteemed one of the most curious collections of portaits in the world; for all the persons are drawn with the greatest strength of colour and truth of expression, and are said to be perfect resemblances not only of the monarch and grandees, but even of the monks, servants, and guards. The statues, busts, and medallions of the Escurial, are not in any great number, nor very remarkable for their excellence: but the library contains a most precious collection of manuscripts, many fine drawings, and other curiosities. Notwithstanding the coldness of the exposure, the late king, for the sake of hunting, used to pass here several months of the year; and to make the place less inconvenient to his attendants, and the nobility, he built an entire new town adjoining to it.

ESCUTCHEON, or SCUTCHEON, in heraldry, is derived from the French *escusson*, and that from the Latin *scutum*, and signifies the shield whereon coats of arms are represented.

Most nations of the remotest antiquity were wont to have their shields distinguished by certain marks painted on them; and to have such on their shields was a token of honour, none being permitted to have them till they had performed some honourable action.

The

The efcutcheon, as ufed at prefent, is fquare, only rounded off at the bottom.

ESDRAS, a Jewifh prieft, and doctor of the law. Artaxerxes Longimanus fent him with rich prefents for the ufe and ornament of the temple of Jerufalem, rebuilt under Zerubbabel: the king alfo ordered the neighbouring governors to provide him with what conduced to the pomp of the Jewifh religion, and to exempt the priefts from paying taxes. He is fuppofed to be the collector of the Canon of Scripture; and that, by divine infpiration, he added fome things which happened after the deaths of the authors. It is gueffed he wrote the Chronicles, befides thofe books which bear his name, the two laft of which are exploded even by the church of Rome.

ESK, the name of feveral rivers both in England and Scotland, particularly of one which forms part of the boundary between the two kingdoms. It runs from north-eaft to fouth-weft, and gives name to the county of Efkdale.

ESKI-HISSAR. See STRATONICEA.

ESKIMAUX. See ESQUIMAUX.

ESNE, a confiderable fea-port town of Upper Egypt. It is governed by an Arabian prince, and by a cachef, dependant on the bey of Girze. The Mahometants have feveral mofques here, and the Coptis a church ferved by two priefts. "Efne (fays Abulfeda), remarkable for its public baths and its commerce, is built on the weftward of the Nile, between Affouan and Cous, but nearer to this latter. It acknowledges, adds the geographer of Nubia, the Coptis for founders. Its well cultivated territory abounds in grain and palm trees. It is furrounded by gardens filled with fruit trees. One admires here feveral ancient monuments conftructed by the Coptis, and fuperb ruins." This defcription anfwers to Efne in our time, which is fituated on the edge of a rich country and fhaded by groves of orange trees loaded with fruits and flowers. This town, formerly called *Latopolis*, revered Minerva and the fifh *Latus* (Strabo). It contains within its boundary an antique temple: thick walls inclofe it on three fides. Six large fluted columns, crowned by a capital ornamented with the palm leaf form the facade of it; 18 others fupport the roof, which is compofed of large fquares of marble; the building is furrounded by a freeze, and innumerable hieroglyphics cover its exterior afpects.

A little to the fouth of the town are feen the ruins of a monaftery founded by St Helena, and near it the burying-place of the martyrs, adorned with tombs crowned by cupolas, fupported by arcades. The inhabitants of Efne having revolted againft the perfecution of Dioclefian, that emperor deftroyed this town and put them to the fword. This place, confecrated by religion, is become a celebrated pilgrimage among the Coptis. They repair thither from the moft diftant provinces of the kingdom. In the chain of mountains which ftretches to the eaftward of the Nile, and nearly oppofite Efne, are quarries of a foft ftone, called *Baram*. It is made ufe of for kitchen utenfils. It hardens in the fire, and forms excellent kettles and pans, which give no bad tafte to the victuals.

ESOX, in ichthyology, a genus of fifhes belonging to the order of abdominales. The body is elongated; the head is plainifh above; the upper jaw is plain, and fhorter than the under one, which is dotted: and the branchioftege membrane has from feven to twelve rays.

1. The LUCIUS or PIKE, has a flat head: the upper jaw is broad, and fhorter than the lower: the under jaw turns up a little at the end, and is marked with minute punctures. The teeth are very fharp, difpofed only in the front of the upper jaw, but in both fides of the lower; in the roof of the mouth, and often in the tongue. The flit of the mouth, or the gape, is very wide: the eyes fmall. The pike is common in moft of the lakes of Europe; but the largeft are thofe taken in Lapland, which, according to Scheffer, are fometimes eight feet long. They are taken there in great abundance, dried, and exported for fale. The largeft fifh of this kind faid to be caught in England, weighed 35 pounds. All writers who treat of this fpecies bring inftances of its voracioufnefs. It hath been known to choke itfelf by attempting to fwallow one of its own fpecies which proved too large a morfel. Yet its jaws are very loofely connected, and have on each fide an additional bone like the jaw of a viper, which renders them capable of greater diftenfion when it fwallows its prey. It does not confine itfelf to feed on fifh and frogs; it will devour the water-rat, and draws down the young ducks as they are fwimming about. But there are inftances of its fiercenefs ftill more furprifing, and which indeed border a little on the marvellous. Gefner relates, that a famifhed pike in the Rhone, feized on the lips of a mule that was brought to water, and that the beaft drew the fifh out before it could difengage itfelf; that people have been bit by thefe voracious creatures while they were wafhing their legs; and that the pike will even contend with the otter for its prey, and endeavour to force it out of its mouth. Small fifhes fhow the fame uneafinefs and deteftation at the prefence of this tyrant, that the little birds do at the fight of the hawk or owl. When the pike lies dormant near the furface, as is frequently the cafe, the leffer fifhes are often obferved to fwim around it in vaft numbers and in great anxiety. Pikes are often haltered in a noofe, and taken while they thus lie afleep, as they are often found in the ditches near the Thames, in the month of May. In the fhallow water of the Lincolnfhire fens they are often taken in a manner, we believe, peculiar to that country and to the ifland of Ceylon. The fifherman makes ufe of what is called a *crown net*; which is no more than an hemifpherical bafket, open at top and bottom. He ftands at the end of on of the little fen-boats, and frequently puts his bafket down to the bottom of the water; then poking a ftick into it, difcovers whether he has any booty by the ftriking of the fifh; and vaft numbers of pike are taken in this manner. The longevity of this fifh is very remarkable, if we may credit the accounts given of it. Rzaczynfki tells us, of one that was 90 years old; but Gefner relates, that in the year 1497, a pike was taken near Hailbrun in Suabia, with a brazen ring affixed to it, on which were thefe words in Greek characters: "I am the fifh which was firft put into this lake by the governor of the univerfe, Frederick the Second, the 5th of October 1230:" So that the former muft have been an infant to this Methufalem of a fifh. Pikes fpawn in March or April, according-

ing to the coldness or warmness of the weather. When they are in high season, their colours are very fine, being green, spotted with bright yellow; and the gills are of a most vivid and full red. When out of season, the green changes to a grey, and the yellow spots turn pale.

2. The BELONE, or GAR, some times grows to the length of three feet or more. The jaws are very long, slender and sharp-pointed; the under jaw extends much farther than the upper; and the edges of both are armed with numbers of short and slender teeth; the tongue is small; the eyes are large; the irides silvery; the nostrils wide and round. The body is slender, the belly quite flat, bounded on both sides by a rough line. The tail is much forked. The colours are extremely beautiful when the fish is in the water; the back is of a fine green, beneath which appears a rich changeable blue and purple: the sides and belly are of a fine silvery hue. This fish, which is found in many places, is known by the name of the *sea-needle*. It comes in shoals on our coasts in the beginning of summer, and precedes the mackerel: it has a resemblance to it in taste; but the light green which stains the back-bone of this fish gives many people a disgust to it.

3. The SAURUS, or SAURY, is 11 inches in length: the nose slender; the jaws produced like those of the sea-needle, but of equal length: the eyes large: the body anguilliform; but towards the tail grows suddenly smaller, and tapers to a very inconsiderable girth. The tail is much forked: the back dusky: the belly bright and silvery. Great numbers of these fish were thrown ashore on the sands of Leith near Edinburgh, after a great storm in November 1768. Rondeletiius describes this species among the fish of the Mediterranean; but speaks of it as a rare kind.

4. The BARRACUDA of Catesby, is found in great numbers about the seas of the Bahamas and as far as Jamaica. Its body and head very much resemble the European pike: the eyes are large: the mouth is very wide: the under jaw longer than the upper: there are four very large and sharp teeth in the front of the upper jaw; in that of the lower, a single great and sharp tooth: there are two dorsal fins; the tail is large and forked: colour a deep brown, whitish on the belly. It grows to the length of 10 feet. It swims exceedingly swift, and is of dreadful voracity: will attack and devour men when they are bathing. The flesh has a disagreeable smell and taste, and is frequently poisonous; causing great sickness, vomiting, intolerable pains in the head, and loss of hair and nails: yet the hungry Bahamans formerly were under the necessity, at times, of feeding on it.

ESPALIERS, in gardening, are rows of trees planted about a whole garden or plantation, or in hedges, in such a manner as to inclose quarters or separate parts of a garden; and are trained up regularly to a lattice of wood-work in a close hedge for the defence of tender plants against the injuries of wind and weather. They are of admirable use and beauty in a kitchen garden, serving not only to shelter the tender plants, but screen them from the sight of persons in the walks.

The trees chiefly planted for espaliers, are apples, pears, and some plums; some plant apples grafted upon paradise-stocks: but as these are of short duration, it is better to plant those grafted upon crabstock, or upon what the gardeners call *Dutch-stocks;* which will both cause them to bear sooner, and prevent their growing too luxuriant. The best kind of apple for this purpose, are the golden pippen, nonpareil, rennet, &c. and the best sort of pear, are the jargonelle, blanquette, &c. These last, if designed for a strong moist soil, should be grafted upon quince-stocks; but if for a dry soil, upon free-stocks.

While the trees are young, it will be sufficient to drive a few stakes into the ground on each side of them; fastening the branches to these in an horizontal position as they are produced. This method will do for the three first years; after which an espalier should be made of ash-poles, whereof there must be two sorts, larger and smaller; the former to be driven upright into the ground a foot asunder, and the latter, or slender poles, to be nailed across these, at about nine inches. Some prefer to this another sort of espalier, made of square timber cut to any size: these are, indeed, more sightly, but withal vastly more expensive.

When the espaliers is thus framed, the branches are to be fastened to it with osier-twigs; observing to train them in an horizontal position, and at equal distances. Fruit-trees thus managed are preferable to any others; not only as bearing better-tasted fruit, but as taking up very little room in a garden, so as to be less hurtful to plants which grow in the quarters.

ESPLANADE, in fortification, the slopping of the parapet of the covered-way towards the campaign.

ESPLEES, in law, the general products which lands yield, or the profit or commodity that is to be taken or made of a thing.

ESPOUSALS, in law, signifies a contract or promise made between a man and a woman to marry each other; and in cases where marriages may be consummated espousals go before. Marriage is termed an espousal *de præsenti.*

The espousals among the Jews were either by writing, or by a piece of silver given and received, or by cohabitation. Amongst the Greeks, after the parents and friends of the young couple had finished their negociation, the couple themselves pledged their faith to each other, the man by swearing that he would be constant and true, the woman that she would marry him, and make him master of all she had. Then they ratified their agreement by a kiss and joining right hands.

Amongst the Romans the espousals consisted in an engagement of friends on both sides, whether absent or present, in public or without witnesses. But the common way was by writings drawn up by common consent, and sealed by both parties; besides this, the man sent a ring to the woman, consisting of iron and without a stone.

ESQUILIÆ (anc. geog.), one of the seven hills of Rome, which Varro will have to be two, viz. Cispius and Oppius; also Mons Esquilinus, softened from Exquilinus; and this again from Excubinus, the watch or guard Romulus kept here, from a jealousy he entertained of his colleague Titus Tatius. On the east side it reached the city walls; on the south the Via Lavicana; on the west, the wide valley between mount Coelius and the Palatine; on the north, the Mons Viminalis; on the east side was the Porta Esquilina. This hill by some of the ancients was called *Suburranus,* from the street

street *Suburra* to the north of it: by the poets, *Esquilius*.

ESQUIMAUX, a people of North-America inhabiting all that vast tract of land known by the name of *Labrador* or *New Britain*.—They differ very considerably both in aspect and behaviour, from the other American nations; agreeing in most respects with the inhabitants of West-Greenland. See *New Britain*, and Greenland.

ESQUIRE (from the French *escu*, and the Latin *scutum*, in Greek σκυτος, which signifies an hide, of which shields were anciently made, and afterwards covered; (for, in the time of the Anglo-Saxons, the shields had a covering of leather), was originally he who, attending a knight in time of war, did carry his shield; whence he was called *escuier* in French, and *scutifer*, or *armiger*, i. e. armour-bearer, in Latin. Hotoman says, that those whom the French call *esquires*, were a military kind of vassals, having *jus scuti*, viz. liberty to bear a shield, and in it the ensigns of their family, in token of their gentility or dignity. But this addition hath not of long time had any relation to the office or employment of the person to whom it hath been attributed, as to carrying of arms, &c. but hath been merely a title of dignity, and next in degree to a knight. For those to whom this title is now due, see the article Commonalty. Officers of the king's courts, and of the king's household, counsellors at law, justices of the peace, are only *esquires* in reputation; and he who is a justice of peace has this title only during the time he is in commission, and no longer, if he is not otherwise qualified to bear it. A sheriff of a county being a superior officer, bears the title of *esquire* during his life; in respect of the great trust he has in the commonwealth. The chief of some ancient families are esquires by prescription; and in late acts of parliament for poll-money, many wealthy persons commonly reputed to be such, were ranked among the esquires of Great-Britain.

There is a general opinion, that every gentleman of landed property who has L. 300 a-year, is an esquire; which is a vulgar error: for no money whatsoever, or landed property, will give a man properly this title, unless he comes within one of the above rules: and no person can ascribe this title where it is not due, unless he pleases; there being no difficulty in drawing the line by the accounts given above and in the article Commonalty: but the meaner ranks of people, who know no better, do often basely prostitute this title; and, to the great confusion of all rank and precedence, every man who makes a decent appearance, far from thinking himself any way ridiculed by finding the superscription of his letter thus decorated, is fully gratified by such an address.

Esquires *of the King*, are such as have that title by creation, wherein there is some formality used, as the putting about their necks a collar of SS, and bestowing on them a pair of silver spurs, &c.

ESRAKITES. See Eschrakites.

ESSAY, a trial or experiment for proving the quality of any thing; or an attempt to learn, whether or not any invention will succeed.

Essay, in literature, a peculiar kind of composition, the character whereof is to be free, easy, and natural; not tied to strict order or method, nor worked up and finished like a formal system.

ESSAYING, or Assaying, in chemistry and metallurgy, signifies the examination of a small quantity of any ore or mineral by fire, in order to discover its contents. This is very necessary for those who intend to deal largely in metallurgic operations, in order to avoid unnecessary expence, by becoming previously acquainted with the naure of the ore.

1 History of the art.

The first attempts in this way were no doubt extremely rude; but succeeding trials have advanced it to the form of a science or art practised by numbers of people under the title of *essay-masters*. No treatise was published on this subject till after the middle of the 16th century; and the first book we have upon it is attributed to Lazarus Ercker, which appeared in 1574. Agricola, however, in his seventh book *De re Metallica*, published in 1576, described both the instruments and processes, illustrating the whole with plates; and there is incontestable evidence that this treatise had been presented to the elector of Saxony in 1567, tho' it did not appear to the world till after the publication of Ercker's book. Since that time, the art has been greatly improved; but the operations in the dry way are not materially different from those described under Metallurgy. The Blow-pipe likewise affords an excellent method of examining small quantities of metal in the dry way; but the greatest improvement hitherto made in it is that of essaying by the moist way introduced by Mr Bergman.

2 The moist way of essaying introduced by Mr Bergman.

3 Requisites for essaying in the dry way.

This celebrated chemist observes, that in the *Docimasia Sicca*, or essaying in the dry way, three things are requisite: 1. That the metal contained in the ore be all reduced to a complete form; for such part of it as is deficient in that respect cannot be united with the eliquated metal. 2. That the whole be collected into one mass; for when it is dispersed in numerous small grains, some of them are very easily scattered, and diminish the weight. 3. That the metallic form be preserved; for the extracted regulus must inevitably be diminished more or less by calcination. All these requisites are frequently effected conveniently enough in a crucible by fusion with proper strata of charcoal, provided the ore is free from sulphur and other volatile mixtures, and is entirely without a matrice, or united to one that can be melted by a moderate degree of heat; but if the matrice be refractory, notwithstanding the most subtile pulverisation, it will cover many of the metallic particles, and thus the reduction and fusion will be in some measure prevented. When this happens to be the case, we must add such other substances as not only promote fusion, but make the matter flow sufficiently thin to allow the reguline particles to fall to the bottom. These substances, which from the effect they have on the matter are called *fluxes*, are of a saline nature, and must therefore necessarily corrode the metals more or less; and hence the scoria, which are almost always tinged, contain a quantity of calcined metal. But as long as we are destitute of a sure method of measuring intense degrees of heat, and as long as it is necessary to perform the operation in close vessels to prevent the access of air, the force and proper continuance of the fire will be uncertain.

Essaying. tain (A). Now, by every excess or defect in this point some part of the regulus is lost; so that any judgment of the goodness of the ore, formed from the weight of the regulus, must be fallacious, or at least somewhat inaccurate.

4 Deficiencies of the dry-way of essaying. Hence we may understand, that experiments upon ores made in the dry way, are liable to many faults and imperfections; to which we may add the following, viz. that a given quantity of ore subjected to trial almost always exceeds in weight the regulus to be extracted from it. Now, since it is impossible to avoid a certain loss both during calcination and fusion, this loss will be the more remarkable, as the mass to be weighed becomes ultimately lighter. The case is quite otherwise with experiments made in the moist way; for here the weighty sediment, from which the quantity of the contents is judged, is never less, but often greater, than that obtained by fire.

5 Method of essaying in the moist way previous to Bergman's improvements. In the attempts made to essay ores in the humid way previous to those of Mr Bergman, both methods were used, the metallic part being extracted by a menstruum, and afterwards reduced by fire. Our author, however, has now shown a method of performing the operation without either calcination or fusion. "It must indeed be confessed (says he), that experiments in the humid way often require more care and pains than the other; but if accurate conclusions are thereby obtained, we ought not to grudge the slowness. Besides, in many cases this method is more expeditious than the other; and indeed almost always, if we content ourselves with such discoveries as can be made by the common calcinations and fusions: nay, sometimes the dry method is obviously sufficient, when the metallic content is either very small or volatile; but particularly if it be inflammable, as is the case with zinc."

6 Directions for essaying in the moist way. In this method the ores to be examined should be reduced to a very subtile powder by pulverization and calcination. In dissolving such ores as contain sulphur, we ought to employ the vitriolic or marine acid; for the nitrous, by long continued heat, destroys the sulphur. Too great heat also dissipates some of it in vapours, or melts it into globules containing heterogeneous matters; therefore boiling ought to be avoided where it can be done. All the precipitates must be carefully collected, washed, and dried. Distilled water ought constantly to be used, and all the menstrua carefully depurated. Vitriolic acid our author calls *diluted*, when its specific gravity is below 1.3, the nitrous when below 1.2, and the marine when below 1.1. The precipitations should be carefully made in glass vessels; so that nothing may remain either through the deficiency of the precipitant, or be redissolved through its too great quantity. The clear liquor is to be decanted from the precipitate, water poured on in its place, the vessel shaken, and then suffered to stand; the water again decanted off, and more poured on in its stead, until it will no longer affect certain precipitants by which it must be examined. The sediment is then to be collected on a filter, the latter being previously weighed, and made of paper not impregnated with alum. It is to be dried at first with a gentle heat, but afterwards exposed for five minutes to a heat of 100°. On cooling, it is to be weighed together with the filter; the known weight of which must afterwards be subtracted. The sediment is best washed in a bottle; for a filter when once impregnated with saline matter cannot be freed from it again without great difficulty, especially if an interval of some hours intervenes.

7 Alkalies pure and phlogisticated used by Mr Bergman. The alkali made use of in Mr Bergman's experiments, was that of soda saturated with aerial acid. His phlogisticated alkali is made by deflagrating equal weights of pure nitre and cream of tartar intimately mixed together; the residuum is the common white flux. Half an ounce of this is dissolved in half a quadrans of distilled water. To this he adds, in a digesting heat, two ounces of Prussian blue, carefully avoiding such an effervescence as may throw any thing over, which easily happens if the quantity be too large. The pigment soon loses its beautiful blue colour, growing not red but black; which shows that a decomposition has taken place. The Prussian blue used in his experiments contained in 100 parts only 23 of the pigment and 77 of the clay; so that if we employ the blue made without any alum, 221 grains of it will saturate the half ounce of alkaline salt more completely than the two ounces of the kind already described. But in whatever manner the operation is performed, after the addition of the last quantity, the whole must be exposed to a stronger digesting heat, and stirred with a wooden spatula. If the liquor be too much diminished by evaporation, the defect must be supplied by adding more water. When the liquor becomes clear, the residuum must be collected upon filtering paper, and gradually washed with warm water until all the soluble part is extracted; when, if the operation has been properly conducted, the filtered liquor amounts to a whole quadrans, of a brownish yellow colour, and so well saturated with colouring matter, that it does not change the colour of paper tinged with Brasil wood. This lixivium, however, contains a small quantity of Prussian blue, about 4lb. to a cwt. of the alkali. These should be previously separated by an acid, or, which is better, corrected by subtracting from the weight of the sediment 16 essay pounds for each quadrans of the lixivium. When we wish to examine the colour of the precipitate exactly, however, the lixivium we employ must necessarily be well depurated; for by neglecting this precaution we may easily persuade ourselves that any metal precipitated by the lixivium has a blue colour. When we only wish to ascertain the weight, the lixivium, having the small proportion of Prussian blue intermixed, may be employed: but still the proper correction must ultimately be made use of; for the precipitating acid is wont to impair the qualities of the lixivium, and even to destroy them altogether, especially in a warm temperature. Calcareous earth, whether in its mild or caustic state, is also capable of abstracting a coloured substance from iron and other metals.

8 How to precipitate metals by metals. In the precipitation of metals by metals, it is to be observed, that the acid of the solution ought to be somewhat predominant; but any considerable excess must be corrected occasionally, either by alkali, water, or spirit of wine.

(A) The newly invented thermometer of Mr Wedgewood has furnished us with a method of measuring intense degrees of heat; but we have not yet heard how far this has been found useful in practice.

Essaying.

In the following experiments an essay cwt. was always employed, unless where it is expressly mentioned otherwise: conclusions sufficiently accurate may indeed be obtained from 25 lb. nay sometimes from smaller quantities. In these cases our author mentions the usual quantity; applying to them those formulæ of calculation which are founded on the mutual proportions of the proximate principles constituting metallic salts. By an easy substitution, the same formulæ may be used by those who employ $\frac{1}{4}$ or $\frac{1}{2}$ cwt. We now come to describe the method of essaying the ores of the particular metals.

9 Weights used in Mr Bergman's experiments.

10 How to essay the ores of gold.

1. *Ores of Gold.* This metal occurs in the bowels of the earth native, possessing a complete metallic form, although in general the small particles of it are so interspersed in various matrices, that they are entirely invisible. It is also found mineralized, or united with sulphur, by means of iron or some other metal. These two species of ore we shall consider separately.

11 Native Gold.

Native gold is very seldom, if ever, free from heterogeneous matters; the most usual mixtures are copper, silver, and sometimes iron. The first of these remains in the menstruum, and may be separately collected by dissolving the gold in aqua-regia, and precipitating it by martial vitriol: the second falls during the solution, yielding a salited silver; which, being washed and dried, shows the weight of the silver contained and the iron may be discovered by phlogisticated alkali. The precipitate occasioned by martial vitriol is pure gold in its metallic state, but very subtilely divided, and therefore its weight requires no correction.

Hence it appears how small a portion of gold inherent in the ores of other metals may be extracted; besides a solution containing the most minute particle of gold instantly produces the purple precipitate of Cassius, with a solution of tin properly prepared.

12 Ores of this metal properly so called.

As to the ore which contains gold adhering to and surrounded by stony particles, 1. We must reduce a determined weight to an impalpable powder, by triture and elutriation. Then let the powder, weighed a second time, be boiled in aqua regia, as long as any thing is taken up by the menstruum; after which, let the exhausted ore, well washed, be collected, exsiccated to ignition, and weighed. Let the clear solution (the colour of which, in some degeee, affords a method of judging) be precipitated in the usual way by martial vitriol; the precipitate well washed, dried, and weighed, shows the gold, which, added to the weight of the exhausted ore, ought to be equal to the original weight, unless somewhat has been dispersed by the pulverisation, or unless some of the matrice has entered the menstruum. The former of these is discovered by comparing the weights before and after pulverisation; the latter by precipitants.

When grains of gold are mixed with loose earthy particles, they are sometimes easily separated by mechanical application of water.

13 Gold mineralized by sulphur.

When the metal is mineralised by sulphur, as in the golden pyrites, let one or more essay cwts. reduced to powder be gently boiled in the nitrous acid, or rather digested in a heat of 50°—80°, lest the sulphur should be destroyed. It is even necessary to employ a more gentle heat for this purpose, that the sulphureous particles, gradually separating, may rem ain in their natural state; for if they melt, the heterogeneous particles which ought to have been removed, will be inclosed in the melted mass. The menstruum ought to be added in several portions, about six times the quantity of the ore, at each turn. The pyrites is acted upon by this menstruum; an effervescence ensues, which continues for some time; after which a fresh quantity of the acid is to be added, until the sulphur is obtained pure and of its proper colour. From 12 to 16 parts of the acid are usually required to one of the ore. The purity of the sulphur is easily ascertained by caustic alkali.

The matrice, if insoluble in the menstruum, remains at bottom, together with the gold; which is distinguished by its peculiar colour and splendour, and may be separated from the matrice by careful elutriation. The particles of gold assume the form of very small grains, yet such as have angular points discernible by a good eye; and their appearance gives some reason for supposing that they have rather been intimately mixed with the pyrites than dissolved in it. The clear solution, which is generally green, must be evaporated, made red hot, and then weighed. Any other metals that happen to be present besides iron, may be extracted by suitable menstrua; as copper by the volatile alkali, manganese by dilute nitrous acid, with the addition of a little sugar: zinc is scarce ever met with in gold pyrites; but if it should happen to exist, may be extracted by any menstruum; and silver by pure nitrous acid. Calcareous earth, when it happens to form the matrice, unites with nitrous acid, and clay with that of vitriol. The sum of the weights of all the ingredients ought to be equal to the original weight of the ore; and unless any loss has been sustained during the operation, any deficiency may be attributed to the consumption of the sulphur.

2. *Ores of Platina.* The only metal with which platina is known to be alloyed is iron. This may be separated in a great measure by boiling the grains of platina, reduced to as fine a powder as possible, in marine acid, by which the original weight of the grains is generally reduced by about 0.05 of the whole. The depurated platina, dissolved in aqua-regia, easily discovers itself by precipitation with martial vitriol, if any gold be present: and, on the other hand, if platina contains a small quantity of gold, the latter may be discovered by any neutral salt containing vegetable or volatile alkali. 14 Of platina.

3. *Ores of Silver.* This metal, when found in its native state is generally alloyed with gold or copper, or both. The silver and copper will be taken up by nitrous acid, leaving the gold at bottom in the form of a black powder, which may be made to assume a more metallic appearance by solution in aqua-regia and precipitation by martial vitriol. The copper remaining in the solution may then be collected by means of iron or aerated alkali. 15 Of silver.

Silver united with sulphur alone (the glassy ore of silver) is of a black colour. To discover the contents of this ore, let it be divided and powdered as much as possible, and then gently boiled for an hour in 25 cwt. of diluted nitrous acid: then after decanting the liquor, the operation is to be repeated with an equal quantity of the menstruum; and even a third time, unless the pure sulphur be now separated. The last particles of the 16 Mineralized by various substances.

the silver adhere obstinately to the sulphur. If any gold be present, it remains undissolved at the bottom of the vessel. The decanted liquors being collected, are to be deprived of the silver by adding common salt; then if we suppose the precipitate when collected, washed, and dried, to be $=a$, the silver required will be $\frac{100a}{129}$. The weight of the sulphur added to the above ought to be 100 lb. if the operation has been rightly performed, and no decomposition of the sulphur taken place. The clear liquor, which passes in filtering the luna cornea, easily discovers any other metal which may originally have been mixed with the silver; after which, the earth may be precipitated by means of a common fixed alkali.

It is difficult to separate the remains of the matrice from the sulphureous particles. To effect this, however, let the sum of the weights be first observed; then pour on caustic lixivium, which will dissolve the sulphur by a gentle digesting heat; the matrice then remains alone, and by its weight we can determine that of the sulphur; but we must not continue the digestion longer than is necessary to dissolve the sulphur, lest some of the siliceous earth should also be taken up, tho' Mr Bergman thinks there is no great reason to apprehend any inconvenience of this kind.

17 Red silver ore.

The red ore of silver may be examined by reducing it to a very subtile powder, and boiling it twice gently in diluted nitrous acid. A part of the menstruum being decanted off, wash the residuum well, then precipitate the silver by means of sea-salt; boil the above-mentioned white powder quickly in aqua-regia, until the arsenic be dissolved and the sulphur appear pure. The yellow solution, cautiously decanted, lets fall a very white powder on the addition of a proper quantity; and the small quantity taken up by the water may be obtained by evaporating to dryness. The sulphur separated in this manner, though it seems pure, yet contains some silver which the nitrous acid could not dissolve on account of the arsenic contained in the ore; but when this is taken away by the aqua-regia, the remaining parts of the silver adhere to the marine acid entangled among the sulphureous particles. This luna cornea may be freed from the sulphur by caustic volatile alkali diluted with water, and kept in a well-closed vessel for some days. A weight of alkaline liquor equal to that of the sulphur is sufficient. By weighing the sulphur both before and after the operation, we know the weight of it as well as the luna cornea. Iron may be discovered by means of the phlogisticated alkali.

18 White ore.

The white ore of silver, consisting of the metal united with sulphur, arsenic, and copper, is essayed in the following manner. Let 1 cwt. of the ore, reduced to powder, be gently boiled for an hour in a little more than 12 times its weight of diluted nitrous acid. The dry powder becomes black, foul, and sends forth the smell of hepar sulphuris. Part of it is dissolved, and a white residuum remains at length at the bottom. The liquor cleared by subsiding or filtration, contains the silver and copper; the former cannot be precipitated alone by sea-salt, because the marine acid attracts the copper more strongly. A white precipitate indeed, consisting of small needle-like crystals, is thrown down; but is found on examination to consist of a peculiar combination of marine acid, silver, and copper. The silver therefore must be precipitated by a determined weight of copper, and the latter may be afterwards separated by iron or mild fixed alkali; but from the ultimate weight we must subtract that of such part of the precipitant as has entered the menstruum. The white menstruum must next be boiled in marine acid, and precipitated by water; by which means we obtain the arsenic, along with a small quantity of marine acid which it retains obstinately. After the separation of the arsenic, it remains only to prove the purity of the sulphur by volatile alkali, in order to determine whether it still contains any luna cornea, or copper.

19 Mineralized by sulphur.

Silver mineralized by sulphur sometimes contains antimony also; and this ore often appears in the form of capillary threads of an hoary brown colour. To analise this, let it be gently boiled, or rather digested, for an hour, in six times its weight of diluted nitrous acid, until the silver is thoroughly dissolved, and all the antimony reduced to a white calx; which, after decanting the liquor, may be separated from the sulphur by marine acid, and precipitated by water. The solution of silver may be precipitated by sea-salt, and 1 cwt. seldom contains more than four ounces. Sometimes there is present in this kind of ore a little copper and iron besides the sulphur and antimony; in which case we may conduct the experiment in the same manner, only with the addition of a double portion of acid. All the metals are easily obtained by precipitating the silver by copper, and the iron by zinc or an alkaline salt.

20 Corneous silver ore.

The corneous silver ore, in which the metal is mineralized by the marine and vitriolic acids, has two remarkable varieties; one of which may be cut, and is somewhat malleable; the other brittle, and containing some sulphur besides the acid. An hundred parts of the former, reduced to fine powder, is to be digested for one day in marine acid, shaking the mixture from time to time. The liquor is then to be decanted clear, and the residuum, previously well washed in water, added to the liquor. A solution of terra ponderosa is to be gradually dropped into the liquor, until it ceases to occasion any precipitation. Suppose the weight of the precipitate, washed and dried, $=a$: now vitriolated terra ponderosa, whose weight is a, contains of acid $0.15a$, which corresponds with vitriolated silver $0.48\,a$; for from 100 l. of vitriol of silver, 68.75 of metal is obtained by reduction. But as all the silver is not precipitated from nitrous acid by mineral alkali combined with vitriolic acid, the luna cornea will therefore be $100-0.48\,a$. In the former salt, the silver contained is expressed by $0.33a$; in the latter, by $75.19-0.36\,a$; and therefore the sum required for the 100 will be $75.19-0.03\,a$. The brittle corneous ore likewise contains sulphur; but the saline part may be extracted by volatile alkali, and the quantity of metal afterwards ascertained by the method already described. Or this compound may be reduced in the following manner: Let the mass be mixed with an equal bulk of alkaline salt in a glass mortar, and be formed into a globule by means of a few drops of water: let this globule be put into a crucible, the bottom of which has been previously strewed with sal soda, compressed and covered with the same

alkali.

alkali. On applying a melting heat, the whole of the metal will then be reduced if the luna cornea has been properly collected.

21 Native mercury. 4. *Ores of Mercury.* Native quickfilver is feldom mixed with any other metals than gold, filver, and bifmuth. The firft remains at the bottom on diffolving the fluid mafs in nitrous acid; the fecond is difcovered by fea-falt, which at the fame time precipitates the mercury combined with fea-falt; and the third, though it is taken up by the fpirit of nitre, is yet precipitated by the mere affufion of water.

22 Cinnabar. The combination of quickfilver with fulphur (native cinnabar) cannot be decompofed either by vitriolic, nitrous, or marine acid. Our author has even attempted in vain to difunite them by boiling for many hours in a folution of cauftic fixed alkali in water. There are, however, he tells us, two ways of effecting a perfect decompofition; only by gently boiling for an hour the cinnabar with eight times its weight of aqua-regia, one fourth of which is marine acid; the other by boiling it in marine acid, with the addition of one tenth of the weight of the cinnabar of the black calx of manganefe; but the former method is preferable, as no heterogeneous matter is thus added to the mercury. The menftruum is the fame in both, *viz.* the dephlogifticated marine acid; the only difference is, that in the former method it is dephlogifticated by the nitrous acid, and in the latter by the manganefe. In whatever manner, however, the fulphur be feparated, it may be collected by a filter, and the mercury precipitated by zinc: copper precipitates mercury from the marine acid in a more imperfect manner.—If the ore under examination be very much entangled in the matrice, it muft be mechanically freed from it by lotion; after which the foluble parts of the matrice being taken up by the nitrous, marine, or vitriolic acid, the metal itfelf is feparated by aqua-regia.

23 Mercury mineralized by vitriolic acid. When mercury is mineralized by the vitriolic acid, it may be feparated by the help of the marine acid by trituration or digeftion, and the metal precipitated by terra ponderofa diffolved in nitrous acid; after which the weight of the new earthy falt a being given, we can eafily learn the quantity of metal contained; yet, as folution of mercury in nitrous acid is not totally precipitated by Glauber's falt, we muft not here depend on the weight of the precipitate. By another procefs, therefore, our author obained from 100 lb. of vitriol of mercury 33.899 of pure metal, and from an equal weight of corrofive fublimate 75.5; from whence a calculation is eafily deduced in the following manner. Let the quantity of vitriolic acid be$=0.15\ a$; the vitriol of mercury containing this,$=0.44\ a$; and the combination of mercury with marine acid, $=100-0.44\ a$. In the former falt the mercury conftitutes $0.29\ a$, and in the latter $72.5=32\ a$; fo that the whole metallic content in 100 lb. is $72.5-.03\ a$. The fcarcity of this ore, however, renders it ftill uncertain whether this combination of mercury with marine acid approaches to the nature of corrofive fublimate or mercurius dulcis. In the latter cafe the calculation comes out different; for mercurius dulcis contains above 0.99 of metal, and the whole content is expreffed by $91.18\ a \times 0.29a-0.40a=91.18-0.11a$.

N. B. The weights on which all thefe calculations are founded, may be found in Bergman's table of precipitates under the article CHEMISTRY.

24 Lead. 5. *Ores of Lead.* This metal, if ever found native, may be eafily examined as to its purity by means of nitrous acid, which difcovers copper both by its bue colour and precipitation by iron; and filver is difcovered by the addition of copper.

25 Mineralized by fulphur; When lead is mixed with fulphur, and freed from any matrice, it is to be reduced to a fine powder, and then boiled in nitrous or marine acid until the fulphur is obtained pure, which may be afcertained by the cauftic fixed alkali. The folution is then to be precipitated by mild mineral alkali, when the lead is either alone or mixed with filver. In the former cafe, if a be the weight of the precipitate, that of the lead will be $\frac{100a}{32.}$ In the latter, the filver is to be extracted by volatile alkali and the refiduum multiplied by $\frac{100a}{132}$ will give the weight of the lead. The aerated filver is known by the diminution of weight; and if this be called b, then the filver in a metallic ftate will be $\frac{100b}{129}.$

During this operation the folution in marine acid depofits a large quantity of plumbum corneum, which is to be diffolved in water before the precipitation. If antimony happens to be prefent, it is fo much dephlogifticated by the concentrated nitrous acid, that it is calcined and falls to the bottom: the given weight of this multiplied by $\frac{100}{138}$ fhows the quantity of regulus diffolved in marine acid, which falls fpontaneoufly upon being dropped into water, and the plumbum corneum is taken up in its place.

Iron is feldom found in galena; however, in cafe it fhould happen to exift, its prefence may be difcovered in the following manner. Let the folution in marine acid be firft fo far faturated with fixed alkali, that the acid may predominate only a little, and yet all precipitation be carefully avoided. The lead will then be precipitated by a polifhed plate of iron added during boiling; as will alfo the filver, which almoft always exifts in lead. The iron is then to be precipitated by aerated or phlogifticated alkali, and its weight corrected by the part of the metallic plate which is diffolved during precipitation.—When the ore contains any matrice, this is either foluble, and may at firft be feparated by vinegar; or elfe is infoluble in common acids, and is found collected at the bottom.

26 By fixed air; When this metal is mineralized by fixed air, and deprived of all heterogeneous foluble mixtures, it may be diffolved in nitrous acid, and precipitated by aerated mineral alkali; which being done, the quantity of lead is known by the weight of the precipitate as before. But if the matrice be foluble, we muft employ the marine acid, and precipitate the metal by iron, as already directed.

27 By acid of phofphrous. Lead has lately been found mineralized by acid of phofphorus. An hundred pounds of this in powder is diffolved in nitrous acid by means of heat, excepting a few martial particles which commonly remain at the bottom. On adding the vitriolic acid, the diffolved lead falls in the form of a fnow-white precipitate; which, when wafhed, collected, and dried, we may

fuppofe

Essaying. suppose to weigh a; in which case the corresponding lead $= \frac{100a}{143}$. The liquor remaining after precipitation yields, on being evaporated, a phosphoric acid.

28 Copper. 6. *Ores of Copper.* This metal, when native, readily dissolves in nitrous acid. Gold, when mixed with it, falls untouched to the bottom in form of a black powder. Silver is soon precipitated by copper; and iron, by boiling the solution for some time, and inspissating to dryness, is gradually calcined and falls to the bottom.

29 Mineralized by sulphur. Copper mineralized by sulphur is to be powdered, and gently boiled to dryness in five times its weight of concentrated vitriolic acid. The residuum must then be well washed with water, until all the metallic part has entered the menstruum. The quantity of water used for the solution ought to be in some degree proportioned to the goodness of the ore; that which contains 0.05 of copper requires about 0.08 of water, and so on. A polished plate of iron, about twice the weight of the copper, is then to be immersed in the solution properly diluted, and the boiling continued until all precipitation ceases. If the quantity of water be too small, the precipitated metal adheres very obstinately to the surface of the iron plate; which, however, may always be freed by making use of a proper quantity of liquid. The precipitated copper, after being well washed, is to be speedily dried; "but yet (says our author) with such a degree of heat as to make the surface of the metal of different colours, which instantly and sensibly increases the weight."

30 To separate iron from precipitated copper. Sometimes the precipitated copper is found mixed with iron, especially in a poor ore; in which case the precipitate must be redissolved in order to obtain a richer solution; and this deposits pure copper, if the operation has been properly conducted. A similar circumstance also takes place in the precipitation of silver by copper; a rich solution yielding the metal pure, but a poor one affording it mixed with copper. When the precipitated copper is alloyed with other metals, they may easily be separated by solution in the nitrous acid. Gold, as has already been observed, remains at the bottom in form of a black powder, and silver is precipitated on a copper plate.

During this process almost all the sulphur is dissipated by the intense heat necessary for evaporating the vitriolic acid to dryness: however, we may judge of its quantity from the sum of the weights of the other ingredients, compared with that of the whole; or a solution in aqua-regia may be made on purpose for collecting the sulphur.

31 Malachites. The beautiful green ores of copper called *malachites*, in which the metal is mineralized by fixed air, are totally soluble in acids, and may be precipitated by iron or aerated fixed alkali. In the latter case, supposing the weight of the precipitate to be a, that of the copper will be $\frac{100a}{194}$. Calcareous earth, when any happens to be present, may be thrown down by aerated alkali, and the metal precipitated by phlogisticated alkali.—Blue calciform copper, in which the metal is also mineralized by aerial acid, is to be analysed in the same way. Calciform red copper is also totally or in great part dissolved with effervescence, though somewhat weaker than the other.

Mr Bergman has examined by many different ways the red quartz of Mr Cronstedt, supposed to contain a red calx of copper. None of this metal, however, was extracted either by volatile alkali, or boiling the vitriolic acid to dryness upon it. As the siliceous matrices, however, cannot easily be dissolved by the common menstrua, a quantity of mineral fluor was added to the vitriolic acid. The fluor acid has the property of dissolving the particles of quartz, and setting at liberty those of copper which might be entangled among them: but though this experiment always succeeds when copper is present, yet in this substance not the smallest sign of metal could be discovered, and therefore it is probable that Mr Cronstedt was mistaken. Essaying. 32 Red quartz affords no copper by Bergman's experiments.

7. *Ores of Iron.* Though some traces of this metal are found almost every where in the mineral kingdom; yet the ores which contain it in considerable quantity, have it either mineralized by sulphur, or more or less calcined. Ores of iron are frequently found in Sweden so perfect that they obey the magnet, or are themselves magnetic. These attractive and magnetic ores, though they do not contain much sulphur, are yet seldom entirely without it, though more can be extracted by menstrua. Those saturated with sulphur are called *sulphureous pyrites*, nothing but sulphur being extracted from them; for though they sometimes contain the metal in sufficient quantity to pay the expence of smelting, it is always brittle and untractable in the fire, and is easily corroded by rust on exposure to the open air. 33 Iron.

All the ores of iron, when reduced to a very subtile powder, and repeatedly boiled in marine acid, part with their metal; the solution of the pyrites is accelerated by the addition of a small quantity of nitrous acid. In order to obtain the metal by itself, we must precipitate it by phlogisticated alkali; when, if we suppose the weight of the precipitate to be a, the corresponding quantity of metal will be $\frac{a}{6}$; but this must be corrected according to the quantity of the precipitant. That ore which is naturally soluble by vitriolic acid requires nothing but water to precipitate by means of phlogisticated alkali.

Manganese, which is frequently mixed with iron may easily be discovered by immersing the blue sediment (carefully weighed) in water sharpened by nitrous acid; by which means the part arising from the manganese is dissolved. Other metals sometimes enter the ore of iron in larger quantities; which for the most part render the former useless, by imparting bad qualities to the smelted iron. 34 Manganese.

8. *Ores of Tin.* The examination of native tin by the humid method is attended with no difficulty: for the addition of nitrous acid quickly deprives it so far of its phlogiston, that it is reduced to the form of a white calx; the iron and copper, if any be present, remaining in the liquor. An hundred parts of tin corroded by nitrous acid, washed and dried, yielded 140 of calx. Arsenic may be separated by washing with large quantities of warm water; for little enters the acid menstruum. The other metals are but rarely united with native tin. 35 Of native tin.

The pure ore, is commonly called, according to the magnitude of its crystals, *zinngraupen* or *zwitter*, by 36 Its pure ore.

Essaying. by the Germans. These forms cannot be examined in the moist way without great difficulty, as they are not acted upon effectually either by vitriolic, nitrous, or marine acid, or even by aqua-regia. The reason of this insolubility is, that the calx being well dephlogisticated, is either not taken up at all, or in very small quantity; and besides, being involved in strong particles, the menstrua can scarce have access to it. The following method is recommended by our author as one by which this process may be nearly effected.

37 Chrystalline ores of tin.

"To a very subtile powder of the crystalline tin ore obtained not only by levigation but elutriation, let there be added a quantity of concentrated vitriolic acid, and let this be exposed to a strong digesting heat for several hours: then pour on a small portion of concentrated marine acid; and upon agitating it, a vehement effervescence immediately begins, with a considerable heat arising from the marine acid, which is partly deprived of its water by the vitriolic, and generates a marine acid air. By this method the forces of the two are conjoined: water is to be added in about an hour after, and the clear liquor decanted after the sediment has fallen. This operation is to be repeated with the residuum until the acids can dissolve no more. What remains finally undissolved is nothing more than the stony matrice. Let the solution precipitated by means of aerated alkali $=a$, and the quantity of regulus will be $\frac{100a}{131}$. The subtile atoms of the crystalline ore, intimately mixed with any matrice, may, after due pulverisation, be separated by washing from a given portion, as the crystals are nearly of six times the specific gravity of water; so that they not only exceed the gravity of the earthy particles, but that of the ores of other metals, and approach even to the lighter metals themselves. The crystalline particles, after being separated, are exposed to the trial above described. The larger destinct crystals can seldom be employed: the most common ore contains particles of them very much dispersed."

The adventitious metals usually found in tin are copper and iron.

38 Bismuth, 9. *Ores of Bismuth.* This semimetal, when native, is easily taken up by nitrous acid, and may then be precipitated by water; after which any other metals that happen to be mixed with the bismuth remain in the liquor, and may be separated by the methods already frequently described. When mineralized by sulphur, the ore is decomposed by slight boiling in the same menstruum; so that the sulphur may be at last obtained; which when washed and collected is to be examined as to its purity and quantity. The solution of the metallic part precipitated by water leaves a white calx; and supposing its weight $=a$, that of the corresponding metal will be $\frac{100a}{113}$.

Iron is sometimes met with in these ores, which may easily be discovered after the separation of the bismuth.

39 Mineralized. Bismuth in form of a calx, whether alone or mineralized by aerial acid, is also soluble in nitrous acid, and may be precipitated by water, upon which the heterogeneous matters remain in the liquor. The presence of cobalt is discoverable by its communicating a red colour.

10. *Ores of Nickel.* This substance, when found native, may be dissolved by the nitrous acid; and when precipitated by aerated alkali, yields a calx which almost always contains iron, arsenic, and cobalt, in the same proportions in which they usually accompany the regulus obtained in the common way. If silver and bismuth happen to be present, which, however, is very seldom the case, the former is to be precipitated by common salt before the latter is employed. Sulphur may be separated and collected during solution. Essaying. 40 Nickel,

Nickel, mineralized by vitriolic acid, is scarcely ever without iron. A great part of the latter, however, is separated by long and violent boiling in water. Aerated alkali throws down a greenish white precipitate; and if we suppose the weight of this $=a$, that of the reguline nickel is $=\frac{100a}{135}$. The same metal mineralized by aerial acid is dissolved by spirit of nitre, and may be precipitated by means of mild alkali. 41 Mineralized.

11. *Ores of Arsenic.* The purity of native arsenic may be examined by dissolving it in four times its weight of aqua-regia, and the solution slowly evaporated without any separation of the metal. The arsenic is then to be precipitated by water, and collected upon a filter; the heterogeneous metals will be contained in the clear liquor which passes through the filter. If any silver be present, it falls to the bottom in conjunction with the marine acid. Iron is hardly ever absent altogether, and is frequently in such quantity, that the mass has a polished appearance, most commonly crystalline, and is commonly known by the name of *mispickel.* 42 Arsenic,

Arsenic mineralized by sulphur is to be dissolved in marine acid, with the addition of the nitrous occasionally, in greater or lesser quantities, so that the sulphur may be separated free from all metallic matter. The sulphur collected, washed, and weighed, indicates the quantity of the arsenical part. This, however, ought to be precipitated separately by water, and weighed; a step which is always necessary where great accuracy is required. Arsenic dissolved by marine acid may also be precipitated in its metallic form by zinc; the solution being previously weakened by spirit of wine. When sulphur alone is united to the arsenic by its different proportions, it produces different colours, from a dilute yellow to an intense red. But if a considerable portion of iron also enters the composition, a white colour is generated, and a very different species of pyrites formed, which is called the *arsenical pyrites.* This may be analyzed by solution in marine acid in the manner already described. 43 Mineralized by sulphur.

In analyzing arsenical ores in general, we must take care not to add too much nitrous acid, as we would thus take away the whole of the phlogiston, and disengage the arsenical acid. The smallest quantity sufficient for solution ought therefore to be employed; otherwise water will occasion no precipitation; and even with all our caution, it is scarce possible to prevent a small portion of the arsenical acid from being disengaged, especially if the boiling be long continued. This may be recovered by evaporating to dryness, though rarely alone, but united either with the alkaline earths or the metals which are present. Some of the arsenic easily flies off. 44 Too much acid of nitre must not be used.

12. *Ores of Cobalt.* This semimetal, when native, almost

45 Cobalt,

almost always contains iron, arsenic, and frequently nickel; whence no doubt it is, that some authors have said that vitriolated cobalt is of a green colour, as well as the other salts containing this semimetal; but the truth is, that they are of an obscure red, unless the nickel be in large quantity. To separate these metals from one another, dissolve the compound mass in water, evaporate to dryness, and extract the cobalt with vinegar. Let the weight of the precipitate be a, and that of the corresponding regulus will be $\frac{100a}{160}$. If the arsenic be abundant in the evaporated solution, it may perhaps be precipitated by the effusion of water. Cobalt united with sulphur may be treated in the same way, as it differs from the native cobalt only in containing a small quantity of sulphur, which is to be separated and collected.

46 Mineralized by vitriolic acid.

Cobalt has been discovered by Mr Brandt in a state of union with vitriolic acid, along with a large quantity of iron, and without any arsenic. This may be examined by solution in aqua regia. The solution is yellow with scarce any redness, on account of the great quantity of iron. By boiling it assumes an obscure green, and resumes its former colour; a property by which the existence of cobalt is always known. The ore does not appear to contain any sulphur; but a few drops of solution of terra ponderosa dissolved in marine acid immediately discovered the vitriolic acid. Scarce any vestige of arsenic was to be met with. The vitriolic acid, however, though present in such abundance, was yet so far dephlogisticated, that it could not unite with the semimetal into a vitriolated cobalt, and therefore must be considered only as an impurity.

47 Trichetes an ore of cobalt.

The trichetes of the Greeks, which is found in the mines of Herngrund and Idua, adhering to an argillaceous stone, is found to contain a real cobalt, besides the clay and vitriolic acid. It can only be precipitated by the phlogisticated alkali.

48 Arsenicated cobalt.

Cobalt frequently exhibits beautiful red efflorescences, sometimes more dilute, and sometimes of a deeper colour. Sometimes it appears like a loose powder, sometimes concrete, and at times forming most beautiful crystals radiating from a centre like a star. These substances always show some vestiges of arsenic; but as this substance is incapable, either in its reguline or calcined state, of imparting a red colour to arsenic, it is reasonable to suppose that it is done by the arsenical acid itself, as all acids have the property of communicating a red colour to cobalt. To determine this point, Mr Bergman made the following experiments. 1. Having artificially combined the acid of arsenic with cobalt, he found an exact resemblance betwixt this compound and the natural crystals abovementioned. 2. On account of the scarcity of the latter substance, he extracted the pure acid of arsenic, first separating it by vitriolic acid, and then absorbing the latter by highly rectified spirit of wine, which takes up only the superfluous acid, leaving the vitriolated cobalt untouched. Natural arsenicated cobalt is scarcely soluble in water, unless the latter be sharpened by an acid; and when thus dissolved it should be precipitated by mild alkali, to discover the quantity of semimetal. Cobalt artificially combined with arsenical acid, and dried, shows the same properties with the natural.

The black calx of cobalt is generally found concreted into an hard mass, known by the name of the *glassy ore of cobalt*. This, when pulverised, may be dissolved in the marine acid or aqua-regia, and examined like the former.

49 Glassy ore of cobalt.

50 Zinc.

13. *Ores of Zinc.* If ever this semimetal occurs in a native state, its purity may be easily determined, as it is readily soluble in all the acids; and whatever heterogeneous metal is present may be precipitated by zinc.

51 Mineralized by sulphur and iron.

The pseudo-galena which contains zinc mineralized by sulphur, together with iron, must be carefully treated with nitrous acid, in order to extract the metallic part without decomposing the sulphur. If no other metal than iron be present, it may be precipitated by zinc; but if others also are combined with it, the iron must be calcined, by repeatedly abstracting nitrous acid to dryness and a new solution, made by vinegar or any other acid, examined.

52 White vitriol analysed.

To analyse the combination of vitriolic acid and zinc, dissolve the salt in water, and precipitate the solution with mild fixed alkali; when, if the weight of the precipitate be a, that of the regulus will be $\frac{100a}{193}$. When iron is present, as is usually the case, it ought to be precipitated by a known weight of zinc.

53 Zinc mineralized by fixed air.

This semimetal, mineralized by aerial acid, ought to be dissolved in some of the mineral acids, and then precipitated by phlogisticated alkali, or mild fixed alkali. When the former is employed, the weight of the sediment must be divided by 5, in order to ascertain that of the metallic part.

54 Antimony.

14. *Ores of Antimony.* The purity of this semimetal, when found native, may be examined by reducing it to a calx with strong nitrous acid: in which case, if it has been enrirely pure, there will remain only a small part dissolved in the water, and which will separate on the addition of water. When mineralized by sulphur, the metallic part is taken up by aqua-regia, and the sulphur remains pure. The solution, by boiling with strong nitrous acids, lets fall a calcined antimony; which being separated, the remaining liquor may be examined by phlogisticated alkali or otherwise at pleasure.

55 Combined with arsenic.

By the addition of a certain quantity of arsenic, crude antimony grows red, frequently exhibiting beautiful fasciculi of filaments radiating from a centre. The presence of arsenic may be discovered by gently boiling the powder in aqua-regia until the sulphur be obtained pure. The arsenic and antimony are contained in the clear solution, and may be separated in the following manner. Let concentrated nitrous acid be poured on, and the antimony reduced to a white calx by boiling. Let this be collected on a filter; and the liquor that passes through affords arsenic by evaporation, but generally deprived of phlogiston, or reduced to the state of arsenical acid. As the caustic alkali also takes up both sulphur and antimony, it may be advantageously employed, especially for the separation of silver, or other metals which do not yield to this menstruum. A hepar sulphuris is indeed produced; but in this case it dissolves little or nothing.

56 Manganese

15. *Ores of Manganese.* This semimetal accompanies most of the ores of iron, though it has likewise ores of its own in which it predominates, but seldom to be met with. It has never been found native or mineralized by sulphur, but commonly occurs in the form of a calx, generally alone and black, though sometimes mineralized

Essaying. mineralized by the aerial acid. These ores, after being reduced to a subtile powder, must be immersed in any acid, particularly one of the mineral kind, together with a small piece of sugar, in order to supply the phlogiston necessary for dissolving the manganese. Fresh acid is to be poured repeatedly on the calx with sugar, until no more can be extracted by a digesting heat; after which the solution is to be precipitated by mild alkali: and if we suppose the weight of the sediment $=a$, that of the corresponding regulus will be $\frac{100a}{180}$. The insoluble residuum at bottom either contains heterogeneous mixtures or belongs to the matrice.

57
Combined with aerial acid. To separate the iron from calx of manganese combined with aerial acid, nitrous acid is to be repeatedly abstracted from the ore, and the heat, after each addition, increased to ignition; after which the manganese will be obtained pure, or at least contaminated with iron in a much smaller degree than before. It may then be separated by strong concentrated vinegar or diluted nitrous acid. Manganese, when precipitated from superabundant nitrous acid by phlogisticated alkali, totally dissolves in distilled water; which property affords likewise a method of separating it perfectly from iron.

58
Method of essaying silver and gold. Besides the foregoing kind of operations which relate only to the ores of metals, *essaying* is used in metallurgic operations to signify the method of determining how much gold or silver is contained in any mass of metal already smelted from its ore.

1. *Essay of the Value of Silver*, to examine its purity, or the quantity of alloy mixed with it. The common method of examining the purity of silver, is by mixing it with a quantity of lead proportionable to the quantity of imperfect metals with which it is supposed to be alloyed; by testing this mixture; and afterwards by weighing the remaining button of silver. The loss of weight which the silver suffers by cupellation shows the quantity of imperfect metals which it contained.

We may hence perceive, that the essay of silver is nothing else than the refining of it by cupellation. The only difference between these two operations is, That when silver is tested merely for the purpose of refining it, its value is generally known; and it is therefore mixed with the due proportion of lead, and tested, without any necessity of attending to the loss of weight it sustains during the operation; whereas, in the essay, all possible methods ought to be employed to ascertain precisely this loss of weight. The first of these operations, on the mere refining of silver, is made in the great, in the smelting of silver ores, and in mints for making money *. The second operation is never made but in small; because the expences of small operations are less than of great, and in the requisite accuracy is more easily attended to. The last operation is our present object, and is to be performed in the following manner.

* See *Refining*.

We suppose, first, that the mass or ingot of silver of which an essay is to be made, consists of 12 parts perfectly equal; and these 12 parts are called *penny-weights*. Thus, if the ingot of silver be an ounce weight, each of these 12 parts will be $\frac{1}{12}$ of an ounce; or if it be a mark, each of these will be $\frac{1}{12}$ of a mark, &c. Hence, if the mass of silver be free from all alloy, it is called *silver of 12 penny-weights*; if it contains $\frac{1}{12}$ of its weight of alloy, it is called *silver of 11 penny-weights*; if $\frac{2}{12}$ of its weight be alloy, it is called *silver of 10 penny-weights*; and these 10 penny-weights or parts of pure silver are called *fine penny-weights*.

Chem. Dict.

We ought to observe here concerning these penny-weights, that essayers give also the name *penny-weight* to a weight equal to 24 real grains; which latter real penny-weight must not be confounded with the former, which is only ideal and proportional; and such a confusion is the more likely to take place, as this ideal penny-weight is also, like the former, divided into 24 ideal grains, which are called *fine grains*.

An ingot of fine silver, or silver of 12 penny-weights, contains then 288 fine grains; if this ingot contains $\frac{1}{288}$ part of alloy, it is said to be *silver of 11 penny-weight and 23 grains*; if it contains $\frac{2}{288}$ of alloy, it is called *silver of 11 penny-weight and 22 grains*; if it contains $\frac{14}{288}$, it is called *silver of 11 penny-weight and 10 grains*; and so on. Lastly, the fine grain has also its fractions, as $\frac{1}{2}$, $\frac{1}{4}$ of a grain, &c.

As essays to discover the value of silver are always made in small, essayers only take a small portion of an ingot for the trial; and the custom in France is to take 36 real grains for this purpose, which is consequently the largest weight they employ, and represents 12 fine penny-weights. This weight is subdivided into a sufficient number of other smaller weights, which also represents fractions of fine penny-weights and grains. Thus 18 real grains, which is half of the quantity employed, represents six fine penny-weight; three real grains represent one fine penny-weight, or 24 fine grains; a real grain and a half represent 12 fine grains; and $\frac{1}{32}$ part of a real grain represents $\frac{1}{4}$ part of a fine grain, which is only $\frac{1}{752}$ part of a mass of 12 penny-weights.

We way easily perceive, that weights so small, and essay-balances, ought to be exceedingly accurate. These balances are very small, suspended and inclosed in a box the sides of which are panes of glass, that they may be preserved from dust, and that their motion may not be affected by agitated air, so as to disorder their action *.

* See (Essay) *Balance*.

When an essay of a mass or ingot of silver is to be made, the custom is to make a double essay. For this purpose, two fictitious semi-marks, each of which may be equal to 36 real grains, are to be cut from the ingot. These two portions of silver ought to be weighed very exactly; and they ought also to have been taken from opposite sides of the ingot.

Persons accustomed to these operations know pretty nearly the value of silver merely by the look of the ingot, and still better by rubbing it on a touchstone. By the judgment they form of the purity of the ingot, they regulate the quantity of lead which is to be added to it, as this quantity must be always proportionable to the quantity of imperfect metal mixed with the silver.

Nevertheless, this proportion of lead to the alloy has not been precisely determined. Authors who treat of this subject differ much. They who direct the largest quantity of lead say, that thereby the alloy is more certainly destroyed; and others who direct a small quantity of lead, pretend, that no more of that metal ought

Essaying. Essay of Silver.

ought to be used than is absolutely necessary, because it carries off with it always some portion of silver. Every essayer uses his own particular method of proceeding, to which he is attached.

To ascertain these doubtful points, three chemists of the Academy of Sciences at Paris, Messrs Hellot, Tillet, and Macquer, were appointed by the French government. They were directed to ascertain every thing concerning the essay of gold and silver by authenticated experiments, made under the inspection of a minister whose superior knowledge is equal to his desire of public good, and in presence of the officers of the mint.

The experiments made by these chemists, and the consequent regulation, have determined that four parts of lead are requisite for one part of silver of 11 penny-weight and 12 grains, that six parts of lead are requisite for silver of 11 penny-weight, eight parts of lead for silver of 10 penny-weight, 10 parts of lead for silver of nine penny-weight, and so on in the same progression.

Two cupels of equal size and weight are to be chosen. The custom is to use cupels of such a size that their weight shall be equal to that of one half of the lead employed in the essay; because such cupels have been found capable of imbibing all the litharge formed during the operation. These cupels are to be placed together under a muffle in an essay-furnace. The fire is to be kindled, and the cupels are to be made red-hot, and to be kept so during half an hour at least before any metal be put into them. This precaution is necessary to dry and calcine them perfectly; because if they contained any moisture or inflammable matter, an ebullition and effervescence would be occasioned in the essay. When the cupels are heated so as to become almost white, the lead is to be put into them; the fire is to be increased, which is done by opening the door of the ash-hole so as to admit air, till the lead becomes red, smoking, and is agitated by a motion of its parts called its *circulation*, and till its surface becomes smooth and clear.

Then the silver, previously beat into small plates for its easier fusion, is to be put into the cupels; the fire is to be continued and even increased, by putting hot coals at the mouth of the muffle, till the silver shall have *entered the lead*, that is, till it have melted and mixed with the lead. When the melted matter circulates well, the heat is to be diminished by taking away, partly or entirely the coals put at the mouth of the muffle, and by closing more or less the doors of the furnace.

The heat ought to be regulated so, that the essays in the cupels shall have surfaces sensibly convex, and shall appear ardent, while the cupels are less red; that the smoke shall rise almost to the roof of the muffle; that undulations shall be made in all directions upon the surfaces of the essays, which are called *circulations*; that their middles shall be smooth, and surrounded with a small circle of litharge, which is continually imbibed by the cupels.

The essays are to be kept in this state till the operation is finished, that is, till the lead and alloy have soaked into the cupel; and the surfaces of the buttons of silver being no longer covered with a pellicle of litharge, becomes suddenly bright and shining, and are then said to *lighten*. If the operation has been well conducted, the two essays ought to become bright nearly at the same time. When the silver has been by this operation well refined, we may see, immediately after it has brightened, the surface of the silver covered with rainbow colours, which quickly undulate and cross each other, and then the buttons become fixed or solid.

The management of the fire is an important article in essays. For if the heat be too great, the lead is scorified and imbibed by the cupel so quickly, that it has not sufficient time to scorify and carry along with it all the alloy; and if the heat be too little, the litharge is gathered upon the surface, and does not penetrate the cupel. The essayers say then, that the essay is *choaked or drowned*. In this case the essay does not advance; because the litharge covering the surface of the metal defends it from the contact of air, which is absolutely necessary for the calcination of metals.

We have above related the marks of a successful essay. The heat may be known to be too great, from the convexity of the surface of the melted metal; from a too strong circulation; from the too vivid appearance of the cupel, so that the colours given to it by the litharge cannot be distinguished; and, lastly, by the smoke rising up to the roof of the muffle, or not being at all visible from its being so ardent and red-hot as not to be distinguishable. In this case, the heat must be diminished by shutting the door of the ash-hole: some essayers, for this purpose, put round the cupels small, oblong, cold pieces of baked clay, which they call *instruments*.

If, on the contrary, the melted metal have a surface not very spherical, relatively to its extent; if the cupel appear dark-coloured, and the smoke of the essay do only creep upon the surface; if the circulation be too weak, and the scoria, which appears like bright drops, have but a dull motion, and be not soaked into the cupel; we may be assured that the heat is too weak; much more may we be assured of it when the metal *fixes*, as the essayers call it. In this case, the fire ought to be increased by opening the door of the ash-hole, and by placing large burning coals at the mouth of the muffle, or even by laying them across upon the cupels.

As soon as the lead is put into the cupels, the fire is to be increased, because they are then cooled by the cold metal; and the lead ought to be quickly melted, to prevent its calx from collecting upon its surface in too great quantity before it be formed into litharge; which it would do, and be difficultly fused, if the heat were too weak.

When the silver is added to the lead, the heat must be still increased; not only because the silver cools the mass, but because it is less fusible than lead. And as all these effects ought to be produced as quickly as possible, more heat is at length given than ought to be continued; and therefore when the silver has entered the lead, the heat is to be diminished till it becomes of a due intensity for the operation.

During the operation, the heat ought gradually to be augmented to the end of it, both because the metallic mixture becomes less fusible as the quantity of lead diminishes; and also because the lead is more difficultly scorifiable, as it is united with a larger proportion of silver. Hence the essays must be rendered very hot before they brighten.

Essay of Silver.

When the operation is finished, the cupels are left in the same heat during some seconds, to give time to the last portions of litharge to be entirely absorbed; because, if any of it remained under the buttons of silver, it would stick to them. The fire is then allowed to extinguish, and the cupels to cool gradually, till the buttons have entirely fixed, particularly if they be pretty large; because if they cool too quickly, their surfaces fix and contract before the internal mass, which is thereby so strongly compressed as to burst through the external solid coat and form vegetations, or even to be entirely detached from the rest of the mass, and dissipated. This is called *the vegetation of the button*. It ought to be carefully prevented, because small bits of silver are sometimes thrown out of the cupel.

Lastly, when the buttons are thoroughly fixed, they are to be disengaged from the cupels by a small iron utensil while they are yet hot; otherwise they could not be disengaged clean and free from part of the cupels, which strongly adhere to them when the heat is much diminished.

Nothing then remains to complete the essay, but to weigh the buttons. The diminution of weight which they have sustained by cupellation will show the purity or value of the ingot of silver.

We ought to observe, that as almost all lead naturally contains silver, and that after cupellation this silver is mixed with the silver of the ingot in the button of the essay; before we employ any lead in this operaration, we ought to know how much silver it contains, that we may subtract this quantity from the weight of the button, when we compute the fineness of the silver of the ingot essayed. For this purpose essayers generally cupel a certain quantity of their lead separately, and weigh accurately the button of silver it yields: or, at the same time when they essay silver, they put into a third cupel, in the muffle, a quantity of lead equal to that employed in both their essays; and when the operation is finished, and the buttons are to be weighed, they throw the small button produced from the lead alone into the scale which contains the weights; and as this exactly counterpoises the small portion of silver which the essay buttons have received from the lead employed in the cupellation, the weights will show precisely the quantity of silver contained in the ingot, and thus the trouble of calculating is prevented. The small button of silver procured from the cupellation of lead alone is called the *witness*. But to prevent this trouble, essayers generally employ lead which contains no silver, such as that from Willach in Carinthia, which is therefore procured by essayers.

In the second place, we shall observe, that a certain quantity of silver always passes in the cupel, as refiners in the great have long observed, and which happens also in essaying small quantities. The quantity of silver thus absorbed, varies according to the quantity of the lead employed, and the matter and form of the cupels; all which objects will undoubtedly be determined by the abovementioned chemists.

The cupellation which we have now described is exactly the same for essays by which the produce of a silver ore, or of an ore of another metal containing silver, is determined. But as these ores contain frequently, gold, and sometimes in considerable quantity, when these essays are made, the buttons of silver obtained by the essays ought to be subjected to the operation called *parting*. See Silver, Refining, &c.

M. Tillet has published a memoir, showing that essays of silver made in the common method are uncertain and not to be depended upon; and that this uncertainty proceeds from the different quantities of silver absorbed by the cupel in different essays, according as the heat and other circumstances happened to vary. He therefore proposes, in order to render essays accurate, to extract from the cupel the quantity of silver it has absorbed during the operation, and to add this particle of silver to the button, as these two contain the whole quantity of silver in the matter essayed.

The variations in the different results of different essayers, or of the same essayer at different times, upon the same mass of silver, are sufficient proofs of the uncertainty mentioned by M. Tillet. These variations are occasioned, according to that author, principally from the following causes: 1. From the inaccuracy of the balances and weights employed. 2. From the faulty fusion of the mass to be essayed; by which means the contained alloy may be unequally diffused. 3. From the impurity of the lead, especially from its containing silver, which is not always equally diffused through its mass. 4. From the different proportions of lead used by different essayers. 5. From the difference of the intensity of heat; for if the heat be not sufficiently intense, the silver will still contain a portion of alloy; and if the heat be too intense, too much of the silver will be imbibed by the cupel. 6. From the want of care in picking the small particles of silver, which frequently adhere to the sides of the cupel separately, from the principal button. 7. From the spurting which sometimes happens unobserved by the essayer; and which may further falsify the essays of other pieces included under the same muffle, by the falling of the particles thrown out of one cupel into others adjacent. But, with all the attentions to avoid these causes of error, the author obtained different results from different essays of the same mass of silver. Nor could he, by any method, make his different essays consistent with each other, but by adding to each button the particle extracted from the cupel; and this method he found by accurate experiments to be perfectly exact.

M. Tillet observed, that the quantity of lead directed in the regulations established in consequence of the report made by Messrs Macquer, Hellot, and Tillet, is not sufficient to purify the silver perfectly from its alloy. He nevertheless approves of the said regulation; and considers the weight of the alloy retained by the button, as some compensation for the weight of the silver absorbed by the cupel. And as it is a constant fact, that the more lead is used, the greater is the loss by the absorption of the cupel, he remarks, that a regulation, directing a larger proportion of lead for France then is used in other countries, would be disadvantageous to that kingdom; as thereby the silver of the same denomination would be required to be finer in that than in other countries where a less proportion of lead was employed. He observes that the above mentioned rule, "that the more lead is used, the greater is the loss by the absorption of the cupel," does not extend to quantities of lead much above double the usual quantities. Thus 32 parts of lead to one of silver, will not occasion more absorption than 16 parts of lead, Essay of Gold.

lead. For the refining scarcely takes place till the extraordinary quantity of lead be gone, and the silver is only or chiefly carried into the cupel along with the copper. Accordingly, he found, that he could render the silver finer by using four parts of lead at first, and afterwards adding two more parts when the irises began to appear, than by employing all the six parts of the lead at once. By this method of dividing the quantity of lead, the loss of silver by absorption was greater. M. Tillet did not find, that, by employing bismuth alone, or mixed with lead, his essays were more certain that when lead alone was used. He observed, however, than the addition of bismuth made the silver purer, but occasioned a greater absorption by the cupel.

2. *Essay of the Value of Gold.* The fictitious weights used to determine the purity of gold, and to essay this metal, are different from those of silver. See the preceeding article. A mass of gold perfectly pure, or which contains no alloy, is ideally divided into 24 parts, called *carats*; this pure gold is therefore called *gold of 24 carats.* If the mass or ingot contains $\frac{1}{24}$th part of its weight of alloy, the gold is then of 23 carats; and if it contains $\frac{2}{24}$th or $\frac{1}{12}$th of alloy, it is gold of 22 carats, &c. Hence we see, that the carat of gold is only a relative and proportional weight, so that the real weight of the carat varies according to the total weight of the mass of gold to be examined. If this mass of gold weighs a mark, the real weight of the carat will be $\frac{1}{24}$ of eight ounces, which is equal to a mark. If the mass weigh an ounce, the carat will be $\frac{1}{24}$th part of an ounce, or 24 grains. If it is only a penny-weight or 24 grains, the real weight of a carat will be one grain; and so on.

For the greater accuracy, the carat of gold is divided into 32 parts, which are relative and proportional weights, as the caret itself is. Thus $\frac{1}{32}$d of a carat of gold is $\frac{1}{32}$d of $\frac{1}{24}$th, or the $\frac{1}{768}$th of any mass of gold: and the gold which contains an alloy equal to the $\frac{1}{768}$th part of the whole mass is called *gold of 23 carats, and* $\frac{31}{32}$; gold which contains $\frac{2}{768}$th of alloy is *gold of 23 carats and* $\frac{30}{32}$; and so on.

The real weight now generally used in the operation for determining the purity of gold is six grains. This weight then represents 24 carats. The half of this weight, or three real grains, represents 12 carats. According to this progression, we will find that $\frac{1}{4}$th of a real grain represents one carat, and the $\frac{2}{128}$th part of a grain represents the $\frac{1}{32}$d of a carat, or the $\frac{1}{768}$th part of a mass of gold to be essayed.

As these weights are exceedingly small, some essayers employ a weight of 12 grains, which must be very convenient.

When a mass or ingot of gold is to be essayed, six grains are to be cut off, and exactly weighed; also 18 grains of fine silver are to be weighed. These two metals are to be cupelled together with about ten times as much lead as the weight of the gold. This cupellation is conducted precisely like that of the essay to determine the purity of the silver, excepting that the heat must be raised a little more towards the end of the operation when the essay is going to brighten. Then the gold is freed from all alloy but silver. If the quantity of coppper or other alloy destructible by cupellation be required to be known, the remaining button is accurately weighed. The diminution of weight from the sum of the weights of the gold and of the silver determines the quantity of this alloy.

Essay-hatch || Essence.

The button containing gold and silver is then to be flattened upon a polished piece of steel, and care must be taken to anneal it from time to time, to prevent its splitting and cracking. By this method it is reduced to a thin plate, which is to be rolled up, in order to be parted by aquafortis*. The diminution found after the parting from the original weight of the gold essayed, shows the whole quantity of alloy contained in that gold.

* See *Parting.*

The essay for determining the purity of gold is then made by two operations: the first, which is cupellation, deprives it of all its imperfect metals; and the second, which is parting, separates all the silver from it. By antimony also gold may be purified, which is a kind of dry parting. By this single operation, all the imperfect metals, and silver with which gold is allayed, are separated. See PURIFICATION, GOLD, SILVER, REFINING.

Essay-Hatch, is the miners term for a little trench or hole, which they dig to search for shoad or ore.

ESSEDARII, a sort of gladiators, mentioned by Seneca, Suetonius, and Tully, who on some occasions engaged one another out of chariots called *esseda*. The *essedum* was a sort of heavy chariot from which the Gauls and Britons engaged the Romans. See GLADIATOR.

ESSENCE, in metaphysics, that which constitutes the particular nature of each genus or kind, and distinguishes it from all others: being nothing but that abstract idea to which this name is affixed, so that every thing contained in it is essential to that particular kind.

This Mr Locke calls the *nominal essence;* in contradistinction to the real essence, or constitution of substances on which this nominal essence depends. Thus the nominal essence of gold is that complex idea the word *gold* stands for; let it be for instance, a body, yellow, weighty, malleable, fusible, and fixed: but its real essence is the constitution of its insensible parts, on which these qualities and all its other properties depend, which is wholly unknown to us.

ESSENES, or ESSENIANS, in Jewish antiquity, one of the three ancient sects among that people. They allowed a future state, but denied a resurrection from the dead. Their way of life was very singular: they did not marry; but adopted the children of others, whom they bred up in the institutions of their sect: they despised riches, and had all things in common, and never changed their clothes till they were entirely worn out. When initiated, they were strictly bound not to communicate the mysteries of their sect to others; and if any of their members were found guilty of enormous crimes, they were expelled.

Pliny tells us, that they dwelt on the west side of the lake Asphaltites; and that they were a solitary kind of men, living without women or money, and feeding upon the fruit of the palm-tree: he adds, that they were constantly recruited by new comers, whom the surges of ill fortune had made weary of the world; in which manner the sect was kept up for several thousands of years, without any being born among them. The reason why we find no mention made of them in the New Testament, may be their recluse and retired way of life, not less than their great simplicity

of

and honesty, whereby they lay open to no censure or reproof.

ESSENTIAL, something necessarily belonging to a thing, from which it cannot be conceived distinct: thus the primary qualities of bodies, as extension, figure, number, &c. are essential or inseparable from them in all their changes and alterations.

Essential Oils are such as are really contained in a plant, and are drawn from it by distillation in an alembic with water: they are thus called, in contradistinction to empyreumatic oils, which are raised by a naked fire without water.

ESSEX, a county of England, bounded on the north by the Stour, which separates it from Suffolk and Cambridgeshire; on the east, by the German sea; on the west, by Hertfordshire and Middlesex; and on the south by the river Thames. It extends 46 miles in length from E. to W. and about 42 in breadth from N. to S. and 200 in circuit. This county is in the diocese of London, and gives title of Earl to the family of Capel. It is divided into 19 hundreds, and contains 27 market-towns, 415 parishes, 125 vicarages, and 1100 villages, with about 34,800 houses, and 208,800 inhabitants. It sends eight members to parliament; namely, two for the county, and two for Colchester, Harwich, and Malden. The air in the inland parts is healthy; but in the marshes near the sea it produces agues, particularly in the part called the Hundreds. However, the fertility of the unwholesome part is very great, and even the higher grounds of this county are very fruitful. About Saffron Walden, the earth, after bearing saffron three years, it is said, will produce good barley for 18 years successively without any manure. Its produce, which is very plentiful, consists of corn, most excellent saffron, cattle, fowl, fish, and particularly oysters. The chief manufactures of this county are cloth, stuffs, and particularly baize. The principal rivers, besides the Thames, are the Stour, which falls into the German sea at Harwich; the Lea, its western boundary, falls into the Thames below Stradford; the Blackwater runs thro' the heart of the county, and passing by Chelmsford is joined by the Chalmer, and from thence runs into the German sea; the Coln runs by Haisted to Colchester, and so into the sea. The Roding which rises northwards, near Dunmow, runs into the Thames near Barking. All these rivers abound in most sorts of fish.

ESTATE, in law, signifies the title or interest that a person has in lands, tenements, or other effects; comprehending the whole in which a person hath any property, and will pass the same.

Estates are either real or personal; otherwise distinguished into FREEHOLDS, which descend to heirs; or CHATTELS, that go to executors or administrators.

A fee-simple is the amplest estate our law admits of. See FEE.

Estates are obtained several ways; as, by descent from a father to a son; by conveyance or grant from one person to another; by gift or purchase; or by deed or will. See DESCENT, SUCCESSION, TENURE, &c.

ESTATES, in a political sense, is used either to denote the dominions of some prince, or the general classes into which people are divided.

In Britain, the estates are the king, lords, and commons: or rather the lords and commons, who meet the king, in parliament, for reforming abuses, and enacting good and wholesome laws.

ESTHER, a canonical book of the Old Testament; containing the history of a Jewish virgin, dwelling with her uncle Mordecai at Shushan, in the reign of Ahasuerus, one of the kings of Persia.

The great beauty of this maid raised her to the throne of Persia; whereby she had an opportunity to save her countrymen, whose destruction was plotted by Haman, a favourite of that prince.

The learned are not agreed who this Ahasuerus was. Archbishop Usher supposes him to be Darius Hystaspes, and Artystona to be Esther. Scaliger makes him the same with Xerxes, and his queen Hanestris to be Esther. Josephus, on the contrary, positively asserts, that the Ahasuerus of the scriptures, is the Artaxerxes Longimanus of profane story; and the Septuagint, throughout the whole book of Esther, translate Ahasuerus by Artaxerxes. Most people subscribe to this last opinion; and indeed the extraordinary kindness showed by Artaxerxes to the Jews, can scarce be accounted for otherwise than by supposing that they had so powerful an advocate as Esther to solicit for them.

ESTOILE'E or CROSS ESTOILLE'E, in heraldry, a star with only four long rays in form of a cross; and, accordingly, broad in the centre, and terminating in sharp points.

ESTONIA, is a province of the Russian empire, and part of Livonia. It is bounded on the east by the Baltic sea, on the north by the Gulph of Finland, on the west by Ingria, and on the south by Lettonia. It is divided into six districts: 1. Harrien; 2. Wireland; 3. Alentakin; 4. Wich; 5. Jerven, and, 6. Odepoa. The principal towns are, Revel, Weisenberg, Borchholm, Narva, Nyslot, Habsal, Derpt, St Elin, Pernau, and RodersWick.

In former times the inhabitants of this country carried on a good trade in corn, which was dried in stoves; but wars have much depopulated the country, insomuch that not a fourth part of it is inhabited, and a great number of gentlemen's seats lie in ruins.

ESTOPPEL (formed of the French *estouper*, *oppilare*, *ostipare*, "to stop, or block up"), in law, an impediment or bar of action, arising from a man's own act or deed; against which a man is forbidden, by law, to speak, though it be to say the truth.

ESTOVERS, in law, is used, by Bracton, for that sustenance which a man, committed for felony, is to have out of his lands or goods for himself and his family during imprisonment. In stat. 6 Edw. I, it is, used for an allowance in meat or clothes. In some manors, the tenants have *common of Estovers*; that is, necessary botes or allowances out of the lord's wood: In which last sense, estovers comprehends house-bote, hay-bote, and plow-bote; so that if a man have in his grant these general words, *de rationabili estoveroi in boscis*, &c. he may thereby claim all three.

Estovers is also used for alimony, which, if the husband refuses to pay, there, is, besides the ordinary process of excommunication, a writ at common law, *de estoveriis habendis*, in order to recover it.

ESTRAY, or STRAY, signifies any tame beast, as sheep, oxen, swine, and horses, or swans, found within a lordship, and not owned by any man; in which case

case being cried, according to law, in the church, and two market towns adjoining, if it be not claimed by the owner within a year and a day, it becomes the lord's of the soil where found. If the owner claims it within the year and day, he must pay the charges of finding, keeping, and proclaiming them; and he may seize it, without telling the marks or proving his property, which may be done at the trial if contested. If the beast stray within the year to another lordship, the first lord cannot retake it. An estray must be fed and kept, uninjured, and without labour till it is reclaimed or the limited time expires.

ESTREAT, Extractum, in law, is used for the true copy or duplicate of some original writing, especially of amercements or penalties set down in the rolls of a court, to be levied by the bailiff or other officer, on every offender.

ESTREMADURA, a province of Spain, has New-Castle on the east, Leon on the north, Andalusia on the south, and Portugal on the west. It is 175 miles in length, and 100 in breadth; and its principal towns are, Calatrava, Menda, and Badajoz, on the river Guadiana; Alcantara, on the Tajo; and Cona and Placentia, to the north of this river.

This provice enjoys a very pure and healthful air, and its mountains are full of wild and tame animals; they having woods and forests for the one sort, and pastures for the other. The fields are planted with fruit-trees, which bear all kinds of delicious fruit. The vineyards produce excellent wines of all colours, and the fields yield plenty of corn.

Estremadura, a province of Portugal, near the mouth of the Tagus or Tajo, bounded on the north by Beira, on the east and south by Alentejo, and on the west by the Atlantic Ocean. It is about 88 miles in length, and 45 in breadth This province is divided into six comarcas, viz. Litria, Lisbon, Tomar, Santaren, and Alanquar, to the north of the Tagus; and that of Setubal, to the south of this river. These are likewise the principal towns. Estremadura is equal, if not preferable, to any other province in Spain or Portugal. The district of Santaren produces such plenty of corn, and feeds so many flocks of sheep, that it may enter into competition with Sicily. The fruits and the wines are all excellent; and it was here that the sweet oranges brought from China were first planted, and of which there are large quantities transported to foreign parts, with the wines and other fruits. The fields are covered with flowers almost all the year, from which the bees collect large quantities of fine honey. The olive trees are numerous, from which they have excellent oil. The rivers abound with good fish, and the mountains have quarries of several kinds.

ETCHING, a method of engraving on copper, in which the lines or strokes, instead of being cut with a tool or graver, are eaten in with aquafortis. See Engraving.

Etching is of a latter invention, though not very modern, than engraving with the tool; of which it was at first only an imitation, that was practised by painters and other artists, who could much sooner form their hands to, and attain a faculty of, working in this way, than with the graver. But being then nevertheless considered as a counterfeit kind of engraving, and therefore inferior to the other, it was cultivated in a very confined manner; the closeness of the resemblance of the work to that performed by the tool, being made the test of its merit, and consequently the principal object of aim in those who pursued it. The servile confinement of the art of etching to the imitation of the original kind of engraving, was a great cause of retarding its advancement towards perfection, as many of the most able masters cramped their talents with the observance of it; which may be seen in the instances of Sadelers, Swaneberg, Villamena, and particularly, Le Bosse; who, in his treatise on engraving, has laid down as a principle, that the perfection of this kind consists in the close similitude of the work with that done by the tool. This absurd prepossession has been since worn out: and the method of working with aquafortis has been so far improved, that instead of being now deemed a spurious kind of engraving, it evidently appears the foundation of an excellence in many modern works that could never have been produced without it: since, through the neatness and uniformity of the hatches, which attend the use of the tool, is more advantageous with respect to portraits; yet the liberty and facility of the other manner give a much greater opportunity to exercise the force of genius and fancy in history-engraving; where the effect of the whole, and not the minute exactness in finishing all the parts, constitutes the principal value.

There are two methods practised of engraving in this way; the one with a hard varnish or ground, the other with a soft. The first was formerly much used, being better accommodated to the intention of imitating the engraving with the tool; as the firmness of the body of the varnish gave more opportunity of retouching the lines, or enlarging them with the oval-pointed needles, called by the French *echoppes*, as was practised by Le Bosse and others for that purpose. The latter has now almost wholly superseded the use of the other, by the free manner of working it admits of; which affords a power of expression incompatible with the greater inflexibility of the hard varnish, that confines the lines and hatches to such a regularity and sameness, as gives a stiffness of mixture and coldness of effect to the work.

The mixture of the use of the tool and aquafortis, which are now both employed in many cases, has, however, given that perfection to engraving which it possesses at present. The truth and spirit of the outline that the method of working with aquafortis affords, and the variety of shades which the different kinds of black produce in this way, as well as other means of expressing the peculiar appearance and character of particular subjects, furnish what was defective in the sole use of the tool; while, on the other hand, the exactness and regularity of the lines, which are required for finishing many kinds of designs, are supplied by the graver; and by a judicious application of both, that complete finishing is obtained, which either of them alone must necessarily want.

The manner by which this art is performed, is the covering the surface of the plate with a proper varnish or *ground*, as it is called, which is capable of resisting aquafortis; and then scoring or scratching away, by instruments resembling needles, the parts of this varnish or ground, in the places where the strokes or hatches of the engraving are intended to be; then, the plate being covered with aquafortis, the parts that are laid naked and exposed by removing the ground or varnish, are corroded or eaten away by it; while the rest, being secured and defended, remain untouched.

There are two methods of etching, as hath been already observed; the difference of which from each other consists, as well in the difference of the varnish or ground, as in that of the aquafortis, adapted to each kind; but the general methods of performing them are alike in both. These varnishes or grounds are distinguished by the names of *hard* and *soft*: for in their consistence, or the resistance they give to the needles, lies their essential variation from each other. The hard varnish, it is with good reason conjectured, was not the first in use: but soon took place of the other: and was, for some time, the most received in practice, on account of its admitting the work to be made more like that of the graver: the soft has, however, since, in its turn, prevailed to the exclusion of it in some degree, except in the case of particular subjects; but not so entirely as to take away the expedience of showing how it is performed. The manner of etching with the soft varnish is now, however, one of the most important objects of the art of engraving; and it is at present in universal use, sometimes alone, but more frequently intermixed with the work of the tool, and in some cases with great advantage, even where the whole is intended to pass for being performed by the graver.

Preparation of the soft varnish: according to Mr Lawrence, an eminent English engraver at Paris. "Take of virgin wax and asphaltum, each two ounces; of black pitch and Burgundy pitch, each half an ounce. Melt the wax and pitch in a new earthen-ware glazed pot; and add to them, by degrees, the asphaltum finely powdered. Let the whole boil till such time as that, taking a drop upon a plate, it will break when it is cold, on bending it double two or three times betwixt the fingers. The varnish being then enough boiled; must be taken off the fire; and letting it cool a little, must be poured into warm water, that it may work the more easily with the hands, so as to be formed into balls, which must be rolled up, and put into a piece of taffety for use."

It must be observed, first, that the fire be not too violent, for fear of burning the ingredients; a slight simmering will be sufficient: secondly, that while the asphaltum is putting in, and even after is is mixed with them, the ingredients should be stirred continually with the spatula; and thirdly, that the water, into which this composition is thrown, should be nearly of the same degree of warmth with it, to prevent a kind of cracking that happens when the water is too cold.

The varnish ought always to be harder in summer than in winter; and it will become so if it be suffered to boil longer, or if a greater proportion of the asphaltum or brown resin be used. The experiment abovementioned, of the drop suffered to cool, will determine the degree of hardness or softness that may be suitable to the season when it is used.

Preparation of the hard varnish used by Callot, commonly called the Florence varnish. Take four ounces of fat oil very clear, and made of good linseed oil, like that used by painters: heat it in a clean pot of glazed earthen ware, and afterwards put to it four ounces of mastich well powdered; and stir the mixture briskly till the whole be well melted; then pass the whole mass through a piece of fine linen into a glass bottle with a long neck, that can be stopped very securely; and keep it for the use that will be below explained.

Method of applying the soft varnish to the plate, and of blackening it. The plate being well polished and burnished, as also cleansed from all greasiness by chalk or Spanish white, fix a hand-vice on the edge of the plate where no work is intended to be, to serve as a handle for managing it when warm: then put it upon a chafing-dish, in which there is a moderate fire; observing to hold it so that it may not burn: keep the plate over the fire till it be so hot that the varnish being brought into contact with it may melt: then cover the whole plate equally with a thin coat of the varnish; and while the plate is warm, and the varnish upon it in a fluid state, beat every part of the varnish gently with a small ball or dauber made of cotton tied up in taffety; which operation smooths and distributes the varnish equally over the plate.

When the plate is thus uniformly and thinly covered with the varnish, it must be blackened by a piece of flambeau, or of a large candle which affords a copious smoke; sometimes two, or even four, such candles are used together for the sake of dispatch, that the varnish may not grow cold: which if it does during the operation, the plate must then be heated again, that it may be in a melted state when that operation is performed: but great care must be taken not to burn it: which, when it happens, may be easily perceived by the varnish appearing burnt and losing its gloss. The following expedient is made use of for the more commodiously blackening the varnish, being particularly necessary where the plates are large: fix a strong hook in the roof of the room, through which pass four pieces of cord of equal length, at the end of which are fixed four iron rings of about four inches diameter, for supporting the corners of the plate. The plate being thus suspended in the air, with the varnished side downwards, may be blackened with great convenience: but this is not, however, absolutely requisite, except in the case of large plates that could not, without difficulty, be held up, unless this or some other such contrivance were made use of.

It is proper to be very cautious in keeping the flambeau or candle at a due distance from the plate, lest the wick touch the varnish, which would both sully and mark it. If it appear that the smoke has not penetrated the varnish, the plate must be again placed for some little time over the chafing-dish; and it will be found, that, in proportion as the plate grows hot, the varnish will melt and incorporate with the black which lay above it, in such a manner that the whole will be equally pervaded by it.

Above all things, the greatest caution should be used in this operation, to keep all the time a moderate fire; and to move frequently the plate, and change the place of all the parts of it, that the varnish may be alike melted every where, and kept from burning. Care must also be taken, that during this time, and even till the varnish be entirely cold, no filth, sparks, or dust, fly on it; for they would then stick fast, and spoil the work.

Method of applying the hard varnish. This is precisely the

the same as for the soft; being spread equally over the warm plate with the taffety-ball, and smoked in the same manner; only after it is smoked, it must be baked, or dried over a gentle fire of charcoal, till the smoke from the varnish begins to decrease; taking care not to overheat the plate, which would both soften it and burn the varnish.

The plate being thus prepared, and an exact drawing of the outlines of the design made upon thin paper, the other side of the paper must be well rubbed with chalk or Spanish whitening, or, which is better, with red chalk scraped to a powder; and the loose chalk is cleared off with a linen rag: then the stained side of the paper is laid upon the varnish, fixing the corners to the plate with wax or wafers, to prevent its shuffling; and with a blunted needle or pointer the drawing is slightly traced, and communicates to the varnish an exact outline of the design to be etched.

A variety of pointers is necessary for the work. Those used for the broad large strokes ought to be very blunt, exceeding round, and well polished at the point; the sole of a shoe answers very well for polishing the points. The finest ought to be as sharp as a needle. If any scratches or false strokes happen in the working, they are to be stopped up with a hair-pencil dipped in Venetian varnish, mixed with lamp-black, by which means these places will be defended from the action of the aquafortis.

The next operation is that of eating or corroding the plate with aquafortis; in order to which, a border of soft wax (being a composition of bees-wax melted and tempered with a little Venice turpentine and tallow) must be fastened round the plate about an inch high, in the form of a little wall or rampart, to contain the aquafortis. At one of the corners of this border a gutter is usually made, which serves for pouring commodiously the aquafortis off the plate. The plate being thus bordered, take a due quantity of the refiners aquafortis; mix it with half its quantity of common water; and pour it gently on, till it rise above a finger's breadth above the surface of the plate; when, if all things have been rightly conducted, it will be seen that the aquafortis will soon exert its action in the hatches which have been strongly touched; but those more weakly engraved will appear at first clear, and of the colour of the copper. The menstruum must therefore be suffered to continue on the plate till its effects become visible on the more tender parts; then the aquafortis should be poured off, the plate washed with clean water, and dried before the fire: then take a small pencil dipped into the Venetian varnish, and cover with it the lighter parts of the plate. This being done, the aquafortis must again be poured on, and suffered to continue a longer or shorter time, according to the strength of the menstruum, or the nature of the engraving; when it must be again poured off as before, and the plate immediately washed with water.

It may not be improper to observe, that, when the aquafortis is on the plate, a feather should be used to cleanse away the foulness of the verdigris that gathers in the hatches when the aquafortis operates on them, and to give it more room to exert its action; for by moving the aquafortis to and fro on the plate by the feather, and brushing away the black saline matter where it appears to be formed, the hatches will be cleansed, and the aquafortis exert its whole force equally on every part.

The plate being thus sufficiently corroded by the aquafortis, and well washed with water, it must be warmed at the fire, and the border of wax removed; after which it must be made hotter till the varnish melt; then it must be well wiped with a linen cloth, and afterwards rubbed heartily with oil of olives; when it will be ready to be retouched and finished by the graver. See the article Engraving.

ETEOCLES (fab. hist.), a son of Œdipus and Jocasta. After his father's death, it was agreed between him and his brother Polynices, that they should both share the royalty, and reign alternately each a year. Eteocles by right of seniority first ascended the throne; but after the first year of his reign was expired he refused to give up the crown to his brother, according to their mutual agreement. Polynices resolved to punish such an open violation of a solem engagement, went to implore the assistance of Adrastus king of Argos. He received that king's daughter in marriage, and was soon after assisted with a strong army headed by seven famous generals. These hostile preparations were seen by Eteocles, who on his part did not remain inactive. He chose seven brave chiefs to oppose the seven leaders of the Argives, and stationed them at the seven gates of the city. He placed himself against his brother Polynices, and he opposed Menalippus to Tydeus, Polyphontes to Capaneus, Megareus to Eteoclus, Hyperbius to Parthenopæus, and Lasthenes to Amphiaraus. Much blood was shed in light and unavailing skirmishes, and it was at last agreed between the two brothers that the war should be decided by single combat. They both fell in the engagement conducted with the most inveterate fury on either side; and it was even said that the ashes of these two brothers, who had been so inimical one to the other, separated themselves on the burning pile, as if sensible of resentment, and hostile to reconciliation.

ETERNITY, an attribute of God, expressing his infinite or endless duration. See Logic and Metaphysics.

Eternity, in mythology, a divinity among the Romans, who had neither temples nor altars. They represented it under the figure of a woman, who held the sun in one hand and the moon in the other: her symbols were a phœnix, globe, and elephant.

ETESIÆ, or Etesian *winds*, are such as blow at stated times of the year, from what part soever of the compass they come. They are so called from the Greek word ετος, "year," being yearly or anniversary winds, such as our seamen call *monsoons* or *trade-winds*, which in some parts of the world continue constantly blowing for certain stated seasons of the year. Thus, the north winds, which, during the dog-days, constantly blow upon the coasts of Egypt, and hinder all ships from sailing out of Alexandria for that season, are called *etesiæ* in Cæsar's Commentaries. In other authors, the west and east winds are called *etesiæ*, when they continue blowing for certain seasons of the year.

Cellarius endeavours to prove that those winds are properly etesian which blow from that part of the horizon which is between the north and west about the time of the solstice. In ancient writers, they are represented as of a very mild and gentle nature; and were called

led by mariners *ſomniculoſi* and *delicati*, from their ſleeping or ceaſing to blow in the night.

ETHELBALD, ETHELBERT, ETHELRED, ETHELWOLF, } kings of England. } See (Hiſtory of) ENGLAND.

ETHER, ETHERIAL, } See ÆTHER.

ETHERIDGE (Sir George), a celebrated wit and comic genius in the reigns of Charles II. and James II. deſcended from an ancient family in Oxfordſhire, and born in 1636. He travelled in his youth; and, not being able to confine himſelf to the ſtudy of the law, devoted himſelf to the gayer accompliſhments. His firſt dramatic performance, the Comical Revenge, or Love in a Tub, appeared in 1664, and introduced him to the leading wits of the time: in 1668, he produced a comedy called She would if ſhe could; and, in 1676, he publiſhed his laſt comedy, called the Man of Mode, or Sir Fopling Flutter; which is perhaps the moſt elegant comedy, and contains more of the real manners of high life than any one the Engliſh ſtage was ever adorned with. This piece he dedicated to the beautiful ducheſs of York, in whoſe ſervice he then was; and who had ſo high a regard for him, that when, on the acceſſion of James II. ſhe came to be queen, ſhe procured his being ſent ambaſſador firſt to Hamburg, and afterwards to Ratiſbon, where he continued till after his Majeſty quitted the kingdom. Our author being addicted to certain gay extravagances, had greatly impaired his fortune: to repair which, he paid his addreſſes to a rich widow: but ſhe, being an ambitious woman, had determined not to condeſcend to a marriage with any man who could not beſtow a title upon her; on which account he was obliged to purchaſe a knighthood. None of the writers have exactly fixed the period of Sir George's death, though all ſeem to place it not long after the Revolution. Some ſay that on this event he followed his maſter king James into France, and died there; but the authors of the Biographia Britannica mention a report, that he came to an untimely death by an unlucky accident at Ratiſbon; for that after having treated ſome company with a liberal entertainment at his houſe there, where he had taken his glaſs too freely, and being, through his great complaiſance, too forward in waiting on his gueſts at their departure, fluſhed as he was, he tumbled down ſtairs and broke his neck, and ſo fell a martyr to mirth and jollity. As to Sir George's literary character, he certainly was born a poet, and ſeems to have been poſſeſſed of a genius whoſe vivacity needed no cultivation: for we have no proofs of his having been a ſcholar. His works, however, have not eſcaped cenſure on account of that licentiouſneſs which in general runs through them, which renders them dangerous to young unguarded minds; and the more ſo, for the lively and genuine wit with which its is gilded over, and which has therefore juſtly baniſhed them from the purity of the preſent ſtage.

ETHICS, the doctrine of manners, or the ſcience of moral philoſophy. The word is formed from ηθος, ηθη, *mores*, "manners;" by reaſon the ſcope or object thereof is to form the manners. See *MORAL Philoſophy*.

ETHIOPIA, a celebrated, though very much unknown empire of Africa, whoſe boundaries have never been exactly defined either by ancient or modern geographers. By ſome writers of antiquity the title of *Ethiopians* was given to all nations whoſe complexion was black: hence we find the Arabians as well as many other Aſiatics ſometimes falling under this denomination; beſides a number of Africans whoſe country lay at a diſtance from Ethiopia properly ſo called. Thus the Africans in general were by theſe writers divided into the weſtern or Heſperian Ethiopians, and thoſe above Egypt ſituated to the eaſt of the former; the latter being much more generally known than the former, by reaſon of the commerce they carried on with the Egyptians.

1 The name anciently beſtowed on different nations.

2 Different names of Ethiopia.

From this account we may eaſily underſtand why there ſhould be ſuch a ſeeming diſagreement among ancient authors concerning the ſituation of the empire of Ethiopia, and likewiſe why it ſhould paſs under ſuch a variety of names. Sometimes, for example, it was named *India*, and the inhabitants *Indians*; an appellation likewiſe applied to many other diſtant nations. It was alſo denominated *Atlantia* and *Etheria*, and in the moſt remote periods of antiquity *Cephenia*; but more uſually *Abaſene*, a word ſomewhat reſembling *Abaſſia* or *Abyſſinia*, two of its modern names. On the other hand, we find Perſia, Chaldæa, Aſſyria, &c. ſtyled *Ethiopia* by certain writers; and all the countries extending along the coaſt of the Red Sea were promiſcuouſly denominated *India* and *Ethiopia*. By the Jews the empire of Ethiopia was ſtyled *Cuſh* and *Ludim*.

3 Situation of Ethiopia Propria.

Notwithſtanding this diverſity of appellations, and vaſt diffuſion of territory aſcribed to the Ethiopians, there was one country to which the title was thought more properly to belong than to any of the reſt; and which was therefore called *Ethiopia Propria*. This was bounded on the north by Egypt, extending all the way to the leſſer cataract of the Nile, and an iſland named *Elephantine*; on the weſt it had Lybia Interior; on the eaſt the Red Sea, and on the ſouth unknown parts of Africa; though theſe boundaries cannot be fixed with any kind of preciſion.

4 Different nations in Ethiopia.

In this country the ancients diſtinguiſhed a great variety of different nations, to whom they gave names either from ſome perſonal property, or from their manner of living. The principal of theſe were, 1. The *Blemmyes*, ſeated near the borders of Egypt; and who, probably from the ſhortneſs of their necks, were ſaid to have no heads, but eyes, mouth, &c. in their breaſts. Their form, ſomehow or other, muſt have been very extraordinary, as we learn from Vopiſcus, who gives an account of ſome of the captives of this nation brought to Rome. 2. The *Nobatæ*, inhabiting the banks of the Nile near the iſland Elephantine already mentioned, ſaid to have been removed thither by Oaſis to repreſs the incurſions of the Blemmyes. 3. The *Troglodytes*, by ſome writers ſaid to belong to Egypt, and deſcribed as little ſuperior to brutes. 3. The *Nubians*, of whom little more is known than their name. 5. The *Pigmies*, by ſome ſuppoſed to be a tribe of Troglodytes; but by the moſt approved writers placed on the African coaſt of the Red Sea. 6. The *Aualitæ* or *Abalitæ*, of which we know nothing more than they were ſituated near the Abalitic gulf. 6. The *Struthiophagi*, ſo called from their feeding upon oſtriches, were ſituated to the ſouth of the Memnones. 8. The *Acri-*

Ethiopia. *dophagi*; *Chelonophagi*; 10. *Ichthyophagi*; 11. *Cynamolgi*; 12. *Elephantophagi*; 13. *Rhizophagi*; 14. *Spermatophagi*; 15. *Hylophagi*; and 16. *Ophiophagi*: all of whom had their names from the food they made use of, *viz*. locusts, tortoises, fish, bitches milk, elephants; roots, fruits, or seeds, and serpents. 17. The *Hylogones*, neighbours to the Elephantophagi, and who were so savage that they had no houses, nor any other places to sleep in but the tops of trees. 8. The *Pamphagi*, who used almost every thing indiscriminately for food. 19. The *Agriophagi*, who lived on the flesh of wild beasts. 20. The *Anthropophagi*, or man-eaters, are now supposed to have been the Caffres, and not any inhabitants of Proper Ethiopia. 21. The *Hippophagi*, or horse-eaters, who lay to the northward of Lybia Incognita. 22. The *Macrobii*, a powerful nation, remarkable for their longevity; some of them attaining the age of 120 years. 23. The *Sambri*, situated near the city of Tenupsis in Nubia upon the Nile; of whom it is reported that all the quadrupeds they had, not excepting even the elephants, were destitute of ears. 24. The *Asachæ*, a people inhabiting the mountainous parts, and continually employed in hunting elephants. Besides these, there were a number of other nations or tribes, of whom we scarce know any thing but the names; as the Gapachi, Ptoemphanes, Catadupi, Pechini, Catadræ, &c.

5 Of the first settlement of Ethiopia.

In a country inhabited by such a variety of nations, all in a state of extreme barbarism, it is rather to be wondered that we have any history at all, than that it is not more distinct. It has already been observed, that the Jews, from the authority of the sacred writers no doubt, bestowed the name of *Cush* upon the empire of Ethiopia; and it is generally agreed that Cush was the great progenitor of the inhabitants. In some passages of scripture, however, it would seem that *Cush* was an appellation bestowed upon the whole peninsula of Arabia, or at least the greater part of it. In others, the word seems to denominate the country watered by the Araxes, the seat of the ancient Scythians or Cushites; and sometimes the country adjacent to Egypt on the coast of the Red Sea.

6 People originally from Arabia.

A number of authors are of opinion, that Ethiopia received its first inhabitants from the country lying to the east of the Red Sea. According to them, the descendants of Cush, having settled in Arabia, gradually migrated to the south-eastern extremity of that country; whence, by an easy passage across the straits of Babelmandel, they transported themselves to the African side, and entered the country properly called *Ethiopia*: a migration which, according to Eusebius, took place during the residence of the Israelites in Egypt; but, in the opinion of Syncellus, after they had taken possession of Canaan, and were governed by judges.

7 Abyssinian tradition concerning it.

Mr Bruce makes mention of a tradition among the Abyssinians, which, they say, has existed among them from time immemorial, that very soon after the flood, Cush the grandson of Noah, with his family, passed through Atbara, then without inhabitants, till they came to the ridge of mountains which separates that country from the high lands of Abyssinia. Here, still terrified with the thoughts of the deluge, and apprehensive of a return of the same calamity, they chose to dwell in caves made in the sides of these mountains, rather than trust themseves in the plains of Atbara; and our author is of opinion, that the tropical rains, which they could not fail to meet with in their journey southward, and which would appear like the return of the deluge, might induce them to take up their habitations in these high places. Be this as it will, he informs us that it is an undoubted fact, "that here the Cushites, which unparelled industry, and with instruments utterly unknown to us, formed to themselves commodious, yet wonderful, habitations in the heart of mountains of granite and marble, which remain entire in great numbers to this day, and promise to do so till the consummation of all things."

8 Original habitations of the Cushites.

The Cushites having once established themselves among these mountains, continued to form habitations of the like kind in all the neighbouring ones; and thus following the different chains (for they never chose to descend into the low country), spread the arts and sciences, which they cultivated quite across the African continent from the eastern to the western ocean. According to the tradition abovementioned, they built the city of Axum early in the days of Abraham. This, though now an inconsiderable village, was anciently noted for its superb structures, of which some remains are still visible. Among these are some belonging to a magnificent temple, originally 110 feet in length, and having two wings on each side; a double porch,; and an ascent of 12 steps. Behind this stand several obelisks of different sizes, with the remains of several others which have been destroyed by the Turks. There is also a great square stone with an inscription, but so much effaced that nothing can be discovered excepting some Greek and Latin letters, and the word *Basilius*. Mr Bruce mentions some "prodigious fragments of colossal statues of the dog-star" still to be seen at this place; "and *Seir* (adds he), which, in the language of the Troglodytes, and in that of the low country of Meroe, exactly corresponding to it, signifies a *dog*, instructs us in the reason why this province was called *Sirè*, and the large river which bounds it *Siris*."

9 Description of the city of Axum.

Soon after building the city of Axum, the Cushites founded that of Meroe; the capital of a large island or peninsula formed by the Nile, much mentioned by ancient historians, and where, according to Herodotus, they pursued the study of astronomy in very early ages with great success. Mr Bruce gives two reasons for their building this city in the low country after having built Axum in the mountainous part of Abyssinia. 1. They had discovered some inconveniences in their caves both in *Siré* and the country below it, arising from the tropical rains in which they were now involved, and which prevented them from making the celestial observations to which they were so much addicted. 2. It is probable that they built this city farther from the mountains than they could have wished, in order to avoid the fly with which the southern parts were infested.

10 Meroe why founded.

11 Description of a pestilential fly.

This animal, according to Mr Bruce, who has given a figure of it, is the most troublesome to quadrupeds that can be imagined. He informs us, that it infests those places within the tropical rains where the soil is black and loamy, and no other place whatever. It is named *Zimb* (by whom we are not informed), and has not been described by any other naturalist. It is of a size somewhat larger than a bee, thicker in proportion, and having broader wings, placed separate like those of a fly, and quite colourless, or without any spots. The head

 is

Ethiopia.

is a large, with sharp upper jaw; at the end of which is a strong pointed hair about a quarter of an inch long; and the lower jaw has two of these hairs: all of which together make a resistance to the finger equal to that of a strong hog's bristle. One or all of these hairs are used as weapons of offence to the cattle; but what purpose they answer to the animal itself, our author does not say. So intolerable, however, are its attacks to the cattle, that they no sooner hear its buzzing, than they forsake their food, and run about till they fall down with fright, fatigue, and hunger. Even the camel, though defended by a thick and strong skin with long hair, cannot resist the punctures of this insect; which seem to be poisonous, as they produce large putrid swellings on the body, head, and legs, which at last terminate in death. To avoid this dreadful enemy, the cattle must all be removed as quick as possible to the sandy parts of Atbara, where they stay as long as the rains last, and where this dreadful enemy never ventures to follow them. The elephant and rhinoceros, who, on account of the quantity of food they require, cannot remove to these barren places, roll themselves in the mud, which when dry, coats them over so hard, that they are enabled to resist the punctures of the insect; though even on these some tubercles are generally to be met with, which our author attributes to this cause. Mr Bruce is of opinion that this is the fly mentioned by Isaiah, chap. vii. 18, 19. "And it shall come to pass, in that day, that the Lord shall *hiss* for the fly that is in the uttermost part of the rivers of Egypt; and they shall come and shall rest all of them in the desolate valleys and in the holes of the rocks, and upon all thorns, and upon all bushes." 'That is (says Mr Bruce), they shall cut off from the cattle their usual retreat to the desert, by taking possession of these places, and meeting them there, where ordinarily they never come, and which therefore are the refuge of the cattle.'

Meroe, which lay in N. Lat. 16°, the exact limit of the tropical rains, was without the bounds assigned by nature to these destructive insects; and consequently a place of refuge for the cattle. Mr Bruce, on his return through the desart, saw at Gerri, in this latitude, ruins supposed to be those of Mereo, and caves in the mountains immediately above them; for he is of opinion, that they did not abandon their caverns immediately after they began to build cities. As a proof of this, he mentions that Thebes, in Upper Egypt, was built by a colony of Ethiopians; and that near the ruins of that city, a vast number of caves are to be seen even up to the top of a mountain in the neighbourhood: all of which are inhabited at this day. By degrees, however, they began to exchange these subterranean habitations for the cities they built above ground; and thus become farmers, artificers, &c. though originally their sole employment had been commerce.

Of the magnificence of the ancient Indians and Ethiopians.

On this subject Mr Bruce has given a very curious dissertation; though how far the application of it to the Ethiopians may be just, we cannot pretend to determine. He begins with observing, that the magnificence of the Indians and Egyptians has been celebrated from the most remote antiquity, without any account of the sources from whence all this wealth was derived: and indeed it must be owned, that in all histories of these people, there is a strange deficiency in this respect. The kings, we are to suppose, derived their splendor and magnificence from their subjects; but we are quite at a loss to know whence their subjects had it: and this seems the more strange, that in no period of their history are they ever represented in a poor or mean situation. Nor is this difficulty confined to these nations alone. Palestine, a country producing neither silver nor gold, is represented by the sacred writers as abounding in the early ages with both those metals in a much greater proportion than the most powerful European states can boast of notwithstanding the vast supplies they derive from the lately discovered continent of America. The Assyrian empire, in the time of Semiramis, was so noted for its wealth, that M. Montesquieu supposes it to have been obtained by the conquest of some more ancient and richer nation; the spoils of which enriched the Assyrians, as those of the latter afterwards did the Medes. This, however, Mr Bruce very justly observes, will not remove the difficulty, because we are equally at a loss to know whence the wealth was derived to that former nation; and it is very unusual to find an empire or kingdom of any extent enriched by conquest. The kingdom of Macedon, for instance, though Alexander the Great over-ran and plundered in a very short time the richest empire in the world, could never vie with the wealth of Tyre and Sidon. These last were commercial cities and our author justly considers commerce as the only source from whence the wealth of a large kingdom ever was or could be derived. The riches of Semiramis, therefore, were accumulated by the East India trade centering for some time in her capital. While this was suffered to remain undisturbed, the empire flourished; but by an absurd expedition agaidst India itself, in order to become mistress at once of all the wealth it contained, she lost that which she really possessed; and her empire was soon after entirely ruined. To the same source he attributes the riches of the ancient Egyptians; and is of opinion, that Sesostris opened up to Egypt the commerce with India by sea; though other authors speak of that monarch in very different terms. As the luxuries of India have some how or other become the objects of desire to every nation in the world, this easily accounts for the wealth for which Egypt has in all ages been so much celebrated, as well as for that with which other countries abounded; while they served as a medium for transmitting these luxuries to other nations, and especially for the riches of those which naturally produced the Indian commodities so much sought after. This was the case particularly with Arabia, some of the productions of which were very much coveted by the western nations; and being, besides, the medium of communication between the East Indies and western nations, it is easy to see why the Arabian merchants soon became possessed of immense wealth.

Besides the territories already mentioned, the Cushites had extended themselves along the mountains which run parallel to the Red Sea on the African side which country, according to Mr Bruce, has "in all times been called *Sabo* or *Azabo*, both which signify *South*;" an epithet given from its lying to the southward of the Arabian gulf, and which in ancient times was one of the richest and most important countries in the world. "By that acquisition (says our author), they enjoyed all the perfumes and aromatics in the east; myrrh, and frankincense, and cassia; all which grow

Ethiopia. grow spontaneously in that stripe of ground from the Bay of Bilur west of Azab to Cape Gardefan, and then southwards up in the Indian ocean, to near the coast of Melinda, where there is cinnamon, but of an inferior kind." As the Cushites or Troglodytes advanced still farther south, they met not only with mountains in which they might excavate proper habitations, but likewise with great quantities of gold and silver furnished by the mines of Sofala; which, our author says, furnished "large quantities of both metals in their pure and unmixed state, lying in globules without any alloy or any necessity of preparation or separation." In other part of his work, he labours to prove Sofala to have been the *Ophir* mentioned in scripture.

13 The Ethiopians at first a civilized and learned people.

Thus the Ethiopians, for some time after their settlement, according to Mr Bruce, must have been a nation of the first importance in the world. The northern colonies from Meroe to Thebes built cities, and made improvements in architecture; cultivated commerce, agriculture, and the arts; not forgetting the science of astronomy, for which they had an excellent opportunity by reason of the clearness of the sky in the Thebaid. Their brethren farther to the south, or those who inhabited Ethiopia properly so called, were confined for six months to their caves by reason of the tropical rains, whence they were naturally led to pursuits of another kind. "Letters *, at least one kind of them, and arithmetical characters (we are told), were invented by this middle part of the Cushites; while trade and astronomy, the natural history of the winds and seasons, were what necessarily employed that part of the colony established at Sofala most to the southward."

* *Bruce's Travels*, I. p. 383.

14 Account of the Ethiopian Shepherds.

While the Cushites were thus employed at home in collecting gold, gathering and preparing spices, &c. these commodities were sent abroad into other countries by another set of people named *Shepherds*, who acted as carriers to them, and who afterwards proved so formidable to the Egyptians †. These differed in their appearance from the Ethiopians, having long hair and the features of Europeans; and were of a very dark complexion, though not at all like the Blackmoors or negroes. They lived in the plain country in huts or moveable habitations, attending their cattle, and wandering up and down as various circumstances required. By acting as carriers to the Cushites, they became a great and powerful people, possessing vast numbers of cattle, as well as a very considerable extent of territory. They possessed a stripe of land along the Indian ocean; and to the northward of that, another along the Red-Sea: but their principal habitation was the flat part of Africa between the northern tropic and the mountains of Abyssinia, which country is now called *Beja*. This reaches from Masuah along the sea-coast to Suakem; then turns westward, and continues in that direction, having the Nile on the south, the tropic of Cancer on the north, with the deserts of Selima and Libya on the west. The next district belonging to these people was Meroe, now called *Atbara*, lying between the rivers Nile and Astaboras. A third district now called *Derkin*, is a small plain lying between the river Mareb on the east, and Atbara on the west. But the most noble and warlike of all the Shepherds were those who possessed the mountains of Habab, reaching from the neighbourhood of Masuah to Suakem; which district is still inhabited by them.

† See Egypt, n° 2.

15 Different classes of them.

These Shepherds, according to our author, were distinguished by several different appellations, which may be supposed to denote different degrees of rank among them. Those called simply *Shepherds*, our author supposes to have been the common sort who attended the flocks. Another set were called *Hycsos* or *Agsos*, signifying "armed shepherds." who are supposed to have been the soldiers. A third were named *Agag*, supposed to be the chiefs or nobles of these armed shepherds: whence the title of *king of kings*, according to Mr Bruce, is derived; and he supposes *Agag* killed by Samuel, to have been an Arabian shepherd.

The building of Carthage augmented the power of the Shepherds to a considerable degree, by reason of the vast quantity of carriage naturally belonging to a place of such extensive commerce, and which fell into the hands of the Lehabim, Lubim, or Libyan peasants. An immense multitude of camels, in the early ages, answered the purpose of navigation: and thus we find that commerce was carried on by the Ishmaelites as early as the days of Joseph from the southern extremity of the Arabian peninsula. These Shepherds, however, though generally the friends and allies of the Egyptians, who were also Cushites, sometimes proved very bitter enemies to them, as is related in the history of that country. The reason of this may be deduced from the great opposition betwixt their manners and customs. The Egyptians worshipped black cattle, which the Shepherds killed and used as food; the latter worshipped the heavenly bodies, while the Egyptians were the grossest idolaters, and worshipped idols of all kinds that can be imagined. Hence a mere difference in religion might occasion many bloody quarrels; though if the above account can be depended upon as authentic, it is natural to imagine that the mutual connection of interest should have cemented their friendship, whatever difference there might happen to be in opinions of any kind.

16 Reason of the enmity between the Shepherds and Egyptians.

17 Origin of the different Ethiopian nations.

Besides the Cushites and Shepherds, however, we must now seek for the origin of those different nations which have already been mentioned. Mr Bruce allows that there are various nations inhabiting this country, who are fairer than either the Cushites or the Shepherds, and which, though they have each a particular name, are all known by the general title of *habesh*: which may be translated by the Latin word *convenæ*, signifying a number of distinct people meeting accidentally in one place; and which our author maintains against Scaliger, Ludolf, and a number of others, to be a very just translation, and exceedingly consonant to the history of the country.

18 First settlement of Ethiopia, according to the Abyssinian history.

The most authentic ancient history of this country, according to Mr Bruce, is the chronicle of Axum: the character of which, among the modern Abyssinians, stands next to the sacred writings themselves; and consequently must be esteemed the highest Abyssinian authority we have on the subject. According to this book, there was an interval of 5500 years between the creation of the world and the birth of Christ; 1808 years before which last event the empire of Abyssinia or Ethiopia received its first inhabitants. Two hundred years after its settlement, it was so destroyed

stroyed by a flood that it received the name of *Ouré Midra*, or a country laid waste; "or (says our author) as it is called in scripture itself, *a land which the waters or floods had spoiled*," (Isaiah xviii. 2.)

19 The country laid waste by a deluge.

The peopling of the country was finished about 1400 years before Christ, by the settlement of a great number of people, speaking different languages, who sat down peaceably in the high lands of Tigre, in the neighbourhood of the Shepherds, with whom they were in friendship. These people, according to tradition, came from Palestine; and our author is inclined to believe the whole of the relation to be true, as the time coincides with the expulsion of the Canaanitish nations by Joshua, which happened about 1490 B. C. ten years before which there had been, according to Pausanias, a flood in Ethiopia, which occasioned prodigious devastation. Ethiopia, he thinks, would afford the most ready asylum for the fugitive Canaanites, as they must have long had a commercial intercourse with that country; and he supports the opinion likewise from what Procopius mentions of two pillars extant in his time, on the coast of Mauritania, with the following inscription in the Phœnician language: "We are Canaanites, flying from the face of Joshua, the son of Nun, the robber." The authenticity of these inscriptions, however, is much disputed, and therefore it cannot go a great way in establishing any historical point. The first and most considerable of the colonies abovementioned settled in the province of Amhara; the second in Damot, one of the southern provinces; the third in another province called *Lasta*, or *Tcheratz-Agow*, from *Tchera* their principal habitation; and a fourth in the territory of Gafat.

Our author goes on to prove, that the Ethiopians in ancient times were not only the most learned people in the world, but that they spoke the original language, and were the inventors of writing. In what manner they came to degenerate from this character, and into their present state of barbarity, cannot be known; this being a phenomenon equally unaccountable with the degeneracy of the Egyptians.

20 Ethiopia conquered by Moses.

According to some authors, the Ethiopians were conquered by Moses: of which transaction we have the following account. Before the time of that legislator, the Ethiopians possessed the country of Thebais in Egypt; but, not content with this, they made an irruption into the Lower Egypt, and penetrated as far as Memphis; where, having defeated the Egyptians, they threatened the kingdom with total destruction. The Egyptians, by the advice of their oracles, put Moses at the head of their forces; who immediately prepared for invading the enemy's country. The Ethiopians imagined that he would march along the banks of the Nile; but Moses chose rather to pass through some of the interior countries, though greatly infested with serpents, and where consequently his march must be attended with much danger. To preserve his men, he constructed a number of chests or panniers of the Egyptian reed papyrus, which he filled with the birds named *Ibis*, celebrated for their antipathy to serpents. As soon as he approached the tract abounding with these reptiles, a sufficient number of the birds were let out, who presently cleared the way for the army by destroying the serpents. Thus the Ethiopians were surprised in their own country where they had dreaded no invasion; their forces, being defeated in the field, were at last shut up in the capital Meroe, a city almost impregnable, by being surrounded with three rivers, the Nile, Astapus, and Astaboras. The daughter of the Ethiopian monarch, however, having an opportunity of seeing Moses from the walls, fell in love with him, and offered to deliver up the city, provided he would swear to marry her. With this requisition the Jewish legislator complied; but treated the inhabitants with great severity, plundering the city, and putting many of the inhabitants to death. After this he ravaged the whole country, dismantling all the places of strength; and having thus rendered the Ethiopians incapable of attempting any thing against other nations for a considerable time, he returned in triumph to Egypt, after an absence of ten years.

21 Of the queen of Sheba.

From the time of Moses to that of Solomon there is a chasm in the Ethiopic history. After this, however, we are furnished with some kind of regular accounts. The history commences with the queen of Sheba, who came to visit the Jewish monarch, and whom the Abyssinians suppose to have been sovereign of Ethiopia Propria: but Mr Bruce is of opinion that she was only sovereign of that territory on the eastern coast of Africa named *Saba*, which he says ought to be her title instead of *Sheba*. In favour of this opinion he likewise urges, that it was customary for the Sabeans, or inhabitants of the African district named *Saba*, to be governed by women; whereas those who inhabited the opposite side of the Arabian gulf, and who were named *Sabæan Arabs* or *Homerites*, were not only governed by kings, but would not allow their sovereigns to go abroad any where under pain of being stoned to death. The Abyssinians, as has been already hinted, claim her for their sovereign; and he informs us, that having received an account from Tamerin, an Ethiopian merchant, of the surprising wisdom and wealth of Solomon, she undertook the journey mentioned in Scripture, to ascertain the truth of the report. In this she was attended by a great many of her nobility, carrying along with her also magnificent presents for the monarch she intended to visit. According to the Abyssinian historians, she was a pagan at the time this journey was undertaken; but being struck with admiration at the sight of Solomon's grandeur, and the wisdom he displayed, she became a convert to the true religion. Another part of her history, by no means inconsistent with the character of Solomon, is, that she returned in a state of pregnancy; and within a year was delivered, of a son, named *David* by Solomon; but by his mother *Minileck, Menelech*; or *Menelecke* that is, *another self*. When he grew up he was sent to be educated at the court of his father Solomon; where having staid some time, he was accompanied home by many doctors of the law, and other Israelites of distinction, particularly Azariah the son of Zadoc the high-priest. By these the Jewish religion was established in Abyssinia, where it continued till the introduction of Christianity. The princess we speak of is named *Makeda, Balkis*, or *Bulkis*, by the Abyssinians. By our Saviour, and in the Ethiopic version of the Scriptures, she is styled *The Queen of the South*, and is said to have come from the uttermost parts of the earth or of the habitable world. Hence the compilers of the Universal History have inferred, that

that the princess styled *The Queen of Sheba* in scripture was really sovereign of Ethiopia. "Ethiopia (say they) is more to the south of Judæa than the territory or kingdom of Saba in Arabia Felix; consequently has a better claim than that country for the dominions of the princess whom our Saviour calls *The Queen of the South*. Ethiopia is styled *the remotest part of the habitable world* by Herodotus and Strabo; and therefore better agrees with what our Saviour has said of the queen of Sheba, that she came from 'the uttermost parts of the earth,' than Arabia. Nor can it be deemed a sufficient reply to this argument, that Arabia Felix was the uttermost part of the earth in respect to Judæa, since it was bounded by the Red Sea: for that not only Egypt, but even Ethiopia, regions beyond that sea, were known to, and had a communication with, the Jews, both before and in our Saviour's time, is indisputably clear. Lastly, from what has been suggested, it appears no improbable conjecture, that Judaism was not only known, at least in a part of Ethiopia, but nearly related to the established religion there, at the beginning of the apostolic age, if not much earlier. After all, these two opinions, so contrary in appearance, may be made consistent without great difficulty; since it is agreed, that Arabia and Ethiopia having anciently borne the same name, been included during certain intervals in one empire, and governed by one prince. Part of the Arabs and Ethiopians had the same origin, and very considerable numbers of the Abaseni transported themselves from Arabia Felix into Ethiopia; a circumstance which sufficiently proves the intercourse that formerly subsisted between the Cushites or Ethiopians of Asia and Africa."

The Abyssinian historians farther inform us, that the young prince Menilek was anointed and crowned king in the temple of Jerusalem, before he returned to his own country; that Azarias was constituted high-priest; that he brought with him an Hebrew transcript of the law; and though this book is now lost, having been burnt along with the church at Axum, the office is still continued in the line of Azarias, whose successors are styled *Nebrits, high-priests, or keepers of the church*, in that city; both church and state being modelled exactly after that of Jerusalem. Makeda continued to enjoy the sovereignty for 40 years; and the last act of her reign was to settle the succession to the throne. By this act the crown was declared hereditary in the family of Solomon for ever; it was also determined, that after her no woman should be entitled to wear the crown or act as sovereign of the country; but that the sovereignty should descend to the most distant heirs male, rather than to the females, however near; which two articles were to be considered as fundamental laws of the empire, not to be abolished. Lastly, that the male heirs of the royal family should alway be sent prisoners to a high mountain, where they were to be confined till they should be called to the throne, or as long as they lived. This custom, according to Mr Bruce, was peculiar to Abyssinia; the neighbouring Shepherds being accustomed to have women for their sovereigns, which prevailed in the last century, and perhaps does so at present.

Makeda having established these laws in such a manner as not to be revocable, died in the year 986 B. C. The transactions of her son Menilek after his accession are not pointed out, farther than that he removed his capital to Tigré. His reign can by no means be accounted prosperous; since in his time the empire was invaded by Shishak or Sesac the king of Egypt, who plundered the temple of Jerusalem under Rehoboam.

22 Ethiophia conquered by Shishak.

The like fate attended a rich temple which had been built at Saba the capital of the Ethiopian empire, and which might very probably occasion the removal of the imperial seat to Tigré, as already mentioned. It is indeed pretty plain from Scripture, that Ethiopia, or great part of it, was subject to this monarch; as the Ethiopians or Cushites mentioned in his army which invaded Judæa, are joined with the Lubims or Libyans, and must therefore be accounted inhabitants of Ethiopia Proper. This is indeed no small confirmation of the opinion of Sir Isaac Newton, who agrees with Josephus in supposing Shishak to have been the celebrated Sesostris of profane historians. Thus far we are certain, that in the passage of Scripture just now alluded to, the sacred historian indirectly ascribes the sovereignty of Ethiopia to Shishak; and we do not find it any where hinted that another Egyptian monarch was possessed of this sovereignty. Herodotus also plainly tells us, that Sesostris was master of Ethiopia, and that no other Egyptian but himself ever possessed that empire.

23 Revolutions after the time of Shishak.

During the reign of Shishak we know no particulars concerning the Ethiopians; but after his death, Sir Isaac Newton is of opinion that they defended Egypt against the Lybians, who had taken an opportunity of invading the country during the civil war which took place on the death of that great conqueror. In about ten years afterwards, however, according to the same author, they become aggressors; drowned the successor of Shishak in the Nile, and seized on the whole kingdom; at which time Lybia fell also into their hand. In the time of Asa king of Judah, we find the combined host of the Ethiopians and Lubims or Libyans making an attack on the territories of that prince, to the number of more than a million.

24 Defeat of Zerah by Asa king of Judah.

This may be reckoned a considerable confirmation of the piece of history just mentioned; as it is not easy to conceive how the two should combine in such a manner, unless Zerah was master of both. The total overthrow which the allied army received from Asa, gave the inhabitants of Lower Egypt an opportunity of revolting; who being sustained by an army of 20,000 auxiliaries from Phœnicia and Palestine, obliged Memnon, supposed to be the same with Amenophis, to retire to Memphis. Soon after this he was forced to leave Egypt altogether, and to retire into Ethiopia; but in about 13 years he returned with his son Ramesses at the head of a powerful army, and obliged the Canaanitish forces to retire out of the Lower Egypt; a transaction denominated by the Egyptian writers the *second expulsion of the Shepherds*.

25 Of Menes and his successors.

Sir Isaac Newton is of opinion, that the Egyptian princes Menes, Memnon, and Amenophis, were the same person; and that by him Memphis was either originally built or first fortified, in order to prevent the Egyptians from entering Ethiopia. He is also supposed to have been the son of Zerah, and to have died in a very advanced age about 90 years after the decease of Solomon. Thus, according to Sir Isaac Newton's chronology, the most remarkable transactions

Ethiopia.

tions of antiquity will be brought lower by ages than by the usually received computations. According to this, the Argonautic expedition happened in the time of Amenophis, though some Greek writer inform us, that the same prince assisted Priam king of Troy with a body of forces. He was succeeded by Ramesses, already mentioned, who built the northern portico of the temple of Vulcan at Memphis. The next was Moeris; who adorned Memphis, and made it the capital of his empire, about two generations after the Trojan war. Cheops, Caphrenus, and Mycerinus, succeeded in order to Moeris; the last being succeeded by his sister Nitocris. In the reign of Asychis her successor, both Ethiopia and Assyria revolted from Egypt; which, being now divided into several small kingdoms, was quickly subdued by Sabacon or So, the emperor of Ethiopia. This monarch, soon after his accession to the throne of Egypt, allied himself with Hoshea king of Israel; by which means the latter was induced to revolt from the Assyrians; and in consequence of this, an end was put to the kingdom of Israel by Shalmanesser king of Assyria, in the 24th year of the era of Nabonassar, and 720th before the commencement of the Christian era. According to Herodotus, this monarch voluntarily resigned the crown of Egypt after he had enjoyed it 50 years; but Africanus relates, that after a reign of eight years he died in Egypt, in the ninth year of Hezekiah, king of Judah. His successor Sethon, supposed to be the Sevechus of Manetho, advanced to Pelusium with a powerful army against Sennacherib king of Assyria; when the bowstrings of the Assyrians were gnawed in pieces by a great number of rats or mice, and thus they were easily defeated with great slaughter by the Egyptians. Hence Herodotus informs us, that the statue of Sethon which he saw in Egypt had a mouse in its hand. Sir Isaac Newton, however explains the whole in an allegorical manner. As the mouse among the Egyptians was a symbol of destruction, he conjectures, that the Assyrians were on this occasion overthrown with great slaughter; and that Sethon, in conjunction with Terhakah, either king of the Arabian Cushites, or a relation of Sethon and his viceroy in Ethiopia Proper, surprised and defeated Sennacherib between Libnah and Pelusium, making as great slaughter among his troops as if their shield-stays and bowstrings had been destroyed by mice.

26 Sennacherib defeated by Sethon.

27 Ethiopia subdued by Esarhaddon;

In the 78th year of the era of Nabonassar, the empire of Ethiopia was subdued by Esarhaddon king of Assyria: who held it three years, committing enormous cruelties both in that country and in Egypt. After his death the Ethiopians shook off the yoke, and maintained their independency till the time of Cyrus the Great, the first king of Persia; who, according to the Greek historian Xenophon, seems to have also been sovereign of Ethiopia. After his death they revolted, and his son Cambyses unsuccessfully attempted to reduce them. Herodotus informs us, that before he undertook this expedition, he sent some of the Ichthyophagi ambassadors to the king of the Macrobii or long-lived Ethiopians, under pretence of soliciting his friendship, but in reality to observe the strength of the country. Of this the Ethiopian prince was aware, and told the ambassadors that he knew their design, reproached Cambyses with his injustice and ambition, and gave them his bow; telling them at the same time, that the Persians might think of invading Ethiopia when they could easily bend it; and in the mean time, that their master ought to thank the gods who had never inspired the Ethiopians with a desire of extending their territories by conquest. Cambyses had sent by the ambassadors a rich purple robe, gold bracelets, a box of precious ointment, a vessel full of palm wine, and other things, which he imagined would be acceptable to the Ethiopian monarch. But all these, excepting the wine were despised. This, he owned, was superior to any liquor produced in Ethiopia; and he did not scruple to intimate, that the Persians, short-lived as they were, owed most of their days to the use of this excellent liquor. Being informed by the ambassadors, that a considerable part of the food made use of by the Persians was bread, he said that it was no wonder to find people who lived on *dung* unable to attain the longevity of the Macrobian Ethiopians. In short, the whole of his answer was so contemptuous and disgusting, that Cambyses was filled with the greatest indignation; in consequence of which, he instantly began his march without taking time to make the necessary preparations or even to procure provisions of any kind for his army. Thus a famine ensued among them; which at last became so grievous, that the soldiers were obliged to eat one another; and Cambyses himself, finding his life in great danger, was obliged to give orders for marching back again; which was not accomplished without the loss of a great number of men. Another army which he sent on an expedition against Ammonia, in order to destroy the celebrated oracle of Jupiter Ammon, perished entirely in the desarts, being overwhelmed with the vast clouds of sand frequently raised there by the wind.

28 Unsuccessful expedition of Cambyses against this country.

Ethiopia.

29 Ethiopia at this time a powerful empire.

At this time, it is doubtful whether Cambyses would have accomplished his purpose even if he had found it practicable to march into the heart of Ethiopia. This empire had but a short time before received a very considerable accession of strength by the desertion of 240,000 Egyptians who had been posted by Psammenitus in different places on the frontiers. These not having been relieved for three years, had gone over at once to the emperor of Ethiopia, who placed them in a country disaffected to him; ordering them to expel the inhabitants, and take possession of their lands. Notwithstanding this, however, Sir Isaac Newton hints, that Cambyses conquered Ethiopia about the 223d or 224th year of the era of Nabonassar; but his opinion in this respect does not appear to be well founded. We are told indeed, that the Persian monarch, notwithstanding the misfortunes he met with in the expedition abovementioned, did really make himself master of some of the Ethiopic provinces which bordered on Egypt; and that these, together with the Troglodytes, sent him an annual present of two chœnixes of unrefined gold, 200 bundles of ebony, five Ethiopean boys, and 20 elephants teeth of the largest size: but it appears improbable to the last degree, that even though Cambyses had employed the whole of his reign in the attempt, he could have conquered the vast regions of Ethiopia Proper, Sennaar, and Abassia, which were all included in the Ethiopia of the ancients.

30 Ethiopia supposed by Sir Isaac Newton to have been conquered by Cambyses.

31 Ethiopians employed by Xerxes.

When Xerxes invaded Greece, we find his army, according to Herodotus, was partly composed of Ethiopians, of whom Herodotus mentions two distinct races of

Ethiopia. of people. One of these inhabited the Asiatic coast, and differed from the Indians only in their hair and language. Their arms were the same with those of India: they wore helmets made of the skins of horses, the ears and manes of which served them for tufts and plumes of feathers; their shields being made of the skins of cranes. The hair of the Asiatic Ethiopians was long, but that of the western tribes was frizzled. The latter were also differently armed, having darts lighted at one end and covered with leather. We are not informed particularly from what nations these troops were brought, nor whether they were natural subjects of the king of Persia, or only auxiliaries: of consequence we can conclude nothing certain concerning the dominion of the Persian monarchs at this time over Ethiopia, farther than that they might possess some of the provinces next to Egypt; while the main body of the empire being in a state of indpendence, and unconnected with other parts of the world, is not taken notice of by the historians of those times.

32 Ethiopia conquered by Ptolemy Euergetes.

Though Alexander the Great had a desire to know the sources of the Nile, he did not suffer himself to be diverted by this curiosity from pursuing his grand expedition into Persia. Ptolemy Euergetes, however, appears to have carried this curiosity to such an extremity as to invade Ethiopia for no other purpose. It is surprising that the particulars of this expedition are not recorded by any historian, as it appears by an inscription that he penetrated to the farthest parts of the empire, and conquered the most powerful nations in it. Of this we have the following account, which is looked upon by the best historians to be authentic. It was copied on the spot (being the western entrance to Adule, one of the cities of Ethiopia) by Cosmas Egyptius, or, as some call him, Cosmas Indicopleustes, in the time of the emperor Justin I. by order of Elesbaan king of the Axumites, and of which the following account is given by the person who copied it. "Here (says he), facing the road to Axuma, stood a chair of white marble, consisting of a square base, a small thin column at each angle of this base, with a larger wreathed one in the middle, a seat or throne upon these, a back and two sides. Behind this chair there was a large stone three cubits high, which had sustained considerable injury from time. This stone and chair contained an inscription to the following purpose: 'Ptolemy Euergetes penetrated to the farthest parts of Ethiopia. He subdued Gaza, Agame, Signe, Ava, Tiamo or Tziamo, Gambela, Zingabene, Angabe, Tiama, Athagaos, Calaa, Semene, Lasine, Zaa, Gabala, Atalino, Bega, the Tangaitæ, Anine, Metine, Sesea, Rauso, Solate, the territory of Rauso, and several other kingdoms. Among the nations he reduced, were some inhabiting mountains always covered with a deep snow; and others seated upon ridges of hills, from whence issued boiling steams and craggy precipices, which therefore seemed inaccessible. Having finally, after all these conquests, assembled his whole army at Adule, he sacrificed to Mars, Neptune, and Jupiter; for his great success, he dedicated this chair or throne to Mars.'

33 Conquest of Ethiopia by the Romans.

From the time of this conqueror to that of the emperor Augustus, we meet with nothing of any consequence relating to Ethiopia Proper. The Roman forces having about this time been drawn out of Egypt in order to invade Arabia, Candace queen of Ethiopia, or perhaps rather of the island or peninsula of Meroe, took the opportunity of their absence to make an irruption, with a numerous army, into the province of Thebais. As there was at that time no force to oppose her, she met for some time with great success; but hearing at last that Petronius, governor of Egypt, was in full march to attack her, she retired into her own dominions. Petronius pursued her as far as Pselcha, where with 10,000 men he gained an easy victory over 30,000 undisciplined Ethiopian savages, armed only with poles, hatchets, and other clumsy or insignificant weapons of a similar nature. This victory was soon followed by the reduction of several fortresses; however, as the Roman soldiers were excessively incommoded by the heat of the climate, Petronius, notwithstanding his success, was obliged at last to retire. Soon after, Candace sent ambassadors to Augustus himself with such magnificent presents, that the emperor is said to have been thereby induced to grant her a peace on her own terms. From this time the Romans accounted themselves masters of Ethiopia: Augustus was complimented on the great glory he had acquired; and that he had, by reducing a country till that time even unknown to the Romans, finished the conquest of Africa. No material alteration, however, took place in the affairs of Meroe in consequence of this conquest, whether real or pretended. Pliny informs us that it had been governed by queens, who bore the title of Candace, for several generations before that time; and so it continued to be afterwards, as we learn from Scripture, where we are informed that, in the reign of Tiberius, the sovereign of Ethiopia was still named Candace. Some indeed are of opinion, that the Candace mentioned in the Acts of the Apostles was the same with her who had been conquered by Augustus; but this seems by no means probable, as the interval of time is by far too long to be allowed for the reign of a single princess.

34 Account of the Blemmyes.

From an anecdote of the debauched emperor Heliogabalus, who was accustomed to confine his favourites, by way of diversion, with old Ethiopian women, we may learn that some intercourse took place between the two empires, and probably that the Ethiopians owned some kind of subjection to the Romans. The Blemmyes, a gang of monstrous banditti, who inhabited the frontiers of Thebais, were vanquished by the emperor Probus: but towards the close of the third century, we find them again become so powerful, that in conjunction with another nation called *Nobatæ*, who inhabited the banks of the Nile near the Upper Egypt, they committed such depredations in the Roman territories, that Dioclesian was obliged to assign lands to the latter, and to pay both of them a considerable sum annually, to desist from their former practices. These expedients did not answer the purpose; the savages continued their depredations till the time of the emperor Justinian, who treated them with more severity, and obliged them to remain at peace. We are told by Procopius, that before the time of Dioclesian, the Roman territories extended so far into Ethiopia, that their boundaries were not 23 days journey from the capital, so that probably the whole empire had been in a state of dependence on them.

From the time of this emperor to that of their conversion

version to Christianity, we find nothing remarkable in the history of the Ethiopians. Three hundred and twenty-seven years are counted from the time of our

35 Ethiopians converted to Christianity by Frumentius.

Saviour to that of Abreha and Atzbeha, or from Abra and Asba, who enjoyed the kingdom when the gospel was preached in Ethiopia by Frumentius. This man was a kinsman and companion of a philosopher named Meropius, a native of Tyre; who having travelled all over India, died on an island in the Red Sea. After his death Frumentius, with another named Ædesius, who had also been his companion, were brought before the king of Ethiopia, to whom that island was subject. He took them into his service; making the one his treasurer and the other his butler. On the death of this prince, the queen conceived such a favour for them, that she refused to allow them to depart out of the kingdom; but committed the management of her affairs entirely to Frumentius, who made use of his influence to diffuse the Christian religion throughout the country, and at last was appointed bishop of Axuma. It is said, however, that the court and principal people, if not the nation in general, relapsed into idolatry, which continued to prevail till the year 521, when they were again converted by their king Adad, or Adag.

The two princes Abra and Asba, who reigned jointly in Ethiopia in the time of Frumentius, lived in such harmony together, that their friendship became

36 The two kings refuse to admit Arianism.

almost proverbial. After being converted to Christianity, they adhered strictly to the orthodox doctrine, refusing to admit an Arian bishop into their country. In the time of the emperor Constantius, however, this heresy was introduced, and greatly favoured by that monarch; and an attempt was made to depose Frumentius on account of his refusal to embrace it.

37 Account of the war of the elephant.

The reign of these princes is remarkable for an expedition into Arabia Felix, called by the Mahommedan writers the war of the elephant, and which was undertaken on the following occasion: The temple of Mecca, situated nearly in the middle of the Arabian peninsula, had been held in the greatest veneration for near 1400 years; probably from the notion entertained by the people in the neighbourhood, that Adam pitched his tent on that spot. Here also was a black stone supposed to possess extraordinary sanctity, as being that on which Jacob laid his head when he had the vision of angels. The most probable account of the real origin of this temple, according to Mr Bruce, is, that it was built by Sesostris, and that he himself was worshipped there under the name of Osiris.

On account of the veneration in which this tower and idol were held by the Arabians, Mr Bruce supposes that the thought was first suggested of making it the emporium of the trade between India and Africa; but Abra, in order to divert it into another channel, built a very large temple near the Indian ocean in the country of the Homerites: and to encourage the resort of people to this new temple, he bestowed on it all the privileges of the former which stood in the city of Mecca. The tribe of Arabians named *Koreish*, in whose country Mecca stood, being exceedingly alarmed at the thought of having their temple deserted, entered the new one in the night, burned all that could be consumed, and besmeared the remains with human excrements. Abra, provoked at this sacrilege, assembled a considerable army, with which he invested Mecca, himself appearing on a white elephant, from whence the war took its name already mentioned.

38 Miraculous destruction of the Ethiopian army.

The termination of the war, according to the Arabian historians, was miraculous. A vast number of birds named *Ababil* came from the sea, having faces like lions; each carrying on its claw a small stone about the size of a pea, which they let fall upon the Ethiopian army in such numbers, that every one of them was destroyed.

39 First appearance of the small-pox.

At this time it is said that the small-pox first made its appearance; and the more probable account of the destruction of the Ethiopian army is, that they perished by this distemper.

The war of the elephant is supposed to have terminated in the manner abovementioned about the year 360; from which time to that of Elesbaan, named also *Caleb*, and probably the same with Adad or Adag already mentioned, we meet with nothing remarkable in the Ethiopic history.

40 Reconversion to Christianity under Elesbaan.

He engaged in a war with the Homerites or Sabæans in Arabia Felix; whom he overthrew in battle, and put an end to their kingdom; after which he embraced the Christian religion in token of gratitude for the success he had met with.

41 Christians persecuted in Arabia.

In the time of this prince a violent persecution of the Christians took place in Arabia. The Jewish religion had now spread itself far into that peninsula; and in many places the professors of it were become absolute masters of the country, insomuch that several Jewish principalities had been erected, the sovereigns of which commenced a severe persecution against the Christians.

42 Cruelty of Phineas a Jewish prince.

Among the rest, one Phineas distinguished himself by his cruelty, having prepared a great number of furnaces or pits filled with fire, into which he threw those who refused to renounce Christianity. The Christians applied for relief to the emperor Justin; but he being at that time engaged in a war with the Persians, could not interfere: however, in the year 522, he sent an embassy to Elesbaan, who was now also a member of the Greek church, intreating him to exert himself for the relief the Christians of Arabia. On this the emperor commanded his general Abreha, governor of the Arabian province Yemen, to march to the assistance of Aretas, son to the prince of the same name whom Phineas had burnt; while he himself prepared to follow with a more considerable force.

43 He is defeated.

But before the arrival of the Ethiopian monarch, young Aretas had marched against Phineas, and entirely defeated him. In a short time afterwards the emperor himself arrived, and gave Phineas a second defeat: but notwithstanding these misfortunes, it does not appear that either the principality of Phineas or any of the other Jewish ones, was at this time overturned; though it seems to be certain, that at the time we speak of, the Ethiopians possessed part the Arabian peninsula. According to the Arabian historians, the war of the elephant, with the miraculous destruction of the Ethiopian army already mentioned, took place in the reign of Elesbaan.

Some historians mention, that the Ethiopian monarchs embraced the doctrines of Mahomet soon after the impostor made his appearance; but this seems not to be well founded: though it is certain that the *Najashi* or Ethiopian governor of Yemen embraced Mahommedanism, and that he was related to the royal family. On this occasion, however, the Ethiopians lost

44 Ethiopians driven out of Arabia.

lost all the footing they once had in Arabia; the governors being expelled by Mohammed and his successors. They fled to the African side of the Red Sea with numbers of their subjects, where they erected several small kingdoms, as Adel, Wypo, Hadea, Mara, and others which still continue.

45 Number of Jews in Ethiopia increased.

During the conquests of the caliphs, the Jews were for some time every where driven out of their dominions, or oppressed to such a degree that they voluntarily left them. Ethiopia offered them an asylum: and in this country they became so powerful, that a revolution in favour of Judaism seemed ready to take place. One family had always preserved an independent sovereignty on a mountain called Samen, the royal residence being on the top of an high rock; and several other high and rugged mountains were used by that people as natural fortresses. Becoming by degrees more and more powerful, Judith the daughter of one of their kings formed a design of overturning the Ethiopian government, and setting aside the family of Solomon, who had hitherto continued to enjoy the sovereignty. This design was facilitated by several circumstances. The empire had been weakened by an unsuccessful war, famine, and plague; the throne was possessed by an infant; and the absurd custom of confining the whole royal family on a rock named *Damo*, gave her an opportunity of cutting them all off at once by surprising that place. Fortunately, however, the king himself escaped the general catastrophe, and was conveyed by some of the nobility of Amhara to the province of Xoa or Shoa; by which means the line of Solomon was preserved, and afterwards restored, though not till after a very considerable interval.

46 Royal family of Ethiopia massacred by Judith.

47 The king escapes.

48 Judith usurps the throne.

Judith having by this massacre established her own power, assumed the imperial dignity, though in direct opposition to an established and fundamental law of the empire already mentioned, that no woman should enjoy the sovereign power. The people, however, seemed to have submitted quietly to her government, as she sat on the throne for 40 years, and afterwards transmitted the sovereignty to her posterity; five of whom reigned successively in this country. We are not furnished with any particulars concerning their reigns; farther than that, during them the people were greatly oppressed. By some means, of which historians have not given any account, another revolution took place, and a new set of usurpers, related to the family of Judith, but not their direct lineal descendants, succeeded to the throne. These were Christians, and governed with much greater lenity than the Jewish sovereigns had done; but still, being usurpers, none of their transactions are recorded in the Abyssinian annals, excepting those of Lalibala, who was accounted a saint. He lived in the end of the 12th or beginning of the 13th century, and proved a great prince. At that time the Christians in Egypt were grievously persecuted by the Saracens, who had a particular abhorrence to masons, builders, and stone-cutters; looking upon them as the chief promoters of idolatry by the ornaments they put upon their works. These were joyfully received by Lalibala; who, by affording them an asylum in his dominions, soon collected a great number. They were employed by him in hewing churches out of the solid rock, after the example of the ancient Troglodytic habitations; and many works of this kind remain in the country to this day. He undertook, however, a still more difficult and arduous task; no less than that of lessening the stream of the Nile, and thus starving the whole kingdom of Egypt now in the hands of his enemies, and who persecuted those of his religion. From the account given by Mr Bruce of this project, it appears that there really is a possibility in nature of accomplishing it; not indeed by turning the course of the Nile itself, but by diverting that of many of its branches, which are the means of conveying into it the water supplied by the tropical rains, and by which it overflows its bank annually. We are likewise assured by the same author, that Lalibala succeeded in his enterprise so far as to divert the course of two large rivers from the Nile, and that they have ever since flowed into the Indian-ocean. He next proceeded to carry a level towards a lake named *Zacvia*, into which many rivers, whose streams contribute to increase that of the Nile, empty themselves; and had this been accomplished, there is no doubt that the loss of so much water would have been very sensibly felt by the Egyptians. According to most historians, this enterprising monarch was prevented by death from putting his design in execution: though Mr Bruce informs us of a written account at Shoa, in which it was asserted, that he was dissuaded from it by certain monks, who told him, that by sending down such a quantity of water to the eastern and dry parts of Africa, these countries would soon become so fertile and populous that they would rival the empire of Ethiopia, or at least withdraw their allegiance from it entirely. The remains of these works were seen by the Portuguese ambassador in 1522.

49 A new revolution takes place.

50 Christians persecuted in Egypt fly to Ethiopia.

51 Lalibala undertakes to diminish the stream of the Nile.

52 Restoration of the line of Solomon.

All this time the princes of the line of Solomon had been obliged to content themselves with the sovereignty of the province of Xoa and Shoa, without making any attempt to regain their former dignity; but they were unexpectedly restored without bloodshed or disturbance by Naacueto Laeb the grandson of Lalibala abovementioned. This prince, being of a gentle and pacific disposition, was persuaded by a monk named *Tecla Haimanout*, greatly celebrated for his sanctity, to resign the crown, to which, though he received it from his father, he could not pretend any absolute right. In consequence of the mediation of this monk, therefore, it was agreed that Naacueto should give up the empire to Icon Amlac the lineal descendant of Solomon, who then possessed the sovereignty of Shoa. In consequence of this a portion of lands should be irrevocably and irredeemably assigned to him and his heirs; and he should likewise be allowed some marks of sovereignty as a testimony of his former grandeur. In this treaty, however, the good monk did not forget his own interest. He had founded a famous monastery in Shoa, and was primate of the whole empire under the title of *Abuna*. He now insisted that one third of the kingdom of Ethiopia should be absolutely ceded to himself for the maintenance of his own dignity, and the support of the clergy, convents, &c. throughout the country; he also insisted that no native Abyssinian should ever enjoy the same dignity with himself, even though he should have been chosen and ordained at Cairo, as was the custom with the Abyssinian prelates.

53 Uncertainty of the Abyssinian history for a considerable time.

These extraordinary terms were complied with, and

Icon Amlac raised to the throne of Ethiopia. He did not, however, remove the seat of government from the province of Shoa; but continued at Tegulat the capital of that province during the whole of his lifetime, which continued 15 years after his accession to the throne of Ethiopia. We are ignorant of the transactions of his reign, as well as that of several of his successors, five of whom ascended the throne in as many years. From this quick succession Mr Bruce is of opinion, that a civil war had taken place among the candidates for the throne: but the Abyssinian annals make no mention of this; neither have we any particular account of the transactions of the empire till the time of Amda Sion, who began to reign in 1312. He was the son of Wedem Araad, the youngest brother of Icon Amlac, and succeeded to the throne on the death of his father. He professed the Christian religion; but his practice seems to have been very opposite to its precepts. He began his reign with living publicly with a concubine of his father's; and quickly after committed incest with his two sisters. On this he was first exhorted to repentance, and then excommunicated, by Honorius, a monk greatly celebrated for his sanctity, and who has since been canonized. The prince, enraged at this indignity, caused the saint to be severely whipt through every street of his capital. That night the town was by some unknown means set on fire and reduced to ashes: the clergy persuaded the people, that the blood of Honorius had turned to fire as it dropped on the ground, and thus occasioned the catastrophe; but the king suspecting that the monks themselves had been the incendiaries, banished or imprisoned them all, so that their hopes of exciting an insurrection were disappointed; and being dispersed into those provinces where the inhabitants were mostly Jews or Pagan, they were now obliged to apply to what was certainly more incumbent upon them, viz. the diffusion of the knowledge of the gospel.

54 Reign of Amda Sion.

55 He is excommunicated for incest.

56 The monks banished.

While the king was busied with the monks, one of the factors, who had been entrusted with some of his commercial interests, was assassinated by the Moors in the province of Ifat; on which, without making the least complaint or expostulation, he assembled his troops, and with *seven* horsemen (A) fell upon the nearest Mahometan settlements, massacring all he met without exception. Putting himself then at the head of his army, he proceeded in the most rapid career of desolation, laying waste the whole country with fire and sword, and carrying off an immense booty.

57 His expedition against the Mahometans.

For some time the Moors were so surprised that they did not think of making opposition; but at last they took up arms, and attempted to surprise the Abyssinian monarch in his camp, hearing that he had sent out most of his army in detachments. With this view they approached the camp in the night-time, expecting to have found the king and his few soldiers immersed in sleep. Unexpectedly, however, he had been joined by a considerable part of his army, whom he drew up in battle array to receive his enemies. An engagement ensued, in which the king behaved with great valour; killed the Moorish general with his own hand, and gained a complete victory. He then commanded such of his soldiers as could not find houses ready built, to build huts for themselves, and a large tract of land to be plowed and sown, as if he meant to stay in the country of the enemy during the rainy season. The Mahometans now perceiving they were in danger of being totally exterminated, willingly submitted to the terms he pleased to impose upon them; while the monarch conciliated the affections of his people by dividing among them the vast plunder he had acquired in this expedition.

58 They attack his camp in the night without success.

59 They submit, but quickly revolt again.

The Moors no sooner found themselves freed from any apprehensions of immediate danger, than they prepared for a new revolt. The king having intelligence of their designs, secretly prepared to subdue them before they could have time to bring matters to a sufficient bearing. The Moors, however, being better prepared than he expected, began hostilities by surprising and plundering some villages belonging to the Christians, and destroying their churches. A most formidable combination had taken place; and as the consequence of allowing the confederate rebels to join their forces might have been very dangerous, the king used his utmost endeavours to prevent it. This design was in some measure facilitated by the superstition of Amano king of Hadea, one of the principal rebels. This man, by the advice of a conjurer, in whom he put great confidence, instead of marching his troops to the assistance of his allies, remained at home with them, where he was defeated and taken prisoner by a detachment of the king's army. The governor of Amhara was next dispatched against Saber Eddin the revolted governor of Fatigar, with orders to lay waste the country, and use every method to force him to a battle, if he should be disinclined to venture it himself. These orders were punctually executed; Saber-eddin was compelled to stand an engagement; in which he was defeated; the victors plundered his house, and took his wife and children prisoners. But in the mean time intelligence was received of a new revolt among the Falasha, who had assembled a great army, and threatened to become very formidable; their chief keeping a close correspondence with Saber-edden, as well as with the king of Adel. These, however, shared the same fate with the rest, being entirely defeated by Tzaga Christos another Abyssinian general, who soon after joined the king with his whole army. This proved fatal to the rebel cause: Sabber-eddin, no longer able to support himself against the royal forces, was obliged to surrender at discretion, and all the rest were quickly reduced; so that the king was at leisure to march against the king of Adel and Mara, who having now united their forces, resolved to give him battle. At this the Abyssinian monarch was so exasperated, that he determined to take a most ample vengeance on his enemies. In the presence of his whole army, therefore

60 King of Hadea defeated and taken prisoner.

61 Another rebel chief defeated.

62 The Falasha defeated.

63 The king marches against Adel, Mara, &c.

(A) On this Mr Bruce remarks, that "it has been imagined the number should be increased to 70; but there would be little difference in the rashness of the action." The word in the Abyssinian annals which he translates is *seven*; but if we increase the number at all, it ought more probably to be to *seven hundred* than seventy.

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fore, and a monk of uncommon sanctity dressed in the same habit in which he usually performed divine service, the king made a long speech against the Mahometans. He recounted the many violences which they had committed; and of which the kings of Adel and Mara had been principal promoters. He enumerated many examples of murder, sacrilege, &c. of which they had been guilty; setting forth also that they had carried off great numbers of Christians into slavery, and that the view of making slaves was now a great motive with them for making war. He disclaimed every idea of commencing hostilities from any avaricious motive; as a proof of which, he denied that he would accept of any part of the plunder for his own use; concluding with a declaration, that he was now about to swear on the holy eucharist, that, "though but 20 of his army should join him, he would not turn his back upon Adel or Mara, till he had either forced them to tribute and submission, or entirely extirpated them and annihilated their religion." After this speech, he took the oath in the presence of the whole army; who not only applauded him with loud shouts, but protested that they looked upon themselves to be all bound by the oath he had taken. As he had mentioned in his speech that the plunder had been purchased by the lives of their Christian brethren, they determined to show their abhorrence at keeping any of it on these terms. Taking lighted torches in their hands, therefore, they set fire to the whole plunder that had been amassed since the beginning of the war; and having thus reduced themselves to a state of poverty, they prepared to show their Christianity by thirsting, not after the wealth, but the blood of their enemies.

64 His speech and oath in presence of his army.

65 Enthusiasm of his troops.

Notwithstanding the enthusiasm of the whole army on this occasion, the expedition was attended with great difficulties. These arose principally from superstition; and as, on the one hand, the Abyssinians were by this principle laid under considerable disadvantages, their adversaries on the other enjoyed equal advantages from no better cause. The Abyssinians, according to Mr Bruce, are very credulous with respect to genii or spirits which go about doing mischief in the dark. Hence they are afraid of travelling, but especially fighting, in the night-time; because they imagine that the world is then entirely given up to these beings, who are put out of humour by the motions of men, or of any other terrestrial creature. In the night-time therefore an Abyssinian dares not even throw a little water out of a bason, lest it should fall upon some spirit and provoke it to vengeance. The Moors, on the other hand, tho' equally fearful, secure themselves against these invisible enemies by means no less ridiculous than the fears themselves. A verse of the Koran, sewed up in leather, and worn round their neck or arm, is sufficient to defy the power of the most mischievous genii. Under such powerful protection, therefore, they laugh at the terrors of the Abyssinians, and are on all occasions ready to attack them in the night-time, and even choose that season rather than any other for coming to an engagement. Sensible of this advantage, and encouraged by the little loss which attended even a defeat in these nocturnal encounters, they determined on the present occasion to avoid any pitched battles, and to content themselvs with harassing the king's army by continual skirmishes of this kind. Thus, though the Abyssinian monarch had always the advantage, his troops soon began to complain; and, on the commencement of the rainy season, insisted on being allowed to return.—This was by no means agreeable to a prince of such a martial disposition as Amda Sion. He therefore told them, that, if they were afraid of rains he would conduct them to a country where there were none; meaning Adel, which, though likewise within the limits of the tropical rains, has them at another season than that in which they fall in Abyssinia. Thus he persuaded his army again to set forward: but was so grievously harassed by the nocturnal attacks of the Moors, that he was once more in danger of being deserted; and when by his eloquence he had found means to dissipate the apprehensions of the soldiers, he was seized with such a violent fever as threatened his life. The soldiers now expected that they were soon to return; but while they indulged themselves in the carelessness which usually attends an expectation of this kind, they accidentally received intelligence that the Moors, having assembled an army of 40,000 men, were in full march to attack them, and at a very small distance. The king was now free from fever, but so weak that he fainted on attempting to put himself in readiness for going out to battle. Still, however, his resolution continued firm and unalterable; having recovered from his faint, washed and refreshed himself, he made a speech to his soldiers, filled with the most enthusiastic expressions of confidence in the justice and goodness of the cause in which he was engaged, and in the continuance of the divine favour and protection. "As it never was my opinion (said he), that it was my own strength and valour, or their want of it, which has so often been the cause of preserving me from their hands; so I do not fear at present that my accidental weakness will give them any advantage over me, as long as I trust in God's power as much as I have ever done." By this speech the drooping spirits of the Abyssinians were revived; and they only begged that their monarch would now trust to the valour of the troops, and not expose his person to such danger as he had usually done. He promised to comply with their request; but matters were soon thrown into confusion by a report that the Moors had poisoned the wells and enchanted all the running water in the front of the army. The poisoned wells, however, were easily avoided; and a priest of vast sanctity was dispatched a day's journey before the army to disenchant the waters by his blessings; which, having the advantage of the good qualities of the element itself on their side, were doubtless more powerful than the spells of the infidels. Not content with this, the king caused a river to be consecrated by the name of *Jordan*; but while his men were employed in bathing themselves in this holy water, the *Fits-Auraris*, an officer who had been dispatched with a party of men who always go before the Abyssinian armies, was attacked and driven back on the main body by a detachment of the enemy, who had along with them a number of women provided with drugs to poison and spells to enchant the waters. On this a dreadful panic seized the whole army; who, unmindful of the promises made to their king, not only refused to advance, but for the most part came to the resolution of leaving their camp, and returning homewards without delay.

66 Excessive superstition of both parties.

67 The king's troops harassed by frequent encounters.

68 He is seized with a dangerous fever.

69 His troops disheartened.

70 They are seized with a panic, and refuse to engage.

delay. The king, ſenſible that all was loſt if this pernicious ſcheme ſhould be adopted, did his utmoſt to encourage and perſuade them to return to their duty; but perceiving that nothing was to be gained by reaſoning with men ſo much terrified, he only requeſted that ſuch as

71 He begins the fight with a very few attendants.

could not be induced to fight, would not leave their places, but ſtand quiet ſpectators of the battle. Even this had very little effect: ſo that, finding the enemy now ready to make an attack, he ordered his maſter of the horſe with only five others, to attack the left wing of the enemy; while he, with a ſmall party of his ſervants, made an attack on the right. This deſperate action was attended with ſucceſs. The king, notwithſtanding the weakneſs he yet laboured under, killed with his own hand two of the commanding officers of the enemy's right wing; while his ſon diſpatched another of conſiderable rank belonging to the left. This had ſuch an effect upon the whole Mooriſh army, that they began evidently to loſe courage; while the Abyſſinians, aſhamed of their conduct, now ruſhed furiouſly to reſcue their prince from danger. The battle continued for ſome time with great obſtinacy;

72 The Moors defeated.

but at laſt the centre and left wing of the Moors were entirely defeated. The right wing, compoſed principally of Arabians, retired in a body; but, not knowing the country, they entered a deep valley ſurrounded by perpendicular rocks entirely covered with wood. The Abyſſinians, imagining they had nothing more to do, began to ſtrip and mangle the bodies of the killed and wounded; but the king, perceiving that the Arabians had brought themſelves into a ſituation from whence they never could be extricated, obliged his ſoldiers to

73 And almoſt entirely cut off.

deſiſt from this barbarous employment, and even killed two of them who diſobeyed his orders. The army was then divided into two parts, one of which ſurrounded the devoted Arabians, while the other was ſent a day's journey after the remainder of the Moors. Both parties proved equally ſucceſsful. The king with part of his diviſion attacked the Arabians in front, while the reſt rolled great ſtones down from the tops of the rocks upon them. By this they were thrown into ſuch confuſion, that being neither able to fly nor reſiſt, they were all killed to a man. The fate of the Moors was little better. The other diviſion of the Abyſſinian army found them lying round a large pool of water which they lapped like as many dogs. In this helpleſs ſituation there was nothing requiſite but to order them to be ſlaughtered; and this cruel order was executed with the utmoſt preciſion. The ſoldiers imagining they ſhould now diſcharge their vow to heaven, wearied themſelves with ſlaughter; till at laſt, being almoſt ſatiated with blood, they made a few priſoners, among whom was Saleh king of Mara with his queen; the former of whom was hanged by order of Amda Sion, and the latter cut in pieces, and her body given to the dogs by the ſoldiers.

74 Amda Sion purſues his advantage.

This ſignal victory was gained in the end of July 1316; but as the rains at that ſeaſon ſet in with violence moſt of the army now again inſiſted on their returning home without delay. The king and principal officers, however, were of opinion, that the advantages ſo dearly purchaſed ought by all means to be purſued till they had either reduced the Mahometans to ſubjection, or at leaſt deprived them of all power to make attacks on the empire with any proſpect of ſucceſs. This opinion being adopted, the king ſent back the baggage, women, and others who could be of no uſe to the army; retaining only the veteran ſoldiers, who were able to encounter more than ſix times the number of ſuch

75 His further conqueſts.

enemies as he could expect to meet with. Advancing farther into the Mahometan territories, he took up his reſidence in a large town called *Zeyla*; from whence he, that very night, ſent out a detachment to ſurpriſe a large village in the neighbourhood named *Taraca*. This was executed with ſucceſs; the men were maſſacred, and the women kept to ſupply the places of theſe who had been ſent away. Continuing ſtill to advance he detached parties to lay waſte the countries all round; and in this expedition he had the good fortune to cut off two of the principal authors of the conſpiracy

76 Adel invaded.

againſt him. He then proceeded to invade Talab and Abalge in the territories of the king of Adel. That monarch, now rendered deſperate by the view of approaching ruin, had aſſembled all the troops he could raiſe, in order to make one laſt effort againſt the enemy; but conducted himſelf with much leſs prudence than he ought to have done when contending with ſuch an experienced and vigilant adverſary. Amda Sion, confident of ſucceſs, took no leſs care how to prevent the enemy from eſcaping than how to gain the victory. For this purpoſe he diſpatched parties of horſe to lie in wait in all thoſe avenues by which he ſuppoſed that the Moors might attempt to make their eſcape; after which, falling furiouſly on the Adelians himſelf, and being

79 The king of Adel defeated and killed.

well ſupported by his troops, he gained a complete victory; the king of Adel, with great numbers of his men, being killed on the ſpot, and almoſt all the reſt by the parties of horſe whom the Abyſſinian monarch had poſted in ambuſh to intercept them.

As the loſs of this battle rendered the affairs of the Adelians quite deſperate, the three young princes, ſons to the late king, with their uncle, waited upon Amda Sion with rich preſents, which they laid at his feet

78 The princes of Adel ſubmit.

in the moſt humble manner, putting their foreheads in the duſt, and intreating his pardon; profeſſing their ſubjection and readineſs to obey his commands, provided that he would ſpare the remainder of their country and property. To this the king made a very unfavourable reply, reproaching them with indignities done to himſelf; but eſpecially with the ſacrilege they had committed in burning churches and murdering prieſts deſtroying alſo defenceleſs people in villages, merely becauſe they imagined that he would not protect them. To puniſh thoſe and other crimes, he ſaid, he was now in the heart of their country; and he was determined never to turn his back upon Adel while he had ten men capable of drawing their ſwords; for which reaſon he commanded them to return and expect the approach of his army.

By this fierce ſpeech the brother and two eldeſt children of the king of Adel were ſo diſheartened, that they could not ſpeak; but the youngeſt ſon made a very ſpirited ſpeech, in which he attempted to ſoften the king by complimenting his valour, and ſhowing that it was unworthy of his character to puſh the war againſt a people who were already conquered and de-

79 Are unfavourably received.

fenceleſs. All the anſwer he could obtain, however, was, that unleſs the queen with the reſt of the royal family, and the principal people the nation, would come by to-morrow evening and ſurrender themſelves

as

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as the princes had done, he would lay waste the territory of Adel, from the place where he sat to the Indian ocean. On this the princes earnestly requested their mother to submit without reserve to the clemency of the Abyssinian monarch, and to wait upon him next morning; but she was prevented from this by some of the nobility who had formerly advised the war, and who justly suspected danger to themselves if they should be obliged to submit unconditionally to the conqueror. They resolved, therefore, to venture a battle once more; and the better to ensure success, they bound themselves by an oath to stand by each other to the last extremity. At the same time they dispatched messengers to the princes, requesting them to make their escape with all manner of expedition, and to head the army themselves; all of whom were determined to conquer or die as soon as the royal family should be out of the enemy's hands. By this conduct the Abyssinian monarch was so much irritated, that he divided his army into three parts; two of which he commanded to enter the territory of the enemy by different routs, and to exterminate both man and beast wherever they came; while he himself with the third, took the straight road to the place where the new Adelian army was encamped. Here he found a number of infantry, drawn up and ready to engage him; but, besides these, there was a multitude of old men, women, and even children, all armed with such weapons as they could procure. Surprised at this sight, he ordered a party of horse to disperse them; but this was found impossible; so that he was obliged to call in the detachments he had sent out, with orders to fall upon the enemy by the nearest way they could advance. The engagement was for a long time very doubtful; and in opposition to Amda Sion appeared the young king of Wypo, who every where encouraged his troops, and made the most obstinate resistance. The Abyssinian monarch having observed him, sheathed his sword, and arming himself with a bow, chose the breadest arrow he could find, and took so just an aim, that he shot the young prince through the side of the neck, and his head inclining to one shoulder he soon fell down dead. On this the spirit of the Adelians entirely forsook them, and they betook themselves to flight; but unluckily falling in with two Abyssinian detachments coming to the king's relief, they were so completely destroyed, that only three of them are said to have made their escape. On the side of the Abyssinians, however, the victory was dearly purchased; many of the principal officers being killed, and scarcely one of the cavalry escaping without a wound.

80 The war continues.

81 An obstinate battle.

82 The Moorish army entirely cut off.

83 Dreadful devastations.

The remainder of this expedition consisted only in the destruction and burning of towns and villages, and massacres of helpless people, on pretence of retaliating the injuries committed by the Mohometans against the Christians. At last, weary of conquest and of carnage this victorious monarch, who never suffered a defeat in any battle, returned in triumph to his capital, where he ended his days after a reign of 30 years. In his time we find that the royal family were not confined as had been the usual practice from the time of the queen of Sheba to the massacre by Judith; for Saif Araad, the son and successor of Amda Sion, distinguished himself in one of the battles in which his father was engaged,

84 The royal family not confined as formerly.

Though the new prince, as appears from what has been just now observed, was by no means destitute of military talents, the Abyssinian empire enjoyed a profound peace during his reign. The only remarkable transaction was the relief given by him to the Coptic patriarch, whom the sultan of Egypt had thrown into prison. At this time a great trade was carried on through the desart by caravans between Cairo and Abyssinia, as well as from Cairo and Suakem on the Red Soa; but the Ethiopic monarch having seized the merchants from Cairo, and sent parties of horse to interrupt the caravans in their passage, the sultan was soon content to release the patriarch, whom he had imprisoned only with a view to extort money.

85 Reign of Saif Araad.

In the reign of Theodorus, who held the crown of Ethiopia from the year 1409 to 1412, we find an infringement made on the treaty between Icon Amlac and the Abuna Tecla-Haimantout formerly mentioned. By that treaty the Abuna was to have a full third of the whole empire for the support of his own dignity and that of the church: but Theodorus, justly considering this as an unreasonable acquisition, reduced it very considerably, though he still allowed a very ample revenue out of every province of the empire; and even this has been considered by several of his successors as far too large, and has consequently been frequently abridged by them. The annals of this prince's reign are very defective, and Mr Bruce supposes that they have been mutilated by the ecclesiastics; which, considering what we have just now related of his reducing their revenues, is by no means improbable. By his subjects he was considered as such a saint, that to this day the people believe he is to rise again and to reign a thousand years in Abyssinia; during which period war is to cease, and happiness to be universally diffused.

86 Of Theodorus.

87 Is celebrated as a saint.

From the time of Theodorus to that of Zara Jacob, who began his reign in 1434, the Abyssinian annals furnish us with little or nothing of any consequence. The character of this prince is represented as by no means inferior to that of Theodorus, or indeed of any monarch that ever sat on the throne of Ethiopia, or any other kingdom in the world. He is in short set forth as another Solomon, and a model of what sovereigns ought be; though, from some particulars of his reign, this character should seem to be rather exaggerated. The first remarkable transaction of this great monarch was his sending an embassy to the council of Florence. The ambassadors were certain priests from Jerusalem, who in that assembly adhered to the opinions of the Greek church; and the embassy itself was judged to be of such consequence as to be the subject of a picture in the Vatican. This prince obtained also a convent at Rome from the pope for the use of the Abyssinians; which is still preserved, though very seldom visited by those for whom it was designed. He seems to have been very desirous of keeping up a correspendence with the Europeans as well as the Asiatics; and in his time we first read of a dispute in Abyssinia with the *Frangi* or Franks on the subject of religion. This was carried on in presence of the king between one Abba George and a Venetian painter, Francisco de Branco Lone, in which the former confuted and even convinced his antagonist; but from this time we find a party formed for the church of Rome, and which probably took its rise from the embassy to the council of Florence.

88 Zara Jacob said to equal Solomon.

89 Sends an embassy to the council of Florence.

90 A party for the church of Rome formed.

The prince of whom we now treat was the first who introduced

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introduced perſecution on a religious account into his dominions; and for this reaſon moſt probably he is ſo highly commended by the eccleſiaſtics. The

91 Religious perſecution introduced.

ſtate of religion in Abyſſinia was now indeed very corrupt. The Greek profeſſion had been originally eſtabliſhed from the church of Alexandria; but in the low provinces bordering on the coaſt of Adel, the Mahometan ſuperſtition prevailed. Many of that perſuaſion had alſo diſperſed themſelves through the towns and villages in the internal parts of the empire, while in not a few places the groſſeſt idolatry ſtill took places, ſo as the worſhip of the heavenly bodies, the wind, trees, cows, ſerpents, &c. All this had hitherto paſſed unnoticed; but in the reign of Zara Jacob, ſome families being accuſed of worſhipping the cow and ſerpent, were brought before the king, who pronounced ſentence of death upon them. Their execution was followed by a royal proclamation, that whoever did not carry on his right hand an amulet with theſe words upon it, "I renounce the devil for Chriſt our Lord," ſhall not only forfeit his perſonal eſtate,

92 Amda Sion a cruel inquiſitor.

but be liable to corporal puniſhment. The ſpirit of perſecution thus begun, quickly diffuſed itſelf, and an inquiſitor was appointed to ſearch for criminals. This was one Amda Sion, the king's chief confident, who pretended to all that abſurd and auſtere devotion common to religious hypocrites. In this he was flattered with uncommon parade and attendance, the uſual rewards of people of that ſtamp: as he never appeared abroad but with a great number of ſoldiers, trumpets, drums, and other enſigns of military dignity waiting upon him. He kept alſo a number of ſpies, who brought him intelligence of thoſe who were ſecretly guilty of any idolatrous or treaſonable practices; after which, proceeding with his attendants to the houſe of the delinquent, he cauſed the family firſt ſupply himſelf and his party with refreſhments, and then ordered the unhappy wretches to be all put to death in his pre-

93 Murder of the king's ſons-in-law.

ſence. Among thoſe who ſuffered in this barbarous manner were the two ſons-in-law of the king himſelf, who had been accuſed by their wives, the one of adultery, and the other of inceſt; on which ſlight ground they were both put to death in their own houſes in ſuch a manner as deſervedly threw an odium on the

94 Perſecution ſuppreſſed.

king. His conduct was afterwards ſo ſeverely condemned by certain clergymen from Jeruſalem, that a reformation ſeems to have been produced; and no mention is afterwards made of the inquiſitor or perſecution during this reign.

95 Affairs of the kingdom regulated.

The attention of the king was now called off from religion to the ſtate of his affairs in the different provinces of the kingdom. As the Mooriſh provinces were very rich, by reaſon of the extenſive trade they carried on, and frequently employed their wealth in exciting rebellions, it became neceſſary that the ſovereign himſelf ſhould examine into the circumſtances and diſpoſitions of the ſeveral governors; which was likewiſe proper on another account, that he might aſſign to each the ſum to be paid. On this occaſion he

96 Churches repaired.

divided the empire more diſtinctly, and increaſed the number of governments conſiderably; which being done, he ſet about repairing the churches throughout the country, which had fallen into decay, or been deſtroyed in the war with the Mahometans. So zealous was he in this reſpect, that having heard of the deſtruction of the church of the Virgin in Alexandria by fire, he inſtantly built another in Ethiopia, to repair the loſs which Chriſtianity might have ſuffered.

The laſt public tranſaction of this prince's reign was the quaſhing of a rebellion which ſome of his governors had entered into; but whatever glory he might acquire from this or any other exploit, his behaviour with regard to his domeſtic affairs muſt certainly place him in a very diſadvantageous light. In the decline

97 The queen put to a cruel death.

of the king's life, the mother of the heir apparent conceived ſuch an extreme deſire to behold her ſon in poſſeſſion of the throne, that ſhe began to form ſchemes for obliging his father to take him into partnerſhip with him in the government. Theſe being diſcovered, her huſband cruelly cauſed her to be whipped to death: and finding that his ſon afterwards performed certain ſolemnities at her grave in token of regard for her, he cauſed him to be loaded with irons and baniſhed to the top of a mountain; where he would probably have been put to death, had not the monks interfered. Theſe having invented prophecies, dreams, and revelations, that none but the young prince Bæda Mariam was to poſſeſs the throne, the old king ſubmitted to the decrees of heaven, and relaxed in his ſeverity.

98 The royal family again confined.

On the acceſſion of the new king in 1468, the old law for impriſoning all the royal family was revived, and a mountain named *Geſhen* choſen for the purpoſe. Having thus ſecured himſelf from any danger of a rival in caſe he ſhould undertake a foreign expedition, he proclaimed a pardon to all thoſe who had been baniſhed during the former reign, and thus ingratiated himſelf with his people; after which he began to prepare for war. At this the neighbouring princes, particularly the king of Adel, being alarmed, ſent ambaſſadors re-

99 War with the Dobas reſolved on.

queſting the continuance of peace. The Abyſſinian monarch told them, that his deſign was to deſtroy the Dobas; a race of Shepherds very wealthy, but extremely barbarous, profeſſing the Pagan religion, and greatly reſembling the Gallas. The reaſon of his commencing hoſtilities againſt them was, that they made continual inroads into his country, and committed the greateſt cruelties; on which account he determined not to make war as with a common enemy, but to exterminate and deſtroy them as a nuiſance. The king of Adel was no ſooner poſſeſſed of this piece of intelligence, than he communicated it to the Dobas; deſiring them to ſend their women and children, with their moſt valuable effects, into his country, till the

100 They are maſſacred.

invaſion ſhould be over. This propoſal was readily embraced; but Bæda having got notice of it, ſeized an avenue through which they muſt neceſſarily paſs, and maſſacred every one of the company. After this, entering their country, he committed ſuch devaſtations, that they were glad to ſubmit, and even to renounce their religion in order to free themſelves from ſuch a dreadful enemy. The king then turned his arms againſt Adel, where he was attended with the uſual ſucceſs; a moſt complete victory being gained over the Moors

101 Death of the king.

by the Abyſſinian general: but while the king himſelf was advancing towards that country, with a full reſolution to reduce it to the moſt abject ſtate of miſery, he was ſeized with a pain in his bowels, which occaſioned his death.

The diſcovery of the kingdom of Ethiopia or Abyſſinia by the Europeans took place about this time. It has

has already been obſerved, that ſome intercourſe by means of individuals had been carried on betwixt this

102 Diſcovery of Ethiopia by the Europeans.

country and Italy; but the knowledge conveyed to Europeans in this manner was ſo imperfect and obſcure, that it ſcarce amounted to any thing. Even the ſituation of the country had been forgot; and

103 Of Preſter-John.

though ſome confuſed notions were entertained of a diſtant Chriſtian prince who was likewiſe a prieſt, Marco Paulo, the famous Venetian traveller, affirms, that he had met with him in Tartary; and it was univerſally agreed that his name was *Joannes Preſbyter*, *Prete Janni*, or *Preſter John*. When the Portugueſe began to extend their diſcoveries along the coaſt of Africa, more certain intelligence concerning this prince was obtained. Bemoy, one of the kings of the Jaloſſes, a nation on the weſtern coaſt of Africa, had aſſured the Portugueſe navigators of the exiſtence of

104 Ambaſſadors ſent from the king of Portugal.

ſuch a prince ſo ſtrongly, that the king determined to ſend ambaſſadors to him; and the diſcovery was of the greater conſequence, that a paſſage to the Eaſt-Indies was now attempted both by land and ſea. The ambaſſadors were named *Peter Covillan* and *Alphonſo de Paiva*. Theſe were ſent to Alexandria in Egypt, from whence they were to ſet out on their journey; the intent of which was, to explore the ſources of the Indian trade, the principal markets for the ſpice, &c. but above all to diſcover whether it was poſſible to arrive at the Eaſt-Indies by ſailing round the continent of Africa.

105 Account of their travels.

In the proſecution of this ſcheme our two travellers went from Alexandria to Cairo; from thence to Suez at the bottom of the Red Sea; from Suez they took their route to Aden, a wealthy and commercial city beyond the ſtraits of Babel Mandel. Covillan now ſet ſail for India, and De Paiva for Suakem. The latter loſt his life without making any diſcovery; but Covillan paſſed over to Calicut and Goa. From thence he returned to the continent of Africa, viſiting the gold mines of Sofala, and paſſing from thence to Aden and Cairo; at which laſt place he was informed of the death of his companion. In this city he was met by two Jews with letters from the king of Abyſſinia. One of theſe Jews was ſent back with letters to the Abyſſinian monarch; but with the other he proceeded to the iſland of Ormus in the Perſian gulf. Here they ſeparated; the Jew returning home, and Covillan repaſſing the ſtraits of Babel Mandel, whence he proceeded to Aden, and afterwards entered the Abyſſinian dominions.

The reigning prince at this time was named *Alexander*; and when Covillan arrived, he was employed in levying contributions on his rebellious ſubjects. He met with a kind reception; and was conveyed to the capital, where he was promoted to the higheſt poſts of

106 Important intelligence conveyed to Portugal by Covillan.

honour, but never allowed to return to Europe again. The intelligence, however, which he tranſmitted to the court of Portugal proved of much importance. He not only deſcribed all the ports of India he had ſeen, with the ſituation and wealth of Sofala, but adviſed the king to proſecute the diſcovery of the paſſage round Africa with the utmoſt diligence; affirming, that the Cape at the ſouthern extremity of the continent was well known in India; and accompanying the whole with a chart which he had obtained from a Moor, and which ſhowed exactly the ſituation of the Cape and neighbouring countries.

Covillan arrived in Ethiopia about the year 1490; and the prince to whom he addreſſed himſelf was Alexander the ſon of Bæda Mariam. He ſeems to have

107 Reign of Alexander

been endowed with many good qualities, and no leſs verſed in military affairs than any of his predeceſſors.

108 Meditates a war againſt Adel.

His reign was diſturbed by plots and rebellions, which at laſt proved fatal to him. From his early years he manifeſted a great deſire to make war on the king of Adel, who ſeems to have been the natural rival of the Ethiopic princes. But the Adelian monarch, having now become ſenſible that he was not able to cope with ſuch powerful adverſaries, took the moſt effectual way of ſecuring himſelf; viz. by gaining over a party at the court of Abyſſinia. In this he had now ſucceeded ſo well, that when Alexander was about to invade Adel, Za Saluce the prime miniſter, with many of the principal nobility, were in the intereſt of his adverſary.

109 He is deſerted by his prime miniſter and moſt of his army in battle, but gains a victory.

Not being apprized of this treachery, however, Alexander entruſted this miniſter with the command of a great part of his forces; and with theſe the latter abandoned him in the heat of an engagement. Alexander and the few troops who remained with him, however, were ſo far from being diſheartened by this treachery, that they ſeemed to be inſpired with freſh courage. The king having killed the ſtandard-bearer of the enemy, and thus became maſter of the green enſign of Mahomet, the enemy began to give way; and on his killing the king of Adel's ſon, immediately after they quitted the field altogether. The victory was not by any means complete; neither was Alexander in a ſituation to purſue the advantage he had gained. Having therefore challenged the Moors to a ſecond engagement, which they declined, he returned with a deſign to puniſh his perfidious miniſter Za Saluce, who had endeavoured to excite the governors of all the provinces to revolt as he went along. The traitor, how-

110 Alexander murdered.

ever, had laid his plots too well; ſo that his ſovereign was murdered in two days after his arrival in the capital. Za Saluce did not enjoy the rewards he expected from his treachery: for having attempted to excite a revolt in the province of Amhara, he was attacked by the nobility there; and his troops deſerting him, he was taken priſoner without any reſiſtance, his eyes were put out, and himſelf expoſed on an aſs, to the curſes and deriſion of the people.

111 Reign of Naod.

Alexander was ſucceeded by an infant ſon, who reigned only ſeven months; after which his younger brother Naod was choſen king by the unanimous voice of the people. He proved a wiſe and virtuous prince; but the late misfortunes, together with the corruption introduced at court by the Mahometans, had ſo unhinged the government, that it became very difficult to know how to manage matters. Judging very properly, however, that one of the moſt effectual methods of quieting the minds of the people would be an offer of a general pardon; he not only proclaimed this, but likewiſe, "That any perſon who ſhould upbraid another with being a party in the misfortunes of paſt times, or ſay that he had been privy to this or that conſpiracy, had received bribes from the Moors, &c.

112 Maſſudi ravages the Abyſſinian territories.

ſhould be put to death without delay." On his entering upon government, he found it neceſſary to prepare againſt an enemy whom we have not heretofore mentioned, *viz.* Maſſudi, prince of a diſtrict named *Arar*, which lay in the neighbourhood of Adel. This chieftain being a man of a very enterprising and martial disposition, and a most violent enthusiast in the Mahometan cause, had made a vow to spend 40 days annually in some part of the Abyssinian dominions during the time of Lent. For this purpose he kept a small body of veteran troops, with whom he fell sometimes on one part, and sometimes on another of the frontiers of Ethiopia, putting to death without mercy such as made resistance, and carrying off for slaves those who made none. For 30 years he continued this practice; beginning exactly on the first day of Lent, and proceeding gradually up the country as the term advanced. His progress was greatly facilitated by the superstition of the people themselves, who kept that fast with such rigour as almost entirely to exhaust their strength; so that Maffudi having never met with any opponent, was always sure of success, and thus

113 He is defeated.

came to be reckoned invincible. On the present occasion, however, he experienced a prodigious reverse of fortune. Naod having enjoined his soldiers to live in the same full and free manner during the fast as at any other time, and having set the example himself, marched out against his enemy; who being ignorant of the precaution he had taken, advanced with his usual confidence of success. The Abyssinian monarch, still pretending fear, as if on account of the weakness of his men, pitched his camp in very strong ground, but left some passages open to it, that the enemy might make an attack. This was done contrary to the advice of their leader; and the consequence was, that almost every one of them was cut off. On this the king of Adel sent ambassadors to solicit a continuance of the peace with himself; which was granted, upon condition that he restored all the slaves whom Maffudi had carried off in his last year's expedition; with which the Mahometan chief thought proper to comply rather than engage in such a dangerous war.

Naod having thus freed his country from the danger of any foreign invasion, applied himself to the cultivation of the arts of peace, and reforming the

114 David III.

manners of his subjects, in which he spent the remainder of his days. He died in 1508, after a reign of 13 years; and was succeeded by his son David III. a child of 11 years of age. Though the affairs of the empire were at present in such a state as required a very prudent and active administration, the Empress Helena, widow of Bæda Mariam, had interest enough to get the crown settled on the infant just mentioned. This proceeded partly from her desire of engrossing all the power into her own hands, and partly from a wish to keep peace with Adel her native country. These ends could not be accomplished but by keeping a minor on the throne of Abyssinia; which was therefore her constant object as long as she lived. But though this might not have been attended with any very bad consequence had the two nations been left to decide the quarrel by themselves, the face of affairs was now quite changed by the interference of

115 Abyssinia in danger from the Turks.

the Turks. That people having now conquered almost the whole of Arabia to the Indian ocean, being likewise on the point of reducing Egypt, and having a great advantage over their adversaries in using fire-arms, now projected the conquest of India also. In this indeed they were always disappointed by the superior valour of the Portuguese; but as this conquest remained a favourite object with them, they did not abandon their attempts. All along the countries which they had conquered, they exacted such enormous contributions from the merchants, that vast numbers of them fled to the African side of the Red Sea, and settled on the coast of Adel. The Turks, surprised at the increase of trade in this country, which they themselves had occasioned, resolved to share in the profits. For this purpose they took possession of Zeyla, a small island in the Red Sea, directly opposite to the coast of Adel; and erected a custom-house in it, where they oppressed and ruined the trade as in other places. Thus both Adel and Abyssinia were threatened with a most formidable enemy, which it would have been utterly out of their power to have resisted, had not the desire of possessing India constantly prevented the Turks from

116 An embassy sent to Portugal.

directing their strength against these countries. Helena was sensible enough of the dangerous situation of the empire, but preferred the gratification of her ambition to the good of her country; however, that she might preserve herself from the attacks of such a formidable enemy, it was now thought proper to enter into an alliance with the Portuguese. The ambassador from Portugal Peter Covillan, was denied the liberty of returning to his own country, as has been already related; and as, for some time past, it had not been obvious how he could be of much use, he had begun to fall into oblivion. The present emergency, however, recovered his importance. The empress was sensible of the necessity she lay under of having some person who understood both the Abyssinian and Portuguese languages before she could open any correspondence with that nation, and who might likewise inform her of the names of the persons to whom her letters ought to be addressed. By him she was now instructed in every thing necessary to the success of her embassy. The message was committed to one Matthew an Armenian merchant, with whom a young Abyssinian was joined; but the latter died by the way. The letters they carried are supposed by Mr Bruce to have been partly the work of Covillan and partly of the less experienced Abyssinian confidents of the empress. They began with telling the king, that Matthew would give him information of her whole purpose, and that he might depend on the truth of what he said; but in the latter part the whole secret of the embassy was disclosed, and a force sufficient to destroy the Turkish power was expresly solicited. Among the other particulars of this embassy also it is said, that a third part of Abyssinia was offered in case her requisitions were complied with; but this, as well as the embassy itself, was always denied by David when he came of age.

117 The ambassador ill used.

Matthew, tho' raised from the rank of merchant to that of an ambassador, could not, it seems, act according to his new dignity in such a manner as to screen himself from the most mortifying and dangerous imputations. Having arrived at Dabul in the East-Indies, he was seized as a spy, but relieved by Albuquerque the viceroy of Goa; and that not out of any regard to his character as ambassador, but because he himself had a design upon Abyssinia. This viceroy used his utmost endeavours to induce Matthew to deliver his commissions to him; but the ambassador constantly refused to show any letter he had, except to the king of Portugal in person, and in his own kingdom. This put him out of favour with the viceroy; while his attendants, displeased at the mean appearance of the man, insisted sometimes that he was a spy from the sultan, at others that he was a cook, an impostor, or a menial servant. Matthew, however, perceiving that he was now out of danger, maintained that his person was sacred, and insisted on being treated at the representative of a sovereign. He let the viceroy, bishop, and clergy know, that he had with him a piece of the wood of the true cross, sent as a present to the king of Portugal; and he required them, under pain of sacrilege, to pay respect to the bearer of such a precious relic, and to celebrate its arrival as a festival. This was instantly complied with, and a solemn procession instituted; but very little regard appears to have been paid to this ambassador either in his temporal or spiritual character, as he could not obtain leave to depart for Portugal till 1513, which was three years after he arrived in India. In his passage he was extremely ill-treated by the shipmasters with whom he sailed: but of this they soon had cause to repent; as on their arrival at Lisbon they were all put in irons, and would probably have died in confinement, had not Matthew made intercession for them with the king.

118 Massudi renews his depredations worse than ever.

In the mean time, Massudi having recovered from the defeat given him by Naod, and formed alliances with the Turks in Arabia, had renewed his depredations on the Abyssinian territories with more success than ever. Such a number of slaves had been, by his assiduity, sent to Mecca, that he was honoured with a green silk standard (an emblem of the true Mahometan faith), with a tent of black velvet embroidered with gold, and he likewise was made Sheykh of Zeyla; so that, as this island was properly the key to the Abyssinian empire, he could neither be rewarded with greater honour nor profit. This happened when David had attained the age of 16; and in consequence of such surprising success, the king of Adel, never a hearty friend to Abyssinia, determined to break the peace with that empire and make an alliance with Massudi. Having taken this resolution, the two princes invaded Abyssinia with their joint forces, and in one year carried off 19,000 Christian slaves, so that a general terror was spread over the whole empire. David, already impatient of the injuries his people had sustained, determined to raise an army, and to head it in person as his ancestors had done, contrary to the advice of the empress, who, considering only his youth and inexperience in military affairs, wished him to have employed some of his veteran officers. A very powerful army was raised, and ample supplies of all kinds were procured. With one part of his forces the emperor took the road to Aussa the capital of Adel; sending the other under the command of an officer named *Betwudet*, to meet the Moorish army, who were then ravaging part of Abyssinia. It was natural to be imagined, that the Moors, on hearing that an army was marching to destroy the capital of their country, would abandon the thoughts of conquest or plunder to preserve it. In doing this, David knew that they had certain defiles to pass before they could reach Adel. He ordered

119 David marches against him.

Betwudet therefore to allow them to enter these defiles; and before they could get through, he himself with the main body of the army, marched to attack them at the other end. Thus the Moors were completely hemmed in by a superior army: but besides this unfavourable situation, they were farther dispirited by Massudi. That hero came, on the morning of the engagement, to the king of Adel, informing him that his own time was now come; that he had been certainly told by a prophet, long ago, that if this year (1516) he should fight the king of Abyssinia in person, he should lose his life. He was assured that the Abyssinian monarch was then present, having seen the scarlet tent which was used only by the sovereigns of that country; and therefore advised the king of Adel to make the best of his way over the least steep part of the mountain before the engagement began. The Adelian monarch, who had at any rate no great inclination to fight, was not inspired with courage by this speech: he therefore followed the advice given him; and, with a few of his friends, passed the mountain, leaving his troops to their fate. The Moors, in the mean time, being abandoned by one leader, and having another devoted to destruction, showed an uncommon backwardness to engage, which was taken notice of by their enemies. Massudi, however, as soon as he supposed the king of Adel to be out of danger, sent a trumpet to the Abyssinian camp, with a challenge to any man of quality in the army to fight him; on condition that the party of the victorious champion should be accounted conquerors, and that the armies should immediately separate without further bloodshed. The challenge was instantly accepted by a monk named *Gabriel Andreas;* who, in the reign of Bæde Mariam, had been condemned to lose the tip of his tongue for speaking slightly of the king's proclamation of amnesty. Massudi showed no reluctance to present himself; but received such a stroke from his antagonist with a two-handed sword as almost cut his body in two, and he immediately fell down dead. Andreas cut off his head; and throwing it at the king's feet, cried out, "There is the Goliath of the Infidels." This became the signal for a general engagement, notwithstanding the terms stipulated by Massudi before the combat. The Moors were quickly repulsed by the king's troops, and driven backwards through the defile. At the other end they were met by the Betwudet (B), who drove them back to the king's forces; so that at last being forced to fly to the moutains, they were all slaughtered by the peasants or perished with hunger and thirst.

120 Massudi prophesies his own death.

121 He is killed

122 The Moors defeated and destroyed.

123 Zeyla taken by the Portuguese

The same day that this victory was gained over the Moors by David, being in the month of July 1516, the island of Zeyla in the Red Sea was taken and the town burnt by the Portuguese fleet under Lopez Suarez de Alberguira. The Abyssinian ambassador, Matthew, in the mean time, had been received with the greatest marks of esteem in Portugal. The utmost attention was paid to his embassy; he was lodged in the most splendid manner; and his maintenance was suitable to his lodging. The king prepared an embassy on his part, and sent home Matthew on board the Indian

[123] Embassy from the king of Portugal.

(B) This is the title of one of the officers in Abyssinia, not the proper name of a man.

dian fleet commanded by Lopez. The ambassador ordered for Abyssinia was one Edward Galvan, a man who had filled many state departments with the utmost applause; but who by reason of his age, being now 86, was certainly very unfit for such a distant and perilous voyage. He died accordingly on the island of Camaran in the Red Sea, where Suarez had imprudently landed, and passed the winter in the utmost distress for want of provisions of every kind. This admiral was succeeded by Lopez de Seguyera; who sailed first to the island of Goa in the East Indies, where he fitted out a strong fleet; after which he returned to the Red Sea, and landed on the island of Massuah, having along with him Matthew, about the authenticity of whose mission there had been such disputes. At his first approach the inhabitants fled; but at last he was accosted by a Christian and a Moor from the continent who informed him that the coast opposite to Massuah was part of the kingdom of Abyssinia, and that it was governed by an officer named *Baharnagash*; that all the inhabitants of the island were Christians; that the reason of their flying at the sight of the Portuguese fleet was that they took them for Turks, who frequently made descents, and ravaged the island, &c. The admiral dismissed them with presents: and soon after had a visit from the governor of Arkeeko, a town on the continent; who informed him, that about 24 miles up the country there was a monastery, seven of the members of which were now deputed to wait upon him. These instantly knew Matthew, and congratulated him in the warmest manner upon his return from such a long voyage. An interview soon took place between the Baharnagash himself and Lopez. The Abyssinian informed him that the coming of the Portuguese had been long expected, in consequence of certain ancient prophecies; and that he himself and all the officers of the emperor were ready to serve him. They parted with mutual presents; and all doubt about Matthew being now removed, he prepared to set out for the emperor's court; while Roderigo de Lima was nominated ambassador in place of Galvan who died. Along with them were 15 Portuguese; all men of the most determined courage, and who would hesitate at nothing which they thought might contribute to the glory of their king, their own honour, or the advantage of their country. Their present journey indeed was much more perilous than their voyage from Portugal to Abyssinia. The emperor was at this time in the southern part of his dominions, but the Portuguese had landed on the northern part; so that they had almost the whole breadth of the empire to pass before they could meet with him. The very first journey they attempted was through a wood so thick that it could scarce afford a passage to either man or beast, while the interstices of the trees were so interwoven with briers and thorns of various kinds, that their passage was rendered almost impracticable. This was rendered still more terrible by the vast numbers of wild beasts they saw, and which seemed only to be prevented from devouring them by the appearance of so many men together. The rainy season was also now begun; so that they were exposed to incessant deluges of water descending from the clouds, besides frequent and violent storms of wind, thunder and lightning, &c. To add to their misfortunes, an epidemic fever broke out among them, which carried off Matthew and one of the servants of Don Roderigo. At last, after a most tedious and toilsome journey, from the 16th of April to the 18th of October 1520, the Portuguese Ambassador, with his retinue, came within sight of the Abyssinian camp at the distance of about three miles. His reception was by no means favourable; for instead of being immediately admitted to the presence of the emperor, he was waited on by one of the officers of state, styled, in token of humility, *Hadug Raas*, or *commander of asses*; who caused him pitch his tent three miles farther off from the camp; and it was not till five years afterwards that he was enabled to finish the business of his embassy, and obtained leave to depart for Portugal.

124 A Portuguese fleet arrives on the coast of Abyssinia.

125 Difficult journey of the ambassadors thro' Abyssinia.

126 Are very indifferently received by the emperor, and long detained.

During all this time not a single word had passed relating to the affairs of the two nations; so that it is difficult to imagine what might have been the design of the Abyssinian emperor. At last, having resolved to send an embassy to Portugal, he allowed Roderigo to depart, but detained two of his people, appointing Zaga Zaab, an Abyssinian monk, his ambassador to Portugal.

127 At last allowed to depart with an ambassador from the emperor.

This long intercourse between two such distant nations, however, could not but greatly alarm the Mahometan powers, who were natural enemies to both. Selim the Turkish sultan having been constantly defeated by the Portuguese in the east, and alarmed at the thoughts of having a fleet of that nation in the Red Sea, where they might greatly annoy his settlements on the coast of Arabia, determined to carry his arms to the African side; while the king of Adel, having strengthened himself by alliances with the Turkish officers in Arabia, was now become a much more formidable enemy than before. This was soon experienced in battle with the Adelians; in which the Abyssinian monarch was overthrown with the lost of almost all his great officers and principal nobility, besides a vast number of private men. The victory was principally owing to the assistance given by the Turks; for the army was commanded by Mahomet surnamed *Gragné*, i. e. *left-handed*, governor of Zeyla, which had now received a Turkish garrison. This man, having the conquest of Abyssinia greatly at heart, resolved, as soon as possible, to effect something decisive; and therefore having sent to Mecca all the prisoners taken in his late expedition, he obtained in return a considerable number of janizaries, with a train of portable artillery. Thus the fortune of the war was entirely decided in favour of the Adelians and Turks; the emperor was defeated in every battle, and frequently hunted from place to place like a wild beast. The Moors, finding at last no necessity for keeping up an army over-ran the whole empire in small parties, every where plundering and burning the towns and villages, and carrying off the people for slaves.

128 Bad effects of this delay.

129 The emperor defeated by the Moors.

130 The Adelians assisted by the Turks.

131 The emperor every where defeated and reduced to great distress.

This destructive war continued till the year 1537; when Gragné sent a message to the emperor, exhorting him not to fight any longer against God, but to make peace while it was in his power, and give him his daughter in marriage: on which condition he would withdraw his army; but otherwise he would reduce his empire to such a state that it should be capable of producing nothing but grass. David, however, still refused

refused to submit; replying, that he put his confidence in God, who at present only chastised him and his people for their sins; but that Gragné himself, being an infidel, and enemy to the true religion, could not fail of coming in a short time to a miserable end. This unsuccessful negociation was followed by several encounters, in which the emperor was constantly defeated; in one of them his eldest son was killed, and in another his youngest was taken prisoner: so that he now seemed entirely destitute, being obliged to wander on foot, and all alone, hiding himself throughout the day among the bushes on the mountains.

132 Refuses to submit.

The invincible constancy with which this forlorn monarch bore his misfortunes, proved a matter of surprise both to friends and enemies. Many of his veteran soldiers, compassionating the distresses of their sovereign, sought him out in his hiding places: so that he once more found himself at the head of a small army, with which he gained some advantages that served to keep up his own spirits and those of his adherents. His greatest enemy was Ammer one of Gragné's officers, who headed the rebellious Abyssinians, and who had formed a scheme of assassinating the king; but, instead of accomplishing his purpose, he himself was assassinated in 1538 by a common soldier, on what account we are not informed.

By the death of Ammer and the small successes which David himself had obtained, the affairs of Abyssinia seemed to revive; but still there was no probability of their being ever brought to a fortunate issue. An embassy to Portugal was therefore thought of in good earnest, as the mischievous effects of slighting the proffered friendship of that power were now sufficiently apparent. One of the attendants of Roderigo, named John Bermudes, who had been detained in Abyssinia, was chosen for this purpose; and to his temporal character of ambassador was added that of Abuna, primate or patriarch. John, who was not a clergyman originally, had received all the inferior ecclesiastical orders at once, that the supreme one might be thus conferred upon him; but happening to be a great bigot to the popish religion, he would not accept of his new dignity but with a proviso, that his ordination should be approved by the pope. This was indirectly submitting the church of Abyssinia to that of Rome; to which David would never have agreed, had it not been for the desperate situation of his affairs at that time. John was therefore allowed to do as he thought proper: when passing through Arabia and Egypt to Italy, he had his ordination confirmed by the pope; after which he set out on the business of his embassy. On his arrival at Lisbon, he was acknowledged by the king as patriarch of Alexandria, Abyssinia, and of the sea; for this last title had also been conferred upon him by his Holiness. Entering then upon the purpose of his embassy, he began by putting Zaga Zaab in irons for having wasted so much time, and done nothing effectual since he had left Abyssinia. Then he presented to the king the distresses of the Abyssinians in such a strong light, and insisted so violently for relief to them, that an order was very soon procured for 400 musketeers to be sent by Don Garcia de Noronha to their relief. To accelerate the progress of the intended succours, John himself proposed to sail in the same fleet with Don Garcia; but his voyage was delayed for a whole year by sickness, occasioned, as he supposed, by poison given him by Zaga Zaab, the monk whom he had imprisoned, and who had been set at liberty by the king. After his recovery, however, he set sail for India, where he arrived in safety. The death of Don Garcia which happened in the mean time, occasioned another delay; but at last it was resolved that Don Stephen de Gama, who had succeeded to Don Garcia, should undertake an expedition to the Red Sea, in order to burn some Turkish galleys which then lay at Suez. But intelligence having in the mean time been received of the intended voyage, these vessels had withdrawn themselves. Anchoring then in the port of Masuah, Don Stephen sent over to Arkeeko on the continent to procure fresh water and other provisions; but the Turks and Moors being entirely, masters of that coast, the goods he sent in exchange were seized without any thing being given in return. A message was brought back, importing, that the king of Adel was now master of all Ethiopia, and consequently that no trade could be carried on without his leave; but if Don Stephen would make peace with him, the goods should be restored, a plentiful supply of water and all kinds of provisions granted, and amends likewise made for 60 Portuguese who had been killed at Zeyla. These had run away from the fleet on its first arrival in the Red Sea, and landed on the coast of Adel, where they could procure no water; of which the barbarians took advantage to decoy them up the country; where, having persuaded them to lay down their arms, they murdered them all. To this Don Stephen returned a smooth answer, sent more goods, obtained provisions, and promised to come ashore as soon as a Mahometan festival, which the savages were then celebrating, should be over. This treaty was carried on with equal bad faith on both sides; but Don Stephen had now the advantage by obtaining the provisions he stood in need of. These were no sooner brought on board, than he strictly forbad all intercourse with the land; and choosing out 600 men, he attacked the town of Arkeeko, killed the governor, and sent his head to the Abyssinian court; massacring at the same time all the people in the town he met with.

133 An new embassy to Portugal.

134 A body of Portuguese ordered to assist the emperor.

135 The succours arrive and take the town of Arkeeko.

During this long interval a considerable change had taken place in the Abyssinian affairs. We have already seen that David had been reduced to great distress; but afterwards met with some little successes, which seemed to indicate an approaching change of fortune. In these, however, he was soon disappointed. A Mahometan chief called *Vizir Mugdid* made an attack upon the rock Geshen, where the royal family were kept; and finding it entirely unguarded, ascended without opposition, and put every person to the sword. This last disaster seems to have been too great for the resolution even of this heroic prince, as he died the same year 1540. He was succeeded by his son Claudius, who, though then but about 18 years of age, was endowed with all the great qualities necessary for managing the affairs of the empire in such a dreadful crisis, and had made considerable progress before the arrival of the Portuguese.

136 Affairs of Abyssinia during this interval.

137 Royal family massacred.

138 Death of David, and accession of Claudius to the empire.

On his accession, the Moors despising his youth, instantly

ſtantly formed a league among themſelves to cruſh him at once; but, like almoſt all others too confident of victory, they neglected to take the proper precautions againſt a ſurpriſe. This was not unobſerved by Claudius; who falling upon one party which lay next to him, gave them a total defeat. The king purſued them the whole day of the engagement, the enſuing night, and part of the following day; putting to death without mercy every one who fell into his hands. This exceſſive ardour very much damped the ſpirits of his enemies, and at the ſame time inſpired his own party with the moſt ſanguine hopes of ſucceſs; whence he ſoon appeared at the head of ſuch an army as convinced his enemies that he was by no means to be deſpiſed. They now found it neceſſary to deſiſt from the practice they had ſo long continued of plundering and ravaging the country; to call in their ſcattered parties, unite their troops, and ſpend the rainy ſeaſon in ſuch parts of Abyſſinia as they had conquered, without returning into Adel as had hitherto been uſual with them. They now came to a reſolution to force the king to a general engagement, in which they hoped to prove victorious by dint of numbers. For this purpoſe all the rebel chiefs in Abyſſinia were called in, and a formidable army collected. They waited only for one very experienced chief named *Jonathan*; after whoſe junction they determined to attack the royal army without delay. But Claudius took his poſts at all times with ſuch judgment, that any attempt upon his camp would have been almoſt deſperate; and getting intelligence where Jonathan lay with his forces, he marched out in the night-time, came upon him quite unprepared, defeated and killed him, ſending his head to the reſt of the confederacy by a priſoner, the only one he had ſpared out of all thoſe who were taken. By the ſame meſſenger a defiance was ſent to the Moors, and many opprobrious epithets were beſtowed upon them; but though the armies approached one another, and continued for ſeveral days under arms, the Moors were ſo much intimidated that they would by no means venture an engagement.

139 A powerful league formed againſt the new emperor:

140 The Moors defeated.

141 Jonathan, a rebel chief defeated and killed.

By this victory the ſpirits of the Abyſſinians were ſo much elevated, that they flocked in from all parts to join their prince; and even many of the Mahometans, having experienced the lenity of the Chriſtian government, choſe rather to ſubmit to Claudius than to the Turks and Adelians. The king, however, was in danger of being Aſſaſſinated by one Ammer, a treacherous governor; who knowing that he had retired to ſome diſtance from his army to celebrate the feſtival of Eaſter, attempted to ſurpriſe him when almoſt deſtitute of attendants; but Claudius having timely notice of his deſigns, laid an ambuſh for him with a conſiderable part of his army which he headed in perſon. The rebel, not being equally well informed, fell into the ſnare, was defeated, and almoſt his whole army cut off on the 24th of April 1541.

142 Unſucceſsful attempt to aſſaſſinate Claudius.

Matters were in this ſituation when the Portugueſe arrived, as has been already related. The head of the govenor of Arkeeko had been received by the queen, who conſidered it as an happy inſtance of the valour of her allies, and as a preſage of future victories. The Portugueſe admiral, Don Stephen de Gama, loſt no time in employing the men allowed by the king to aſſiſt the Abyſſinians. Theſe were in number 450; but as the officers who commanded them were all noblemen of the firſt rank, the army was conſiderably increaſed by the number of their ſervants. The ſupreme command was given to Don Chriſtopher de Gama the admiral's youngeſt brother. Almoſt every man on board, however, was ambitious to ſhare in the glory of this enterpriſe; whence great complaints were made by thoſe who were not allowed to go; and hence, Mr Bruce informs us, the bay in the iſland of Maſua, where the admiral's galley rode, had the name of *Bahia dos Agravados;* the bay of the *injured*, not of the *ſick*, as has been erroneouſly ſuppoſed.

143 Derivation of the name of a bay in Maſuah.

This gallant army inſtantly ſet forward by the moſt eaſy road through the Abyſſinian territories, in order to join the emperor. Still, however, the way was ſo rugged, that the carriages of their artillery gave way, and they were therefore obliged to conſtruct new ones as they went along, ſplitting the barrels of old muſkets to furniſh them with iron, that commodity being very ſcarce in Abyſſinia. In this journey the general was met by the empreſs, attended by her two ſiſters and a great many others of both ſexes, whom he ſaluted with drums beating and colours flying, accompanied by a general diſcharge of the fire-arms, to their great confuſion and terror. Her majeſty, whoſe perſon was entirely covered, indulged the Portugueſe general with a view of her face; and after a mutual exchange of civilities, the queen returned with 100 muſketeers appointed by him as her guard. After eight days march, through a very rugged country, Don Chriſtopher received a defiance in very inſulting terms from Gragne the Mahometan general, which was returned in the ſame ſtyle. An engagement took place on the 25th of March 1541; in which little was done by either party beſides wounding both the commanders: however, Gragne, though greatly ſuperior in horſe had already felt ſo much of the Portugueſe valour, that he did not chooſe to venture a ſecond battle.

144 The Portugueſe under Don Chriſtopher de Gama ſet out to meet the emperor.

145 Interview with the empreſs.

146 Battle between the Portugueſe and the Moors.

As the ſeaſon was now far advanced, the Portugueſe put themſelves into winter-quarters; while Grange remained in their neighbourhood, in hopes of forcing them to a battle before they could be joined by the king who advanced for the purpoſe as faſt as poſſible. This being the caſe, it was to the laſt degree imprudent in Don Chriſtopher to think of venturing an engagement without previouſly forming a junction with his royal ally; eſpecially as Gragne had now doubled the number of his horſe, increaſed his train of artillery, and otherwiſe received conſiderable reinforcements. Unfortunately, however, the Portugueſe general ſuffered himſelf to be hurried away by the impetuoſity of his own temper; and paying regard to the defiances and reproaches of a barbarian whom he ought to have deſpiſed, was induced, contrary to all advice that could be given, to venture an engagement at a vaſt diſadvantage. Yet when the armies encountered each other, the ſuperiority of the Portugueſe was ſo great, that victory ſeemed likely to be decided in their favour. On this Gragne ordered ſome artillery to be pointed againſt the Abyſſinian allies. Theſe, entirely unaccuſtomed to fire-arms, fled almoſt at the firſt diſcharge. Gragne, well knowing that it was his intereſt to deſtroy the Portugueſe, who were only 400 in number, ordered no purſuit againſt the Abyſſinians, but fell with his whole

147 Don Chriſtopher raſhly engages at a diſadvantage.

whole force upon the Europeans. Even yet his success was doubtful, till Don Christopher, exposing himself too much, was singled out and shot through the arm. This produced such confusion, that a total defeat, with the loss of the camp, ensued; when the barbarians, according to custom, put to death all the wounded, and began to abuse the women, who had all retired into the tent of the general. This being observed by a noble Abyssinian lady married to one of the Portuguese, she set fire to some barrels of gunpowder which happened to be in the tent, and thus perished along with her ravishers.

148
Is wounded and defeated.

Don Christopher, who by his rashness had occasioned this disaster, obstinately refused to fly, till he was put into a litter by force, and sent off along with the queen and patriarch, who happened to be present. The two latter had set off before the battle; but Don Christopher sent some horsemen in pursuit of them, by whom they were brought back, and reproached by the general for the bad example they had shown to the army. Arriving at the approach of night in a wood where there was a cave, Don Christopher entered it to have his wound dressed, but obstinately refused to proceed farther. Next day he was taken; betrayed, as is most probable, by a woman whom he loved; who is said to have pointed out this cave to him, and promised to send some friends to convey him into a place of safety. Instead of this, a party of the enemy entered the cave; and on his readily informing them of his name, they instantly carried him in triumph to Gragne. Here, after several insults had passed on both sides, the barbarian, in a fit of passion, cut off his head; which was sent to Constantinople, and his body cut in pieces and dispersed through Abyssinia.

149
Takes shelter in a cave, is taken and put to death.

This cruelty of Gragne proved more detrimental to his cause than a complete victory gained by the other party could have been. On the one hand, the Portuguese were so exasperated by the loss of their leader, that they were ready to embark in the most desperate undertakings, in order to revenge his death; on the other, the Turks, on whom he principally depended, were irritated to the last degree at the disappointment of sharing his ransom, which they imagined would have been an immense sum; and therefore abandoned their leader to return to their own country. Gragne, thus left to decide the quarrel with his Africans, was quickly defeated by Claudius; and in another engagement which took place on the 10th of February 1743, his troops were defeated and himself killed. This last misfortune was owing to his boldness in advancing before his army which was giving way, so that he became known to the Portuguese. On this he was singled out by a Portuguese named *Peter Lyon*, who had been valet de chambre to Don Christopher. This man, to make his aim more sure, crept for a considerable way along the bank of a river towards the place where Gragne was; and when come sufficiently near, shot him quite through the body. Finding himself mortally wounded, he quitted the field of battle; and was followed by Lyon, who in a short time saw him fall from his horse. He then came up to him, and cut off one of his ears, which he put in his pocket, and returned to the battle to do what further service he could. The next day Gragne's body was found by an Abyssinian officer, who cut off his head and claimed the merit of killing him; but Lyon having pulled out the ear which he carried in his pocket, vindicated his own right to the reward which was to be given to the other. On this occasion the Moorish army was almost entirely destroyed; Gragne's wife and son were taken prisoners, with Nur the son of Mugdid, who destroyed the royal family; and it had been happy for Claudius, as we shall afterwards see, that he had put these prisoners to death. Very soon after this engagement, the emperor had intelligence that Joram, a rebel chief, who had once reduced his father David to great distress, was advancing rapidly in hopes of being still able to be present at the battle. This was the last of his fathers enemies on whom Claudius had to revenge himself; and this was effectually done by a detachment of his army, who posted themselves in his way, fell upon him unexpectedly, and cut him in pieces with all his men.

150
Gragne abandoned by his allies, is defeated and killed.

151
Joram a rebel chief defeated and killed.

Claudius being now freed from all apprehension of foreign enemies, began to turn his thoughts towards the reparation of the damages occasioned by such a long war, and the settlement of religious affairs. We have already mentioned, that John Bermudes was appointed by the pope, as he said, patriarch of Alexandria, Abyssinia, and of the sea. This, however, is said by others to have been a falshood; that John was originally ordained by the old patriarch of Abyssinia; and that the pope did no more than give his sanction to this ordination, without adding any new one of his own. But whether this was so or not, certain it is, that John, who was very insolent in his behaviour, and of a turbulent disposition, now began to insist that Claudius should not only embrace the doctrines of the church of Rome, but establish that religion throughout the empire, which he said his father David had engaged to do; and which, considering the extreme distress in which he was involved, it is very probable that he did. Claudius, however, was of a different opinion, and refused to alter the religion of the country; upon which a contention began, which was not ended but by the total expulsion of the catholics, and the cutting off all communication with Europeans. At that time the Portuguese and Abyssinians intermarried, and attended religious worship promiscuously in each others churches: so that the two nations might have continued to live in harmony, had it not been for the misbehaviour of Bermudes. Claudius, perceiving the violence and overbearing disposition of the man, took every opportunity of showing his attachment to the Alexandrian or Greek church; denying that he had made any promise of submitting to the see of Rome. On this Bermudes told him that he was accursed and excommunicated; the king in return called him a Nestorian heretic; to which Bermudes replied by calling him a liar, and threatened to return to India, and carry all the Portuguese along with him. To this insolent speech Claudius answered, that he wished indeed that Bermudes would return to India; but that he would not allow the Portuguese, nor any person, to leave his territories without permission.

152
Disturbances on affairs of religion.

153
Altercation betwixt the emperor and the patriarch Bermudes.

Thus matters seemed likely to come to an open rupture; and there can be no doubt that the worst extremities would have followed, had not the emperor been restrained by the fear of the Portuguese valour on the one hand if he should attempt any thing against them, and the hopes of further advantages should he retain them in his service. For these reasons he bore with patience the insults of the patriarch; attempting to gain the rest of the Portuguese over to his side. He succeeded perfectly with their commander Arius Dias; who privately renounced the church of Rome, and was baptized into that of Abyssinia by the name of *Marcus* or *Marco*; in consequence of which, the emperor, looking upon him as a naturalized subject, sent him a standard with the Abyssinian arms to be used instead of those of Portugal. This, however, was not delivered; for a Portuguese named *James Brito*, meeting the page who carried it, took it from him and killed him with his sword. The apostacy of Arius is said to have been owing to the great honours which had been conferred upon him by the Abyssinian monarch: for having, in an expedition against Adel, defeated and killed the king and taken the queen prisoner, he bestowed her in marriage on Arius; and that the match might be equal, he raised him also to the royal dignity, by giving him the kingdoms of Doar and Belwa.

154 The Portuguese commander renounces the Romish religion.

155 He is invested with royal dignity.

The altercation on the subject of religion becoming every day more violent, Bermudes was prohibited by the emperor from sending any farther orders to the Portuguese, they being now under the command of Marco the Abyssinian captain-general; meaning Arius Dias to whom the name of Marco had been lately given. To this the patriarch replied, that being subjects of the king of Portugal, they were under no obligation to obey a traitor to his king and religion; and that since his majesty still persisted in refusing to submit to the pope, he was resolved to leave the empire with his forces. The emperor, however, still insisted that he was absolute in his own dominions; and he expected the Portuguese to pay obedience to his general, and none else. The Portuguese, enraged at this declaration, resolved to die sword in hand rather than submit to such terms; and therefore began to fortify their camp in case of any attack. The emperor, on this, thinking a defiance was given him in his own territories, ordered the camp to be instantly attacked. The attempt was accordingly made, but with very little success; the Portuguese having strewed the ground with gunpowder, set fire to it as the Abyssinians marched along, which destroyed great numbers, and intimidated the rest to such a degree that they instantly fled. Finding it in vain to think of reducing them by force, the emperor is then said to have been advised by Marco to consult his own safety, and break the power of the Portuguese by artifice. With this view he sent for the patriarch, pretended to be very sorry for his frequent breach of promise, and desirous to make what amends for it he could. Instead of complying with the patriarch's demands, however, he first ordered his subjects to supply them with no provisions: he then stopped the mouths of the Portuguese by a considerable quantity of gold, giving the patriarch himself a very valuable present; adding to all this a large supply of provisions; but at the same time taking proper methods to disperse their leaders into different parts of the empire, so that they should find it impossible ever to reunite in a body.

156 Hostilities betwix the Abyssians and Portuguese.

Such is the account given of this transaction by the Portuguese historians; but that of Mr Bruce, who says that he translated his from the Abyssinian annals, is somewhat different. He only informs us, that the quarrel betwixt the the Portuguese and Abyssinians was inflamed by the "incendiary spirit of the brutish Bermudes: from reproaches they came to blows; and this proceeded so far, that one night the Portuguese assaulted the kings tent, where they slew some and grievously wounded others." The event, however, was, that no absolute quarrel ever took place betwixt this emperor and any of the Portuguese excepting this patriarch, whom he was on the point of banishing to one of the rocks used as prisons in Abyssinia. This was dispensed with on the interposition of Gaspar de Suza the new Portuguese commander (who had succeeded Arius Dias), and another named *Kasmati-Robal*, both of whom were in great favour with the emperor; and Bermudes persuaded to withdraw to India. According to Mr Bruce, he repaired to Dobarwa, where he remained two years quite neglected and forlorn, saying mass to no more than ten Portuguese who had settled there after the defeat of Don Christopher. He then went to Masuah; and the wind soon becoming favourable, he embarked in a Portuguese vessel, carrying with him the ten persons to whom he had officiated as priest. From Goa he returned to Portugal, and continued there till his death. On the other hand, the Portuguese writers inform us, that he was narrowly watched by order of the emperor; and that Gaspar de Suza, the Portuguese commander, had orders to put him to death if he should attempt to make his escape. Bermudes, however, being determined at all events to make his escape, pretended to be ill of the gout, and that a change of air was necessary for his recovery; for which reason he went to the town abovementioned, where there was a monastery. On this pretence he was allowed to cross the kingdom of Tigre, accompanied by eight faithful servants, with whom he reached Dobarwa unsuspected. Here he remained concealed in a monastery for two years before he could find an opportunity of getting to the island of Masuah, from whence he proceeded to Goa.

157 Burmudas leaves Abyssinia.

The emperor was scarce freed from this troublesome priest when he was in danger of being involved in new difficulties by the intrusion of others into his dominions. Ignatius Loyola, founder of the order of the Jesuits, was at that time at Rome; and so much attached to the cause of the Pope, that he proposed to go in person to Abyssinia, in order to make a thorough conversion of both prince and people. His Holiness, however, who, from what he had already seen of Ignatius, conceived that he might be of greater use to him by staying in Europe, sent in his stead Nugnez Baretto, one of the society of Jesuits, whom he invested with the dignity of patriarch, and honoured with a letter to Claudius. With these commissions, and a number of priests, Baretto sailed for Goa in the East Indies; by which, however distant, the only passage to Abyssinia was at that time. On his arrival at that place he was informed that the Abyssinian monarch had such a steady aversion to the church of Rome, that there was no probability of his meeting with a favourable reception. For this reason it was judged more proper to send some clergymen of inferior dignity, with proper credentials, as ambassadors to the emperor from the governor of India, without running the risk of having any affront put upon the patriarch. These were Oviedo bishop of Hierapolis, Carneyro bishop of Nice, and several others, who arrived safely at Masuah in the year 1558. Claudius, on hearing of their arrival, was greatly pleased,

158 A new deputation from the pope.

Ethiopia.

pleased, as supposing that a new supply of Portuguese soldiers were arrived. Finding, however, that they were only priests, he was very much mortified, but still resolved to give them a civil reception. But a more important consideration, and which concerned the welfare of the empire in the highest degree, now claimed his attention. This was the appointment of a successor to the throne, Claudius himself having no son. A project was therefore set on foot for ransoming Prince Menas, the emperor's youngest brother, who had been taken prisoner by the Moors in the time of David, and hitherto detained in captivity on a high mountain in Adel. This was not likely to be accomplished; for the Moors would not willingly part with one who they knew was their mortal enemy, that he might be raised to the sovereignty of a great empire. By detaining him prisoner also, they might reasonably hope for disputes concerning the succession to the Abyssinian throne; which would enable them to attack the empire with advantage. In these circumstances, it is probable that Claudius would have found great difficulty in procuring his brother's liberty, had it not been that the son of the famous Gragné had been taken in that battle in which his father was killed, and in like manner confined on a mountain in Abyssinia. A proposal was then made to his mother, who had escaped into Atbara, that her son should have his liberty, provided the king's brother should be restored. This was accepted; and by means of the bashaw of Masuah, an exchange was made. Four thousand ounces of gold were given for the ransom of Menas, which were divided between the Moors and the bashaw of Masuah; while on his part Claudius set at liberty Ali Gerad the son of Gragné without any farther demand.

159 Prince Menas redeemed from captivity.

According to Bermudes's account of these times, the widow of Gragne was taken prisoner at the battle in which her husband was killed, and was afterwards married to Arius Dias. In this case we must suppose her to have been the same with the *queen of Adel*, mentioned as his consort by other historians; but Mr Bruce treats this account as a mere fable; and informs us, that by means of Nur the son of Mugdid, murderer of the royal family as already related, she made her escape into Atbara. On that occasion Nur fell in love with her; but she refused to marry any man unless he brought her the head of Claudius, who had killed her former husband. To attain his wishes therefore, Nur, now governor of Zeyla, undertook the task; and when Claudius marched towards Adel, sent him a challenge to fight; telling him that there was yet a particular instrument for shedding the blood of the Abyssinian princes, and desiring him to be prepared, as he was very soon to set out to attack him. The emperor did not decline the combat, but is said to have been advised against this expedition by all his friends. This advice seems to have proceeded from a number of prophecies, probably trumped up by the clergy, that he should be unfortunate, and lose his life in the campaign. These prophecies ought no doubt to have had weight with him, as they most certainly indicated a spirit of disaffection among his troops; and the event accordingly evinced that it was so. The Abyssinians fled almost on the first fire, leaving the king in the midst of his enemies, attended only by 18 Portuguese and 20 horsemen of Abyssinia, who continued faithful to the last.

160 Nur determines to destroy Claudius.

161 Defeat and death of the emperor.

All these were killed after the most desperate resistance; the king himself receiving upwards of 20 wounds before he fell. His head was cut off, and brought by Nur to his mistress, who hung it up on a tree before her door. Here it remained for three years, when it was a last bought by an Armenian merchant, who buried it at Antioch in the sepulchre of a saint of the same name. Nur gained on this occasion a very complete victory; the king and most of the principal nobility being killed, a great number made prisoners, and the camp taken with an immense booty. On his return to Adel, he refused to accept of any congratulations, or to allow rejoicing to be made for his victory, but passed along in the habit of a common soldier mounted on an ass; saying, that the owed the victory to the mercy of God alone, who had immediately interposed for the destruction of the Christian army.

This fatal engagement took place on the 22d of March 1559; and as the succession had been already settled, Menas ascended the throne without any opposition. On his accession he found his affairs in great confusion, and he had still to contend with foreign and domestic enemies. The first of these was Radaet the king of the Jews, who had a territory in the empire of Abyssinia, the capital of which was on a rock named *Samen.* The cause of this quarrel is not known, but the event was unfortunate; the king being obliged to abandon the enterprise, after having bestowed a considerable time upon it. This was followed by an attempt to assassinate him, which had very near taken place; and this again by a conspiracy among his principal nobles headed by Isaac the Baharnagash. He had been a very faithful servant of the late emperor Claudius; but ill used by Menas, who was of a very haughty and morose disposition. In attempting to suppress this rebellion, the first attempts of the emperor were likewise ineffectual, his forces being attacked by surprise and entirely defeated. Soon after this, Isaac proclaimed Tascar the nephew of Menas, who was then at liberty, king of Abyssinia; hoping thereby to strengthen his cause, and enable him to cope with the emperor, who was assembling a powerful army against him. This expedient did not answer the purpose. His army was entirely defeated by Menas; Tascar taken prisoner, and thrown headlong from the top of a precipice; and Isaac himself escaped with great difficulty to the confines of his own government in the neighbourhood of Masuah. Here he entered into an alliance with the Turkish bashaw of Masuah; whose friendship he gained by putting him in possession of the town of Dobarwa, with the flat country adjacent, which abounds with the provisions wanted at Masuah, and is looked upon as the key to the province of Tigre and the high lands of Abyssinia. Besides this, Isaac strengthened himself also by an alliance with the Portuguese; which, had their numbers been at all considerable, must have been very formidable. Their inclination to desert their former protector and ally the emperor, proceeded entirely from the shameful behaviour of their priests, who never would be satisfied without enslaving the emperor as well as his subjects to the tyranny of Rome. We have already seen that Bermudes had proceeded so far on this subject, that he narrowly escaped with his life. His successor Oveido (for the patriarch Nugnez died by the way) fared still worse. On his introduction to the emperor

162 Reign of Menas.

163 Rebellion of Isaac the Baharnagash.

164 He is defeated.

165 Allies with the Turks and Portuguese.

166 Reason of their quarrel with the emperor.

emperor Claudius, he informed him, that the pope and king of Portugal now expected no less than an immediate fulfilment of his engagements of submission to the see of Rome. This requisition was made with such an air of insolence, that the prince could scarce conceal his resentment; but restraining his passion, he promised to consider of it, and to call meetings of the learned in these matters to debate the point. This was a very fruitless task; and therefore Oveido thought proper to quit the court towards the end of December 1558; leaving behind him an insolent letter addressed to the Portuguese and such converts as they had made; in which he exhorted them not to converse with schismatics, and the Abyssinians to forsake their errors. Being now debarred from access to the emperor, he began to entertain the people with seditious discourses; which practice he continued during the remaining part of the reign of Claudius and the beginning of that of Menas. The latter, perceiving the pernicious tendency of his discourses positively commanded him to desist; which the patriarch refusing, the emperor fell upon him with his own hands, beat him severely, tore his clothes and beard, and took his chalice from him that he might thus be disabled from saying mass; after which he banished him, with Francis Lopez another of his associates, to a barren mountain, where they remained seven months in great misery. Not content with this, he issued many severe edicts against the Portuguese; prohibited them from intermarrying with the Abyssinians; and such of the Abyssinian women as were already married to Portuguese husbands, he commanded not to accompany them to their churches.

167
Oviedo banished to a mountain.

168
Is commanded to leave the empire, but refuses.

His next step was to call Oviedo again into his presence, and command him, under pain of death, instantly to leave his dominions. The insolent and foolish priest refused obedience to this express command; he declared that he would obey God rather than man; and presenting his bare neck to the emperer, desired him to strike and put an end to his life at once. Menas drew his sword, but was prevented by the queen and officers who stood near him from giving the fatal stroke. A second beating and banishment to the mountain succeeded; and in the latter part of the sentence all the Portuguese priests as well as others were included. The Portuguese, however, determined not to submit to such an indignity; and therefore, to a man, joined Isaac; who, in expectation of more auxiliaries from India, professed a great desire of embracing the Romish religion. The king was very apprehensive, and not without reason, of the arrival of more Portuguese; but it apppears that Oviedo had not sufficient interest to procure the supply he promised. An engagement, therefore took place without them, in which Menas was again victorious; though the battle was not so decisive as to put an end to the rebellion.

169
Sentence of banishment passed on all the Portuguese, who thereupon join the rebels.

170
Isaac again defeated.

The emperor died a short time after his victory, and was succeeded in 1563 by his son Sertza Denghel, then only 12 years of age. The beginning of his reign was disturbed by new rebellions; which, however, were happily suppressed. Isaac, with his allies the bashaw and the Portuguese, seem to have remained for some time unmolested; and in the year 1569, a kind of accommodation took place. It is by no means easy to say how the Portuguese were again received into favour after such flagrant treachery and rebellion. Mr Bruce only simply tells us that "Oviedo and the Portuguese did not appear at court." This indeed is not to be wondered at, as they had been so lately at open war with the emperor. Other accounts say, that after the last battle with Isaac, "their names became so odious to all the Abyssinians, especially to their monarchs, that they would never suffer any of them to be in their army from that time." Some of these accounts say also, that Menas was defeated and killed in another battle; others, that he was driven to some high mountains, where he wandered about till death put an end to his misery. Accounts of this kind, however, are by Mr Bruce treated as mere falsehoods, and expressly contradictory to the annals of those times. All we can say upon the subject therefore is, that after the defeat of Isaac, the Portuguese, not excepting Oviedo himself, remained in Abyssinia, where they were more favourably dealt with by the new emperor than they had been by his father; though he was no friend to their religion, as supposing it to be destructive of monarchy and all civil government. It is probable also, that the various disturbances which happened, together with his own tender age during the beginning of his reign, would prevent him from paying that attention to them which he would otherwise have done. The Galla, a very barbarous nation, and who have at last greatly reduced the power of the Ethiopian monarchs, made frequent inroads during this reign; and in the year 1576, a league was formed by Mahomet king of Adel, with Isaac and the Turkish bashaw, who had either continued their hostilities, or renewed them about this time. The emperor, however, marched with such expedition, that he did not allow them time to join their forces; and attacking them separately, gained a complete victory over them all. Almost the whole Moorish army was destroyed; but while the emperor entered Adel with a design to make a full end of his enemies on the east, he received information that the Galla had invaded him on the west. Traversing the whole breadth of the empire therefore with the utmost expedition, he came up with these enemies, who were afraid to encounter him. On this he turned his arms against the Falasha, obliging them to deliver up their king, whom he banished to a mountain. Then invading the country of the Galla and Falasha, he ravaged it for four years successively, protecting at the same time the kingdom of Narea from the inroads of these barbarians.

171
Reign of Sertza Denghel.

172
Isaac and the bashaw league with the king of Adel;

173
But are entirely defeated.

174
The emperor invades and ravages the country of the Galla and Falasha

175
Tigre invaded by Cadward Bashaw.

While Sertza Denghel employed himself in repressing the incursions of the Galla, one Cadward Basha, a Turkish officer of great valour and experience, who had been invested with the office of bashaw of Masuah, began to make inroads into the province of Tigre. The emperor hastened to oppose him; but in his passage committed great devastations in the country of the Falasha, in order to provoke them to descend from their mountains and come to an engagement. These Falasha profess the Jewish religion, and were then governed by a king named *Geshen*. This monarch, provoked at the ravages and destruction he beheld, descended with vast numbers of his subjects, in order to revenge it; but was killed, and his army utterly defeated by the Abyssinians, on the 19th of January 1594. The victorious Sertza then hastened to encounter the bashaw; who, confident of the superiority of his own

176
King of the Falasha defeated and killed.

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own troops, not only waited him patiently, but gave him every advantage he could desire. A very desperate battle ensued; the event of which was doubtful, till Robel, commander of part of the king's household troops, who were armed with pikes, attacked that part of the Turkish horse where he saw the bashaw, and killed the officer who carried the standard. In doing this he broke his pike; but though then destitute of any other weapon than a short crooked knife which the Abyssinians always carry in their girdles, he instantly pushed up to the bashaw, and with it wounded him mortally in the throat. This unexpected event instantly decided the victory; the Turkish horse betook themselves to flight, and the rest of the army soon followed their example. A dreadful slaughter ensued among the Moors, who were pursued to the island of Masuah; and many were driven into the desarts, where they perished with thirst. After this, marching back to the western part of his territories, the emperor proceeded to Narea, destroying the Galla as he went along. His last expedition was towards Damot to chastise some rebels there. Before he set out, a priest of great sanctity and talent for divination, is said to have warned him not to undertake the war; but his advice was rejected with contempt: on which he requested him only not to eat the fish taken out of a certain river; but this advice was also neglected, and the fish being really of a poisonous nature, the king died in consequence of eating them.

177 The bashaw defeated and killed.

178 Death of the emperor.

179 Two successors nominated.

On the death of Sertza Denghel a dispute ensued about the succession. In the beginning of his sickness the late king had named for his successor his son Jacob, a boy of only seven years of age; but finding death approaching, he named his nephew Za Denghel, as being come to the years of manhood, and more fit for the government of such a numerous and turbulent people. This last resolution proved highly disagreeable to the queen and some of the principal nobility, who wished for a minority, during which they might engross the power into their own hands. In conjunction with her two sons-in-law, Kefla Wahad and Ras Athanasius, therefore, the empress determined to raise Jacob to the throne, notwithstanding the final determination of the late king abovementioned. This was put in execution immediately after the death of Sertza Denghel; Jacob was raised to the throne, and Za Denghel confined in an island of the lake Dembea or Tzana. An attempt was likewise made to seize Socinios, natural son to Facilidas grandson of the unfortunate David, who had likewise a claim to the throne; for his not being born of a lawful marriage, was no objection in Abyssinia. Socinios, however, no sooner saw the fate of his cousin Za Denghel, than he withdrew himself from the power of his enemies; and Za Denghel himself, after being a short time confined in the island abovementioned, found means to escape, and took refuge among the inaccessible mountains of Gojam.

180 Jacob raised to the throne.

Thus disappointed in their attempts on the princes, the empress, with her two sons-in-law, were obliged to pretend loyalty to Jacob, whom they governed till he was 17 years of age. The young king then perceiving that his tutors were taking some steps to prolong their dominion over him, took the government into his own hands, and banished one Za Selasse, whom they had employed in the execution of their projects, to the kingdom of Narea. The conspirators, alarmed at this bold exertion of royal prerogative, determined instantly to depose Jacob, and raise Za Denghel, whom they had banished, to the throne. This, however, was now a matter of some difficulty, as he had concealed himself so effectually among the mountains of Gojam, that he could scarce be found out. His retreat being at last discovered, Ras Athanasius took an opportunity of insulting Jacob, even while sitting on the throne; called him an obstinate, stubborn, and foolish boy; declared him degraded from the imperial dignity, and that Za Denghel was coming to supplant him. Jacob, perceiving by the insolence of this speech, that he was entirely in the power of his enemies, left his palace in the night, in order to fly to the mountains of Samen, where his mother's relations were, from whom he expected protection. He got to the borders of that country, but was there discovered, seized, and brought back to his rival, who was now seated on the throne. Za Denghel, however, with a clemency not very usual in Abyssinia, did not either put him to death, or mutilate him in such a manner as to render him incapable of afterwards enjoying the kingdom; but contented himself with banishing him for life to Narea.

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181 Za Denghel raised to the throne.

182 Jacob banished.

Za Denghel was no sooner settled on the throne, than he unluckily behaved in such a manner as to alienate the affections of his people from him entirely. This was occasioned by his attachment to the church of Rome. Ever since the time that the Portuguese had joined Isaac the Baharnagash, the entrance into Abyssinia had been shut up by the Turks, so that no new missionaries could have access; and all those who came with Oviedo being dead, the Romish religion had languished for want of preachers to support it. The last of these died in 1596; and all the rest having been dead for some time before, little could be expected from the labours of a single person. Next year Melchior Sylvanus, a vicar of the church at Goa, was sent on a mission to Abyssinia; being supposed to be a proper person for this work, on account of his language and complexion, which might baffle the vigilance of the Turks. He entered without being suspected; but the great defeat given the Turks by Sertza Denghel already mentioned, had reduced their power so much, that less danger now attended this expedition than formerly, and other missionaries quickly followed.

183 Decline of the Romish religion in Abyssinia.

The most learned, as well as the best qualified for the undertaking in every respect, was *Peter Paez*, who came to this country in the year 1600; and on his taking upon him the whole charge of the mission, Sylvanus returned to India. The new missionary did not at first affect to intrude himself on the emperor; but taking up his residence at the convent of Fremona in the province of Tigre, he first applied to the study of the learned language of the Abyssinians called *Geez*, and in which their books are usually written. In this he made such progress as quickly to surpass the natives themselves; after which he set up a school, where the children of the Portuguese and Abyssinians were taught promiscuously. The progress made by his scholars was so great, that he was spoken of at court, and recommended in the warmest terms to the emperor Jacob before his deposition. On this he was sent for, and appeared before the court in 1604; where, to the

184 Peter Paez restores it.

185 He arrives at court.

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the great dissatisfaction of the Abyssinian monks, he received such honours as are usually bestowed on men of the first quality. Next day, in a dispute before the king, two of his scholars, whom he had brought along with him, fairly vanquished the best theologians that could be found to oppose them. Mass was then said in the Roman manner; and this was followed by a sermon, which in the purity and elegance of its diction (whatever the substance might be) excelled any thing that had ever been composed in the Abyssinian language.

Though Paez had been called to court by Jacob, yet Za Denghel was on the throne before he arrived,

186 The emperor embraces the Catholic religion.

and it was he who witnessed the dispute and heard the sermon. He was so much charmed with the latter, that he instantly resolved to embrace the religion of the church of Rome; which resolution he soon after communicated to several of his friends, and even to Paez himself; but under an oath of secrecy. The emperor's own zeal, however, rendered this oath of no use; for in a little time he issued proclamations forbidding the observation of the Jewish Sabbath, and wrote letters to Pope Clement VIII. and Philip III. of Spain, desiring a supply of mechanics to instruct his people in the useful arts, and Jesuits to teach them religion.

187 His imprudent conduct occasions a rebellion.

This precipitate conduct had the effect which might have been expected. The Abyssinians were generally disaffected to the church of Rome, and no pains had been taken to gain them over: they were also turbulent, savage, and rebellious; ever ready to revolt; and now had a favourable opportunity of excusing their treasons under pretence of zeal for religion. This opportunity was quickly made use of by Za Selasse, whom, as we have already mentioned, Jacob had banished, but who, on the advancement of Za Denghel,

188 The emperor excommunicated.

had probably been set at liberty. This traitor having first held many seditious meetings in private, prevailed on the Abuna, or Abyssinian patriarch, to excommunicate the king, and absolve his subjects from their allegiance. He then set out for the territory of Gojam, where the people had always been remarkable for their aversion to the church of Rome. In this place, therefore, he found no difficulty in raising an army to fight

189 An army raised against him.

against his sovereign. Za Denghel, who was an expert warrior, did not fail to go in quest of him with what forces he could raise; but soon found, by the great desertion among his troops as he passed along, how much the excommunication pronounced by the Abuna had availed. This was so alarming, that John Gabriel, an experienced Portuguese officer, advised him to decline an engagement for the present, and take shelter in some fortress until his subjects should return to a sense of their duty. This salutary advice was rejected, from the absurd notion that it was a dishonour not to fight a rebel who had defied his sovereign. In the beginning of the engagement, victory seemed to favour the royal cause. The Portuguese

190 He is abandoned by his troops and killed.

carried every thing before them, and routed that wing of the enemy which opposed them. In the other wing, however, the cowardly and treacherous Abyssinians deserted their king, who was quickly surrounded by his enemies, and left in a desperate situation. A body of nobility, with his own officers and domestics, attended him and fought desperately in his defence. Za Denghel himself, being an excellent horseman, and admirably skilled in the use of arms, performed astonishing feats of valour. At last he was thrown to the ground, grievously wounded in the breast by a lance. Notwithstanding this, he instantly recovered himself, drew his sword, and resisted his assailants so violently, that they were fain to keep at a distance and annoy him with missile weapons. In this situation he stood till almost fainting with fatigue and loss of blood; when the traitor Za Selasse, pushing up his horse violently against him, threw him to the ground by a blow on the forehead, and a multitude then rushing upon him he was dispatched with many wounds.

191 His death universally lamented.

The news of Za Denghel's death were received with such general indignation throughout the Abyssinian empire, that the rebels durst not name any successor. As it seemed natural to think however, that Jacob would now be re-elected, messengers were dispatched

192 The empire claimed by Socinios.

to acquaint him of his good fortune; but during this interval Socinios appeared, not as a candidate, but as already in possession of the empire, and ready to support his rights by force of arms. His first step was to let Ras Athanasius know his pretensions to the throne, and desire his assistance with his army, promising to reward him as soon as it should be in his power. Without waiting for any answer, he advanced so rapidly, that Athanasius had scarce time to consider what he should reply, when a second message was sent, importing that Socinios was in the neighbourhood, and ordering preparations to be made for receiving him as his sovereign. This expeditious mode of action so much confounded Athanasius, that he complied with the requisitions, saluting him king, and joining his troops to his. Thus successful in his first attempt, Socinios made a similar one on Za Selasse. In this, however, he was disappointed. Za Selasse having first sent an equivocal answer, marched against him with his whole army; while Socinios, happening to fall sick, and putting little confidence in A-

193 He is obliged to retire.

thanasius, withdrew to the mountains of Amhara. Athanasius likewise, not knowing to whom he should attach himself, withdrew his forces, and stood neuter.

Za Selasse had refused to join Socinios, in expectation that Jacob would make his appearance, whom he rather wished to enjoy the crown than Socinios; as under the former he might hope to engross all the power to himself. For a long time, however, no answer was returned to his messages; his troops became impatient; so that fearing lest a mutiny or general de-

194 Jacob set up in opposition to him.

sertion would take place, he dispatched a messenger to Socinios, acknowledging him for emperor. But scarce was this done, when a messenger arrived from Jacob, informing him that he was then in Dembea, and promising Za Selasse great honours if he would acknowledge him for his sovereign. With these terms the traitor instantly complied, and his example was followed by Athanasius; while Socinios, not as yet able to resist all his enemies, retired again to Amhara. This however, he was not long of accomplishing. Jacob, was by no means possessed of equal military skill; and

195 Bad conduct and defeat of Za Selasse, Jacob's general.

though Za Selasse was an experienced officer, yet his extreme perfidy, pride, and obstinacy, rendered it very dangerous to have any concern with him. This appeared remarkably in the present case. His pride in the first place would not allow him to join his forces to those of Jacob, lest the latter, who was inferior in military

military skill, should have a share in the victory he was to gain. Then, intoxicated with his opinion of himself, he neglected to behave with the caution necessary in the neighbourhood of such an experienced general as Socinios, which gave the latter an opportunity of cutting off almost his whole army. Being now obliged to fly with a few attendants to Jacob's camp, he met with an indifferent reception on account of his defeat; for which reason he made proposals to join Socinios. The latter accepted his offer, though he could put no confidence in one who had been guilty of such complicated treachery; only he thought it would be an advantage to put it out of his power to join his antagonist. Jacob, on the other hand, confident in his numbers, which are said to have been almost 30 to 1, advanced boldly to give his antagonist battle. Socinios declined the engagement till he had drawn him into a situation where his numerous forces could not act; so that a dreadful carnage ensued, Jacob himself perishing among the multitude, and his body being never found afterwards. In this battle also was killed the wicked priest Abuna Petros, who was the occasion of Za Denghel's death, as we have already related. Ras Athanasius escaped by the swiftness of his horse, and took refuge in a neighbouring monastry. He was afterwards pardoned at the intercession of Peter Paez; but his goods and estate being confiscated on various occasions, falling into universal contempt, and being abandoned by his wife, he died at last of want. According to the Abyssinian accounts, Socinios ordered the pursuit to be stopped as soon as he saw the head of Abuna Petros; but the Portuguese writers inform us, that he kept it up with the utmost vigour throughout the whole day and part of the night. They particularly mention, that a number of Portuguese, who had joined the army of Jacob, lost their lives on this occasion, by falling over a precipice which they could not avoid in the dark. One of these named *Manuel Gonsalvez* had the good luck to light on a tree, where he sat till morning in the utmost terror, but at last made a shift to clamber up and escape.

196 Jacob defeated and killed.

By this victory Socinios was fully established on the throne, though his situation might still be accounted precarious by reason of the rebellious disposition of many of the provinces. He began with making a general proclamation of pardon, excepting only the murderers of Za Denghel, with whom he had been in terms of intimate friendship. Being informed therefore, that one *Mahardem*, a Moor, had given him the first wound in that battle in which he was killed, he ordered his head to be instantly struck off with an ax before the gate of the palace.

197 Socinios favours the Portuguese.

The Portuguese were much favoured by this prince; and they were become very numerous by continual intermarriages with the Abyssinians; the male children being always trained to the use of fire-arms by their parents, and incorporated as soldiers with them; and they were now all united in one body under an experienced officer named *John Gabriel*, whom we have already had occasion to mention. As their numbers and valour made them objects of consideration, Socinios determined to attach them to himself as much as possible; and the best means to do this he knew was by favouring their priests. Peter Paez was therefore sent for to court; where a dispute concerning the supremacy of the pope and the two natures of Christ (the great subjects of debate in Abyssinia), took place, and a sermon was preached with as great success as that in Za Denghel's time. The king first enlarged the territory possessed by the Jesuits at Fremona; after which he declared to Paez his resolution of embracing the Catholic religion; giving him at the same time two letters, one to the king of Portugal, the other to the Pope, the purport of which was to request a number of more Portuguese to deliver Abyssinia from the incursions of the Galla, as they had formerly done from the yoke of the Moors.

198 He resolves to embrace the Catholic religion.

Before any thing of importance could be done in matters of religion, the king was called forth to suppress a rebellion, which had already taken place. An impostor had appeared, who called himself *Jacob* the late king, and pretented to have escaped from the battle; but so much wounded in the face that he kept one side of it constantly covered to conceal the deformity. He made his appearance among the mountains of Habab near Masuah; and being joined by great numbers of people, Sela Christos, brother to the king, and governor of Tigre, marched against him. The impostor's troops, though numerous, fled at the first onset; but he escaped to the mountains, where it was very difficult to follow him. This, however, was attempted; and a great many of the posts he had taken were stormed like as many forts: but still the impostor himself, though driven from place to place, found means to make good his retreat to the country lying between the mountains of Habab and the territory of the Baharnagash. Thither he was pursued by Selah Christos; but that general, finding the rebellion likely to spread through the whole province of Tigre, thought proper now to acquaint his brother Socinios with the state of affairs, and to desire his assistance. The king, though at that time he had sent away most of his troops in an expedition against the Shangalla and Gongas, who dwell on the northwest of Abyssinia, set out immediately with such troops as he could collect. These were but few in number; his cavalry particularly, amounting to no more than 530, besides a small reinforcement brought by his brother Emana Christos, governor of Amhara. As he proceeded, he was informed that a party of Galla were lodged on a hill at no great distance from him. Determining to cut them off, he surrounded the hill where they were posted; but having caused his cavalry to advance before, and pass a deep ravine, they were almost entirely destroyed, while the rest of the army were seized with such a panic that they refused to stir. In this extreme danger, the Gall apassed the ravine to attack them; but the king having advanced singly, and killed the first of them, his troops, ashamed of their cowardice, rushed forward on the enemy, and gained a complete victory, which obliged the savages to leave the province they infested at that time.

199 An impostor, pretending to be the late emperor, Jacob appears.

200 Is defeated.

201 The Galla defeated.

The misfortune of the cavalry on this occasion quickly occasioned a report that the king had been defeated; of which the impostor Jacob did not fail to take advantage; and descending from his mountains, committed great devastations in the low country. But though attended by a great multitude, who likewise fought with more obstinacy than formerly, he was still defeated by Sela Christos with a force greatly inferior.

202 The impostor Jacob again defeated.

But

But before any thing effectual could be done for his reduction, the Galla made a dreadful irruption into the southern provinces, murdering all who fell into their hands, and burning and destroying towns, churches, and villages, in the most dreadful manner. The king bore those excesses for some time with patience, till at last he drew them into such a disadvantageous situation, that being surrounded by his forces,

203 An army of Galla cut off.

and inferior in number as well as in valour, they were all cut off to a man, with the loss of only 400 on the part of the Abyssinians. Soon after this victory the

204 Coronation of the king.

king underwent the ceremony of coronation. He then marched against the impostor Jacob; but the latter was too sensible of the superiority of his rival to face him in the field. He therefore retired again to his mountains, while the king left the suppression of the rebellion to an experienced officer named Amsala

205 The impostor Jacob assassinated.

Christos; who employed two young men, that had been outlawed for murder, to assassinate the impostor. This being done, it was found that the pretended Jacob was no other than a herdsman among those mountains to which he so constantly fled for refuge; and that he had neither wound nor scar on his face, but had kept one half of it covered to conceal the little resemblance he bore to Jacob whom he personated.

The king being now freed from this rebellion, began again to turn his thoughts towards religion. His first step was to make an handsome present to the Jesuits; but he soon showed his inexperience in religious matters, by attempting to reconcile the two contending parties in his empire. Before he could see the folly of this attempt, however, his attention was called by a most

206 Dangerous rebellion begun by Melchizedec.

dangerous rebellion, which was begun by one Melchizedec, a servant of the late Sertza Denghel, but a man of great experience in war. He was first opposed by Sanuda, a brave officer; but being totally destitute of troops, he was obliged to apply to the attendents of the king of Sennaar, who had been deposed by his subjects, and was at that time in Abyssinia. These readily joined him; and a bloody battle

207 Defeats one of the king's generals.

ensued, in which Sanuda was so totally defeated, that he alone had the good fortune to escape, and that grievously wounded, his men being all killed on the spot. On this misfortune Socinios sent his brother Emana Christos with a considerable force to reduce the rebels. Melchizedec finding himself opposed by such an able general exerted himself to the utmost, in order to raise a force sufficient to resist him; and in this he succeeded so well, that his army soon struck terror into all the neighbouring country, notwithstanding the presence and known valour of the king's brother. A

208 Causes Arzo be proclaimed king.

prince of the blood-royal named *Arzo*, was likewise found out and proclaimed king, in order to give some sanction to the rebels; soon after which they boldly marched to meet the royal army. The engagement took place on the 9th of March 1611, and was fought with great obstinacy on both sides: the advantage even appeared for some time on that of the rebels; till Emana Christos, perceiving that all was at stake, pushed desperately forward to the place where Melchizedec himself was. The latter seeing no probability of avoiding a single combat, which he did not choose to try, instantly turned his horse and fled; and the rest of the army soon followed his example. Melchizedec, however, did not much avail himself of this cowardice; for he was closely pursued by the peasants, taken

209 Is defeated, taken prisoner, and put to death.

prisoner, and executed as a traitor, together with several of his principal officers. The fate of Prince Arzo, whom, to support their cause, the rebels had proclaimed king, is not known.

This victory, so far from extinguishing the spirit of rebellion, seemed to have inflamed it beyond all bounds:

210 The rebellion continues.

for news were now received that the whole country round the head of the Nile to the province of Tigre had revolted; so that there was a necessity for the immediate presence of the emperor himself; and even this was insufficient, as the rebels were dispersed over such a large tract of territory. His two brothers, Emana and Sela Christos, were therefore both employed against different rebel chiefs, while the king

211 Cruel manner of carrying on the war.

marched against those who were most formidable. The principle on which this war was carried on seems to have been very cruel, viz. that of killing all the men, and carrying off the women and children for slaves. This was punctually executed, first upon the inhabitants of a mountainous district named *Gusman* on the Nile; though at the intercession of the missionary Peter Paez, the women and children, instead of being sold for slaves, were given to the Jesuits to be educated in the Catholic religion. The Gongas and Agows were next attacked with equal success and still greater cruelty; one of their tribes, named *Zalabassa*, being almost entirely exterminated: but this, instead of having any good effect, seemed to multiply the rebels still more. The Agows and Galla invaded the provinces in the

212 Amdo, another impostor, supported by the Jews.

neighbourhood; and another impostor, whose true name was *Amdo*, but who pretended to be the unfortunate emperor Jacob, appeared as a competitor for the crown. This last rebel proved much more formidable than any of the rest. He was indeed surprised before he had time to collect any forces; but Gideon, king of the Jews of Samen, having killed the guards who watched him, set the impostor at liberty, and supported his cause. Thus he soon collected a very formidable army, with which he defeated and killed an officer named *Abram*, who opposed him with a considerable force. This brought Socinios himself against him, who instantly attacked the Jewish monarch Gi-

213 War with Gideon.

deon, as being the principal support of his cause. As the country of the Jews was naturally strong, and very full of fortified places, the reduction of it was evidently a very difficult task. The first place attacked was a fortress, named *Massiraba*; which, though very strongly fortified and garrisoned, was soon taken by storm, and every one in it put to the sword without distinction. Hotchi and Amba Za Haucasse, two other strong fortresses, shared the same fate. A fourth, named *Senganat*, no less strong than any of the former, was also taken; Gideon himself narrowly escaping with his life in the attack. Discouraged therefore by so many misfortunes, and apprehending the total ruin of his country, this prince at last was content to sue for peace;

214 Amdo delivered up and put to death.

which was granted on condition that Amdo should be delivered up. This traitor was condemned to a punishment very unusual among Christians, *viz.* that of being crucified; but in nailing him to the cross, his cries and groans so much affected the king, that he ordered him to be taken down and beheaded.

The war was now resumed against the Gongas and

Guba; whom the king annually invaded for the purpose of making slaves. In this expedition his officers not only executed their commission against these savages, but likewise carried of a great number of cattle from the Agows, who were then at peace with the emperor. This conduct was highly resented by Socinios, who obliged them to make restitution of what they had taken away; and the doing them justice in this particular, had more effect in reducing the rest of these people to obedience, than all the cruelties which had been committed since the beginning of the war.

215 Other military expeditions.

In 1616, the emperor set out on an expedition against the Galla; but this was laid aside on the death of his eldest son, for whom he entertained a great affection. It was succeeded by a very cruel order against the Jews, whom Socinios now determined to exterminate without any apparent occasion. His commands, however, were executed with the utmost punctuality, so that very few escaped; and among the rest perished their prince Gideon lately mentioned. He was supposed to be immensely rich, and to have concealed his riches which have been sought for in vain by the Abyssinians from that time to the present. The children of the murdered Jews were sold for slaves; and such of the profession as were scattered through the empire, had orders to renounce their religion and be baptized, under pain of death. Thus almost the whole Jewish religion was extinguished at once, as most of them chose rather to embrace Christianity than suffer death. In token of the sincerity of their conversion, they were all ordered to plough and harrow on the sabbath day.

216 The Jews exterminated.

217 Successful expedition against the Galla.

This butchery being over, the expedition against the Galla was resumed, and carried on with the usual cruelty; while the Galla never once appeared to prevent the desolation of their country. Next year, however, a new association was made among these savages, and the empire invaded by them in two different parts at once. One of their armies was cut off to a man before they had time to begin their ravages; while the other fled on the first approach of the royal army, leaving their wives, children, and baggage, to the mercy of the enemy. Thus the king was left for a short time at rest from rebellions or foreign invasions; and this interval he determined to make use of in making war on his neighbour the king of Sennaar, from whom he had formerly received an affront. In this expedition he was assisted by one Wed Ageeb, a prince of the Arabs, who lived on the frontiers of Abyssinia. The allies proceeded with their usual cruelty, killing all the men, and selling the women and children for slaves. Vast numbers of cattle were carried off; and the victorious armies returned with an immense booty. The next expedition was against Fatima queen of the Shepherds, otherwise called *queen of the Greeks*, who resided on the north east of Atbara. In this also the king proved successful, though less blood was shed than usual: but it was not long before this extraordinary success met with a severe check by the entire loss of an Abyssinian army; the favourite son of the emperor himself being killed in the engagement, with some of the best officers in the empire.

218 War with Sennaar, &c.

219 Progress of the Romish religion.

All this time Peter Paez had applied himself with the utmost assiduity to the conversion of the Abyssinians to the Catholic faith; and in this undertaking he had been attended with wonderful success. He was indeed of all others the most fit for an undertaking of this kind among a rude and barbarous people. Besides an uncommon share of learning, he possessed an eminent degree of skill in the mechanical arts; by which he was enabled to teach the Abyssinians how to build houses of stone and lime, which they had never known before. In these he was at first mason, carpenter, smith, and architect, himself; and thus, to the astonishment of the whole empire, he built some churches and a palace for the king. His universal genius prepared the people for the reception of his opinions; while the barbarous ignorance and savage manners of his antagonists tended to prejudice every one against their tenets, though ever so just in themselves. Sela Christos, the king's brother, is said to have been converted by only reading the Abyssinian books with attention; in which it seems the ignorance of the priests had been displayed in an extraordinary manner. We have already seen how well the emperor himself was disposed towards the Romish church; and his example was followed by many of the principal people of the kingdom. At last the Abyssinian patriarch named *Simon* made a complaint, that irregularities in religion had been committed; and disputes held on matters of faith without calling him, or permission granted him, to support his clergy in these controversies. As Socinios had no opinion of this priest's learning or eloquence, he did not imagine that any harm could ensue to the cause from granting what he wanted. A public dispute was accordingly appointed; in which Simon's inferiority was so apparent, that Socinios now publicly declared his belief in the two natures of Christ.

220 Excellent character of Peter Paez.

221 Letters from the pope and king of Spain.

While the conversion was in this prosperous way, letters arrived from the pope and king of Spain, but without any promise of the temporal assistance, *viz.* the soldiers he had solicited; though they assured him of an ally far superior, the Holy Spirit himself, provided the emperor continued firm in his resolutions of embracing the Catholic faith. Socinios would probably have been as well satisfied with an account of a reinforcement of soldiers; but as matters stood, he was obliged to be content, and resolved to submit in form to the pope, renouncing for ever his connection with the Greek church. As it was improper, however, to send letters on a subject of such importance by a common messenger, proper persons were to be appointed who might occasionally assume the character of ambassadors, and act accordingly. This being resolved on, the next thing was to determine the way by which the ambassadors were to reach Europe. The usual track by Masuah was now shut up on account of the rebellion which existed in the neighbouring provinces; so that the more eligible way seemed to be through Narea and the provinces to the southward, by which they might reach Melinda, and from thence embark for Goa.

222 Determines to submit to the pope.

223 Ambassadors set out for Europe.

The ambassadors were chosen by lot; which falling first on Antonio Fernandez, he named Fecur Egzie as his companion; and, all things being settled, these two set out for Gojam in the beginning of March 1613. It seems surprising that the Abyssinian monarch should have sent these ambassadors on such a dangerous expedition without a proper guard through the

the barbarous countries they had to pass. This, however, seems undoubtedly to have been the case; as we hear of no other attendants they had than 10 Portuguese taken with him by Fecur Egzie, six of whom were to go no farther than Narea, but the other four were to proceed to India; forty men armed with shields and javelins were also granted, but this force was undoubtedly too small to answer any useful purpose. Sela Christos indeed furnished them with guides from the barbarous nations in the neighbourhood of Narea, taking
224 hostages for the security of the travellers; but the insufficiency of these precautions soon appeared. Our travellers had proceeded but two days journey into the country of the Gongas, when they were treated in such an hostile manner, that one of the Portuguese was obliged to return with Fernandez to complain of the behaviour of the savages. On this information Sela Christos instantly dispatched three officers, with a proper number of troops to chastise them; by which means the ambassadors got safe to Mine, the name of some miserable villages on a ford of the Nile. Here they crossed the river on skins blown up, and next day entered the country of the Pagan Galla; and soon after, though not without great difficulty, they reached the kingdom of Narea the most southerly province of the Abyssinian empire, but quite surrounded by the Galla. Here they were received with great kindness by the commanding officer of the first fortified place they came to; but on being introduced to the king himself, they met with a very indifferent reception. This was owing to the insinuations of an Abyssinian Monk, that they were to bring Portuguese soldiers that way into Abyssinia; which would be destructive to his kingdom. On calling a council, it was resolved to send them into the kingdom of Bali; so that they would be obliged to pass through a much more difficult and dangerous road than what was first intended. Having thus, as he supposed, provided against the danger which threatened his kingdom, he made them a present of 50 pieces of gold, recommending them at the same time to the ambassador from the sovereign of Gingiro, thro' which they were next to pass.

Account of their journey.

On leaving Narea, they received a convoy of 80 soldiers to conduct them safely to their next stage; after which they passed four days through countries totally laid waste by the Galla, and where they were obliged to hide themselves for fear of meeting with these savages. Proceeding still through woods and vast chains of mountains, they came to the river Zebee, or more pro-
225 perly *Kibbee*, from its white colour resembling melted butter, as the word imports. Fernandez described this river as larger than the Nile, and vastly more rapid. They passed it by a kind of bridge, but certainly a most tremendous one. The channel of the river is full of rocks; and betwixt every two of these a single tree was laid, so elastic that it would bend with the weight of one person; while the vast height of the precipice, and the sight of the roaring current below, was sufficient to strike the boldest with terror. At a small distance from this bridge was a ford, through which it was necessary that their mules should pass; which being accomplished without any accident, though with difficulty and danger, they entered the territory of Gingiro. Here they were hospitably received by the sovereign, and after a mutual exchange of presents proceeded to Sangara, the capital of another small kingdom named *Cambat*, which was at this time governed by a Moor named *Amelmal*. During the time of their residence here, one Manquer, a schismatic Abyssinian, arrived, who insinuated to the king that the recommendations they had brought along with them were false. This reduced them to the necessity of staying there till messengers could be sent to Socinios to know whether it was so or not; which occasioned a delay of three months. At last orders were brought to send them off immediately. This favourable answer procured the dismission of the ambassadors with presents; while the malicious Manquer was detained prisoner. He escaped, however, and overtook them in the next kingdom, named *Alaba*, which was governed by a Moor named *Aliko*. Here he accused them of a design to overturn the Mahometan religion altogether: which so exasperated the barbarian, that he threatened them all with death; and actually put them in prison, where some of the Portuguese died. At last, after holding a council in which Manquer gave his voice for 226
putting them to death, it was resolved that they should be sent back to Amelmal; which was accordingly done, and from his dominions they returned to Abyssinia. Thus ended this memorable embassy, by which the Pope was deprived of any authentic documents which might show than any Abyssinian emperor had ever voluntarily submitted to him; and there can be no doubt that this miscarriage, more than any thing else, prevented the establishment of Popery in this country. 227

Description of the river Zebee.

They are obliged to return.

Socinios had now gone so far in favour of the Catholic party, that he began to share in some measure the fate of Za Denghel, numberless conspiracies being formed against him; which it was undoubtedly owing only to the altered situation of affairs by the preaching and assiduity of Peter Paez, that he was able to withstand. The conspirators were at this time supported, not only by the Abuna, but by Emana Christos himself, the king's brother, whom we have frequently had occasion to mention. Their first step was the very same which had been so successfully taken by Za Selasse in the time of Za Denghel, viz. to pronounce sentence 228
of excommunication on the emperor. He was at that time absent on an expedition against the Agows; but returned immediately on hearing what was transacted in his absence; informing the Abuna, that if he did not recal the excommunication without delay, his head should pay the forfeit. This spirited declaration had such an effect, that the Anathema was annulled, and the conspiracy dissolved for that time. It was next resolved between Emana Christos the king's brother, Julius his son-in-law, and Kesla Wahad master of the 229
household, to assassinate the king in his palace. To accomplish this purpose it was concerted that they should desire an audience; that Julius should enter first, and present a petition of such a nature as would probably be refused: on this he was to begin an altercation; and during the continuance of it the other two assassins were to come up, and stab their sovereign before he had time to put himself in a posture of defence. Happily for Socinios, however, he was informed of his danger by a page just before Julius made his appearance: on which, instead of refusing the petition, he granted it immediately; so that there was no room for dispute. He then got up to walk; which was scarce

A number of rebellions on account of religion.

The Abuna excommunicates the emperor, but is obliged to withdraw his sentence

Attempts to assassinate the emperor.

ſcarce done when Emana Chriſtos alſo came; on which Socinios invited them all to the terrace to walk with him. This prevented their falling upon him at that moment; and as they ſuppoſed they would have ſtill a

230 **It miſcarries.**

better opportunity on the terrace, they readily conſented. But Socinios having opened a private door, at which he entered firſt, drew it quickly after him; and as this door had a ſpring lock made by Peter Paez, which ſhut it in the inſide but could not be opened from without, the conſpirators were diſappointed. Being alſo ſenſible that their deſign had been diſcovered, they were obliged for ſome time to keep at a diſtance, but did not for that reaſon abandon their wicked pro-

231 **The rebellious ſpirit of the conſpirators continues.**

jects. Their next ſcheme was to be put in execution when the king was abſent on an expedition againſt Senaar, who had made a violent irruption into the Abyſſinian territories. The object now was not the aſſaſſination of the emperor, but of his brother Sela Chriſtos; becauſe the emperor had taken the government of Gojam from Emana Chriſtos, who was a ſchiſmatic, to give it to Sela Chriſtos, who was a violent

232 **Julius the emperor's ſon-in-law firſt appears in arms.**

Catholic. The enterpriſe was begun by Julius; who iſſued a proclamation, that all thoſe who believed two natures in Chriſt ſhould leave the province of Tigre, where he was governor; and that ſuch as were true friends to the Alexandrian faith ſhould repair to his ſtandard to fight for it. He then ordered the goods of all the Catholics in Tigre to be confiſcated; and marched without delay into Gojam, in hopes to ſurpriſe Sela Chriſtos. But here the whole ſcheme was baffled by the vigilance and activity of the emperor; for he having received information of what was going forward, returned into that province before the conſpirators had received certain intelligence of his having

233 **Is deſerted by his aſſociates.**

left it. This ſo much damped the ardour of Emana Chriſtos and Keſla Wahad, that they ſtood aloof without attempting any thing till Julius ſhould try his fortune. That rebel was at firſt very much diſconcerted; but ſoon recovering his courage, advanced to the place where the Nile iſſues out of the lake of Dembea, where he met with the Abuna. Being confirmed by that prieſt in his wicked deſigns, he reſolved, by his advice, to fall upon the king before he could be joined by Sela Chriſtos, Simon himſelf (the Abuna) offering

234 **Socinios excommunicated a ſecond time.**

to ſhare his fortune; and to confirm all, a new and ſolemn excommunication was pronounced againſt the king and all his adherents. Socinios alarmed at theſe proceedings, ſent a meſſage to Sela Chriſtos, deſiring him to come to his aſſiſtance as faſt as poſſible. In the mean time he himſelf advanced to meet Julius; but choſe his poſts ſo judiciouſly, that he could not be forced to an engagement without great diſadvantage on the part of the enemy. Notwithſtanding this, Julius pitched his camp cloſe to that of the king, with a deſign to force him to a battle at all events. This raſh action was followed by one ſtill worſe. Simon had perſuaded him, that as ſoon as the royal army ſhould ſee him, they would abandon the ſtandard of the em-

235 **His raſhneſs and death.**

peror to join his. On this, without farther conſideration, he ruſhed into the camp of Socinios with a very few attendants, and reached the emperor's tent. Here he was known by the guards, and inſtantly diſpatched with all his followers: the whole army betaking themſelves to flight after his death, and being purſued with great ſlaughter by the royaliſts. The plunder of the camp was immenſe, Julius having brought all his riches, which he amaſſed by a long courſe of extortion, into the field along with him; and all of theſe were diſtributed among the ſoldiers. A vaſt number of cattle were likewiſe taken, which Socinios diſtributed among the prieſts, judges, and lay-officers. By this complete victory the whole ſcheme of the conſpirators was overthrown. 236

Emana Chriſtos taken, but pardoned.

Emana Chriſtos having no forces capable of coping with his brother, and unwilling, as we have ſaid, to aſſiſt Julius openly, had retired to a high mountain named *Melca Amba*, in the territory of Gojam. Here he was inveſted by Af Chriſtos, an experienced general, whom Sela Chriſtos had left governor when he joined the emperor. Emana, who was likewiſe an expert commander, would have made a vigorous defence; but unfortunately the mountain was ſo deſtitute of water, that in three days he was delivered up by his own men to ſave themſelves from periſhing with thirſt. On being brought to the king, he was tried in a full aſſembly of judges, and condemned to death; but the king pardoned and ſent him to Amhara.

This terrible conſpiracy had been occaſioned by the diſpute concerning the two natures of our Saviour: another quickly followed on account of the diſpute concerning the Sabbath-day; the Abyſſinian church inſiſting on the obſervance of the ſeventh day of the week as a Sabbath, and the Romiſh church on 237

Another rebellion by Jonael.

the obſervance of the firſt day. The author of this rebellion was one Jonael, who had been concerned in the expedition formerly mentioned, in which the Agow's cattle were driven away, and afterwards reſtored by the king. It is more than probable that his reſentment on this account contributed much to increaſe his zeal on the preſent occaſion; but whatever was the real cauſe, religion was the ſole pretence. He began with a moſt inſolent and anonymous letter to the king; in which the arguments of the Alexandrians for the obſervance of the Jewiſh Sabbath were ſtated, and the contrary doctrine condemned with the utmoſt virulence of expreſſion. The king himſelf was reviled in the moſt opprobrious manner, compared to another Diocleſian, the Jeſuits ſaid to be relations of Pontius Pilate, and all of them devoted to hell without redemption. By this ſtupid performance the king was ſo much offended, that he added a clauſe to the former proclamation, commanding that "all out-door work, ſuch as ploughing and ſowing, ſhould be publicly followed by the huſbandman on the Saturday, under the penalty of paying a web of cotton-cloth for the firſt omiſſion, the value of the cloth to be 5s.; the ſecond offence to be puniſhed by a confiſcation of moveables, and the offence not to be pardoned for ſeven years." To this Socinios added a ſpeech from the throne in vindication of himſelf, concerning the part he had taken in religious matters; and to ſhow that he was in earneſt, cauſed the tongue of a monk to be cut out for denying the two natures of Chriſt, and one of his generals to be whipt for obſerving the Jewiſh Sabbath.

In the mean time Jonael having collected what forces he could, openly declared againſt his ſovereign; but not daring to meet him in the field, he retired into the country of the Galla, on hearing that Socinios was approaching him with an army. On this the king entered

Ethiopia.

entered their territories, and laid them waste; which created a dissention among the savages themselves; one party being for affording him protection, the other for delivering him up. This being made known to the king, he sent a few presents to the faithless barbarians of Jonael's party; who returned his kindness by sending him the head of the rebel, though but a short time before they had fought with their brethren for his rescue.

238 He is murdered by the Galla.

239 Another rebellion.

A more formidable enemy than Jonael, however, still remained. The province of Damot was one of the most disaffected to Socinios in the whole empire; and to this place the greatest part of the religious fanatics in other provinces had retired. They now mustered up an army of more than 12,000 men, among whom were 400 monks, all of them armed with shields, lances, and swords; inspired, besides, with such a degree of religious enthusiasm, that they expected to be rendered invulnerable by all terrestrial weapons, and that armies of angels would fight in their cause. Against these Sela Christos was dispatched with about 7000 excellent soldiers; and as the general himself was a zealous Roman Catholic as well as most of his men, we need not doubt that both parties imagined themselves sure of the protection of heaven, and consequently that the encounter would be very violent. The two armies met on the 16th of October 1620; but Sela Christos was unwilling to destroy the infatuated people, who he knew would be unable to resist his veteran troops. He therefore first showed them his superiority in some skirmishes; and then sent a pathetic message, offering a general pardon if they would lay down their arms. The messengers, however, were not allowed to approach, so that an engagement became unavoidable. The number of the rebels, as Sela Christos had foreseen, availed very little against the discipline of the veterans he commanded. The 400 monks made a most obstinate resistance; and did not yield till after 180 of them had been killed on the spot.

240 Desperate enthusiasm of the monks.

Socinios, having once more vanquished his enemies, now determined to show his attachment to the church of Rome more openly. Having therefore sent for Peter Paez, he told him his final resolution to embrace the Catholic religion in its full extent; after which he renounced the Alexandrian church in the most explicit manner. His renunciation was followed by a proclamation vindicating his conduct: in which, besides the arguments used for the Pope's supremacy, &c. he insisted much on the bad lives of the clergy of the opposite party, and for which it appeared that there was in reality too much foundation. This was the last work of the excellent missionary Peter Paez, who died of a fever immediately after his leaving the king. The example of the sovereign, however, had very little effect upon his subjects. The proclamation was followed by a new rebellion in Amhara. Unluckily the enemies of his brother Sela Christos had persuaded Socinios to deprive him of his government; and there was no other in the kingdom who could be entrusted with such an important commission; so that the king soon found himself under a necessity of replacing and committing to him the charge of the war against the rebels. In this he was attended with his usual success: for the rebel chief, finding himself unable to contend with his enemy, repaired for assistance to the Galla; who no sooner had him in their power than they killed him on the first offer of the imperial general, mangling his body in such a manner that scarce a bit of it remained to be sent to his antagonist.

241 The emperor publicly renounces the Alexandrian faith.

242 A new rebellion breaks out.

243 The rebel chief murdered by the Galla.

In the mean time news of the revolution in religious matters which had taken place in Abyssinia, arrived in Europe. Though the embassy to the Pope and king of Spain could not pass, as has already been related, yet frequent accounts had been otherwise transmitted; which produced such an effect, that a new set of missionaries, with a patriarch (Alphonso Mendez) at their head, were sent to Abyssinia. They arrived at Gorgora, the seat of royal residence, in the beginning of the year 1626; and at the very first audience of the emperor, it was agreed that he should take an oath of submission to the Pope. The ceremony was performed with all the splendor that could be contrived: the patriarch then preached a sermon on the Pope's supremacy in the Portuguese language, intermixed with Latin quotations; which is reported to have greatly confirmed the faith of the emperor and his brother, though neither of them understood a word of the languages in which it was preached. An answer to this unintelligible discourse was made in the Amharic language, which was equally unintelligible to the patriarch and his attendants; and to this the patriarch added a few words of a reply equally ill understood. At the conclusion of the dispute, an oath of the Pope's supremacy was taken by the emperor himself on his knees, then by the princes, and afterwards by all present, according to their different stations. Sela Christos, not contented with taking the oath, drew his sword, and in words not easily understood, denounced vengeance on "those who fell from their duty;" and he likewise added to the oath of supremacy another to the emperor and Facilidas the Prince Royal; but if the latter should fail in the defence of the Catholic faith, he swore to be his greatest enemy: nor would he be satisfied without imposing this clause upon all the officers, whether civil or military, then present.

244 A new patriarch and missionaries arrive in Abyssinia.

245 Socinios takes an oath of submission to the pope.

246 Violent conduct of Sela Christos.

This violent conduct of Sela Christos procured him a number of enemies, and at last was the occasion of his destruction; but that of the king and patriarch set the whole empire in a flame. An excommunication was first pronounced upon all who did not keep the oath: a proclamation was next issued, that all priests should previously embrace the Catholic religion under pain of death; and that every one, under the same penalty, should observe Lent and Easter according to the rules of the Romish church. The patriarch proceeded in the same style; re-ordaining the clergy, consecrating the churches over again, rebaptizing the people, even such as were full-grown, abrogating circumcision, polygamy, and divorce (for these had been allowed by the Alexandrian church), and reducing the moveable feasts entirely to the rules of the church of Rome.

247 And of the emperor and patriarch.

Though polygamy and divorce are no doubt inconsistent with the pure doctrines of the gospel, yet it was very improper to meddle with these practices at once in such a violent manner. Besides the confusion that this would naturally occasion in private families, these practices gave occasion to many questions in law, which it belonged to the civil judges to decide; but now these were all subjected to the authority of the patriarch;

patriarch: and from some other steps taken by this prelate, it appeared that he intended to encroach much farther upon the civil authority. One of these related to the church-lands; which in Ethiopia are granted by the king, and resumed at his pleasure; others being granted in their place, so that neither priests nor monks have any property in them. On the present occasion, an Abyssinian nobleman had possessed some lands belonging to a Catholic monk; for which he was called before the patriarch. On his refusing to submit to this new tribunal, he was instantly condemned to restore the lands; but refusing this also, the patriarch took an opportunity, as he was attending the emperor at church, to pronounce sentence of excommunication against him, giving him over at once, soul and body, to the devil.—On hearing this terrible sentence pronounced, the nobleman fainted away, and was with difficulty recovered. On the intercession of the emperor, however, the curse was taken off; but the incident produced a very disagreeable effect on the minds of the people, who from that day began to entertain a greater aversion than ever to the Roman Catholics and their priests. This aversion was greatly increased by the absurd conduct of the patriarch, in ordering the body of an Abyssinian saint to be taken up, and thrown out of the grave in an ignominious manner, because it had been buried under the altar of a church, which he imagined was thus defiled. In all other respects, the patriarch behaved in such an insolent and overbearing manner, that the effects of his oppression soon began to be universally felt, and the Catholic religion began very quickly to decline.—The first stroke given to it was the alteration of the liturgy; which was done at the desire of the emperor. Ever since the establishment of the Catholic religion, the Latin mass-book, &c. had been made use of according to the practice of the church of Rome; but as it seemed very unreasonable to impose this at once upon the Ethiopians, Socinios ordered the patriarch to make such alterations in the old Abyssinian liturgies as he thought proper, that the people might thus have an opportunity of paying their devotions in a language they understood. The patriarch, not being able to assign any solid reason to the contrary, was obliged to comply; but no sooner was this done than the people made use of their old liturgies entirely, without the least regard to the innovations of the patriarch. In the midst of the confusion which daily took place from these causes, the Galla made a dreadful invasion, and cut off one of the emperor's generals with his whole army: nor were all the abilities of Sela Christos, who had so often distinguished himself, sufficient to retrieve matters; so that the savages, after having ravaged the country for some time at pleasure, returned home loaded with booty. This misfortune was followed by the revolt of Tecla Georgis the king's son-in-law; who not only made religion the pretence for taking up arms, but insulted the Catholics in the most outrageous manner; collecting their images and other religious trinkets into an heap, and then publicly setting fire to them. After this he called before him his own chaplain, named *Abbæ Jacob*, who was a Catholic, stripped him of his pontificals, and killed him with his own hand. A reconciliation with Socinios was now impossible; so that he had no resource but in arms. In this, however, he was equally unsuccessful with the other rebels in this reign; being defeated, taken prisoner, and put to death along with his sister Abdera, notwithstanding the intercession of a Catholic missionary for him, and that of the queen and ladies of the court for his sister.

248 An Abyssinian nobleman excommunicated;

249 Body of an Abyssinian saint thrown out of the grave

250 Catholic liturgy altered.

251 An army cut off by the Galla.

252 Tecla Georgis, the king's son-in-law, revolts.

253 Is defeated, taken, and executed.

As the reasons given by the king for refusing such powerful intercession were purely religious, the people became more and more averse to a profession so extremely oppressive and sanguinary as that of Rome seemed to be. A revolt of the Agows quickly followed; not that religion had really any share in their determinations, but that they were exasperated by the slavery and oppression to which they saw themselves subjected. They now therefore set up Melcha Christos, a prince of the royal blood, as a pretender to the crown; and soon put on such a formidable appearance, that the king himself thought proper to march against them with an army of 30,000 fighting men, which with the servants and other attendants amounted to more than 80,000. Melcha Christos retired with his troops to the craggy mountains of the country; and being imprudently followed by the emperor, rolled down such quantities of stones from the precipices, that Socinios was obliged to retreat with great precipitation, after having lost almost half his army.

254 Revolt of the Agows who set up Melcha Christos.

On this defeat the emperor found himself obliged to apply to Sela Christos, whom he had again disgraced and deprived of his government. He succeeded in giving the rebels a dreadful overthrow, which for some time entirely broke their power; but this success was quickly followed by the revolt of Læca Mariam, a near relation of the king. He also was defeated, and obliged to retire to a mountain so steep, that though he ascended it in safety, he was dashed in pieces with many of his followers, in attempting to descend; the rest, who escaped this danger, being killed by their pursuers. Still, however, the rebel Melcha Christos was unsubdued; against whom Prince Facilidas, the heir apparent to the throne, was sent, having under him a nobleman of most distinguished character named *Keba Christos*. The latter was defeated and killed, without its being in the power of Facilidas to do any thing towards the suppression of the rebellion. This misfortune was followed by the death of Fecur Egzie, formerly ambassador with Antonio Fernandes to the pope, but now lieutenant-general to Sela Christos. He was cut off with a small body of troops by the Galla; and from many misfortunes befalling the imperial troops, the power of Melca Christos was augmented to such a degree, that he now began to act as a king, and appointed a deputy-governor to one of the provinces. His opinion of his own importance, however, had almost proved his ruin; for the new governor having appointed a great festival on a Saturday, in opposition to the royal edict, he was attacked by a party of the king's troops, and entirely routed with the loss of 4000 of his men. This defeat was revenged by an overthrow given to Prince Facilidas himself; the blame of which was laid upon Sela Christos. The latter, as we have often had occasion to observe, was not only a most valiant commander, but a rigid Catholic; and these two properties might naturally have been thought to secure him in favour with the emperor. His violent conduct in regard to the

255 The rebels defeated by Sela Christos.

256 Læca Mariam's revolt and death.

257 Several misfortunes befal the emperor.

258 A rebel general entirely defeated.

259 Prince Facilidas defeated.

the Catholic religion, however, had raised him so many enemies, that accusations were perpetually brought against him; and one disgrace constantly followed another, notwithstanding all his services.

260 Sela Christos universally hated.

The present accusation was brought by one Lesana Christos, whom Sela Christos had formerly condemned to death. For this offence he had received a pardon from Socinios; and he now revenged himself upon his former judge by accusing him to his sovereign. Sela Christos was not unmindful of this conduct; and therefore, as soon as he had him in his power, put him to death without regarding the pardon he had received.

260 Deprived of the government of Gojam:

The emperor on this deprived him of the government of Gojam, which he gave to Serca Christos, who was supposed to be a dependent on Prince Facilidas, and was besides cousin to the emperor himself.

262 Revolt of the new governor.

The new governor, on his entering upon office, promised solemnly to support the Catholic religion; but no sooner did he arrive in Gojam, than he solicited Prince Facilidas to rebel against his father, and re-establish the Alexandrian faith. This was not the only instance in which he showed his disobedience. He had received the charge of a caravan which came annually from Narea; but instead of acting properly in this respect, he employed himself in driving off the cattle of the Agows and Damots, who expected no harm, and were consequently quite unprepared. Such numbers of them were carried off on this occasion, that 100,000 are said to have been sent to the Abyssinian market. Socinios, when informed of such an atrocious robbery, ordered him to restore the cattle, and to surrender himself prisoner; but instead of complying with this order, he again solicited Facilidas to revolt against his father. For this he was sharply reproved; but now, determining to make the world believe that the prince had entered into his schemes, he sent a public message to him, in which he was desired to come and take possession of the kingdom. Facilidas imprisoned the person who brought this treasonable message, and soon after sent him to Socinios; but Serca Christos still persisted in his mad attempts. He now proposed to abolish the Romish religion throughout the kingdom; and with that view attacked a convent which Sela Christos, had built in Gojam: but the fathers having been furnished with some fire arms, made so good a defence, that he was obliged to give over the enterprise. He then took the last step to complete his folly, by openly revolting against the emperor, and setting up a prince of the blood-royal in opposition to him, whom he had found living in obscurity among his mother's relations. To cut of all possibility of reconciliation with the emperor, he renewed the sacrilegious practices of Georgis, and put to death a priest for refusing to deny the two natures of Christ. Thus he procured a multitude of enthusiasts to join him; but when the affair came to a decision, and Prince Facilidas with a well disciplined army was sent against him, it then became evident how little the fanaticism of a tumultuous rabble availed against the skill of a regular army.

263 He is defeated, taken, and put to death.

The rebels fought, however, with great obstinacy till most of them were killed, their commander being obliged to take refuge on a mountain; from whence being unable to make his escape, he at last came down and surrended at discretion. We need not doubt of his fate: but notwithstanding the execution of this rebel, another still remained. This was Melca Christos, against whom the emperor next prepared to march. He now found, however, the bad consequences of having acted so violently in favour of the Catholic religion.

264 The emperor relaxes in his severity concerning religion, which is resented by the patriarch.

His army was so disaffected, that he could scarcely put any confidence in them. For this reason he issued a proclamation, that such as chose to observe the Wednesday as a fast instead of Saturday, had liberty to do so. This and some other indulgencies being reported to the patriarch, the latter sharply reproved him as committing an encroachment on the priesthood; and put him in mind of the punishment of leprosy inflicted upon Uzziah for assuming the priest's office. Thus an altercation commenced; and it is evident, from the behaviour of Socinios, that his extreme favour for the Romish religion began to decline. After this he set out for the country of Lasta, where Melcha Christos was; and the entrance to which was guarded by very high and rugged mountains. Among these the rebels had strongly fortified themselves; but were driven from four posts by the king's troops, so that the latter imagined a complete victory had been gained. Assembling themselves, however, on the top of another high mountain, the rebels watched their opportunity; and descending suddenly upon them, cut off great numbers, and obliged the rest to make a precipitate retreat.

265 The emperor defeated.

Another campaign was therefore necessary; but now the army lost all patience. They were become weary of making war on their countrymen; and, after slaughtering them in the field, seeing the intervals between the campaigns filled up with numerous executions of those who had escaped the sword.

266 The army require the restoration of the Alexandrian faith.

A deputation was therefore sent from the soldiers by Prince Facilidas, who, though he had never declared his sentiments openly, was strongly suspected of being no friend to the catholics. The purport of the deputation was, that they did not mean to say that the Romish profession was a bad one, but it was such as they could not understand; and consequently there could be no merit on their part in professing it. They were ready, however, to lay down their lives for the public good, provided their ancient religion was restored; but this was a point they would not give up, and without which they would neither concern themselves in the quarrel, nor even wish success to the emperor's arms. With regard to the Romish religion, they added this declaration, perhaps the strongest possible mark of aversion, that they did not *wish* to know any thing about it. Socinios, therefore, according to the Abyssinian accounts, promised to restore the Alexandrian faith, on condition, that he returned victorious from Lasta. The army then redily agreed to follow him wherever he pleased; while the rebels, having left their fortresses in Lasta, probably from a confidence in their own strength, boldly marched towards the royal army. In the engagement, however, they did not show their usual alacrity, and were soon defeated with the loss of 8000 men.

267 Melca Christos defeated.

Many of their best officers were killed on the spot, and Melca Christos himself escaped only by the swiftness of his horse.

By this victory the power of the rebels was broken; but it was not attended with the same satisfaction to the people with which other victories were wont to be accompanied. On viewing the field of battle along with

with Facilidas next day, the prince is ſaid to have made a pathetic ſpeech to his father; in which he told him, that the bodies of the men he ſaw dead on the field of battle were neither thoſe of Pagans nor Mohammedans, but of his own Chriſtian ſubjects; and that victories of this kind were like driving a ſword into his own entrails. "* How many men (he ſays) have you ſlaughtered? how many more have you yet to kill? We are become a proverb even to the Pagans and Moors for carrying on this war; and for apoſtatizing, as they ſay, from the faith of our anceſtors." The king did not make any reply at that time; but the effects of the prince's words were ſoon apparent. The patriarch took the firſt opportunity of upbraiding him with his ingratitude to the Catholics, and deſerting the religion whoſe profeſſors had by their prayers obtained ſuch a ſignal victory. To this Socinios replied in general, that he had done every thing in his power to eſtabliſh the Catholic religion; for which he had ſhed the blood of thouſands, and had ſtill as much more to ſhed: but that he ſhould conſider of the matter, and acquaint him with his final reſolution. This was by no means favourable; for next day, in a meſſage to the patriarch, he recounted the many rebellions which had been excited on account of religion; and concluded with telling him, that though the faith of Rome was not a bad one, yet the people of Abyſſinia did not underſtand it. For this reaſon he was determined to grant a toleration, by allowing ſuch as profeſſed the Catholic faith to do ſo in peace, and ſuch as rather choſe that of Alexandria to do the ſame. The patriarch replied, that he had no objection to grant this indulgence to ſuch as had not yet embraced the Catholic faith; but thoſe who had done ſo could not be permitted to renounce it without a grievous ſin. Thus a new ſyſtem of perſecution would have commenced: but the emperor, underſtanding well the purport of his diſcourſe, replied, that if this was the caſe, he was no longer maſter of his own kingdom; and immediately afterwards iſſued a proclamation, wherein he declared the Alexandrian faith reſtored, with the altars for the ſacrament, liturgy, and every other thing belonging to it; at the ſame time, that being now old and infirm, he himſelf reſigned the crown and empire to Facilidas.

268 Pathetic ſpeech of prince Facilidas to his father concerning the war.

* Bruce's Travels, vol. ii. p. 943.

369 An univerſal toleration granted.

270 Oppoſed the patriarch.

271 The emperor reſtores the Alexandrian faith, and reſigns the kingdom.

This remarkable proclamation was made on the 14th of June 1632; after which Socinios took no farther care of public affairs, nor did he long ſurvive this tranſaction. He died on the 7th of Sptember this year, and with him fell all the hopes of the Jeſuits. Facilidas, as had been rightly conjectured, was an inveterate enemy to the Catholic faith. As ſoon therefore as he had obtained the government, even before he took upon himſelf the title of king, the Catholics were every where diſplaced from offices of truſt and honour; but as ſoon as he found himſelf eſtabliſhed on the throne, a letter was ſent to the patriarch informing him that as the Alexandrian faith was now reſtored, it was become indiſpenſably neceſſary for him to leave the kingdom, eſpecially as the new Abuna was on the way, and only deferred his journey till the Romiſh prieſts ſhould be out of the country. For this reaſon he commanded the patriarch, with all his brethern, to leave their convents throughout the empire, and retire to Framona in the kingdom of Tigré, there to wait his further pleaſure. The patriarch attempted to ſoften him by many conceſſions, but in vain; on the 9th of March 1633 he was ordered, with the reſt of the fathers, to proceed immediately for Fremona. This they were obliged to comply with; but the emperor, underſtanding that they were about to eſtabliſh themſelves, and to ſolicit ſuccours from Spain to accompliſh their purpoſes by force, he ſent orders to the patriarch inſtantly to deliver up all the gun-powder they had at that place, and to prepare without delay to ſet out for Maſuah. Still the infatuated and obſtinate prieſt determined not to comply with the emperor's orders. At laſt he thought proper to deliver up the gun-powder; but reſolved to leave his companions behind him, and to diſperſe them as much as poſſible through the empire, in caſe he himſelf ſhould be obliged to embark at Maſuah; which, however, he did not by any means intend. For this purpoſe he applied to the Baharnagaſh, named *John Akay*, then in rebellion againſt the emperor; who carried them all off from Fremona in the night-time, under a guard of ſoldiers, and lodged them ſafely in a ſtrong fortreſs named *Adicotta*. Here the patriarch imagined that he might remain in ſafety till he ſhould be able to procure ſucceſſors from India. In this, however, he was deceived. John conveyed them from place to place through many unwholſome ſituations, till their ſtrength as well as their patience was exhauſted. At laſt, on receiving a preſent of gold, he allowed them to return to their old habitation Adicotta. Facilidas, then, being determined at all events to get rid of ſuch troubleſome gueſts, endeavoured to prevail upon John by bribes to deliver them into his hands. John was too delicate to comply with this requeſt, which he ſuppoſed would be a violation of hoſpitality; but he conſented, on receiving a proper compenſation, to ſell them to the Turks. Two were left in Abyſſinia, in hopes of ſoon ſharing the crown of martyrdom; and this indeed Facilidas did not delay to put them in poſſeſſion of, both being ordered for execution as ſoon as he got them into his power. Not content with this, and being perpetually apprehenſive of freſh invaſions from Europe, he entered into a treaty with the Turkiſh baſhaws to keep the ports of Maſuah and Suakem ſhut againſt them; by which their entrance into Abyſſinia would be effectually prevented.

272 The new emperor an enemy to the Romans.

273 The patriarch commanded to quite Abyſſinia.

274 He applies for protection to the Baharnagaſh, then in rebellion.

275 The patriarch and other miſſionaries ſold to the Turks.

During theſe tranſactions, the emperor took the moſt effectual methods otherwiſe to eradicate the Romiſh religion, by cutting off the principal perſons who profeſſed it, or obliging them to renounce their profeſſion. The principal of theſe was his uncle Sela Chriſtos, who had deſerved ſo well of the late emperor Socinios, and of the whole empire in general. His exceſſive bigotry in religious matters proved the cauſe of his deſtruction, as has formerly been hinted. When it was propoſed to him to renounce his faith, he abſolately refuſed to do ſo, either to avoid the greateſt puniſhment the king could inflict, or to obtain the greateſt gift he had in his power to beſtow. On this he was baniſhed to an unwholeſome diſtrict among the mountains of Samen; but as even here he kept up a correſpondence with the Jeſuits, and wiſhed to facilitate the introduction of more Portugueſe from India, he was ſentenced to be hanged on a cedar tree.

276 Sela Chriſtos put to death.

The expulſion of the preſent race of miſſionaries did not entirely diſcourage the Europeans from attempting

Ethiopia. to introduce a fresh mission into Abyssinia. The obstinate, haughty, and rebellious spirit of the Jesuits was universally condemned, and looked upon to be the cause of the extreme aversion showed by the emperor and the whole empire against the doctrines they professed. It was therefore hoped, and not without some appearance of reason, that the point might still be gained, provided the mission were undertaken by others less violent and insidious in their behaviour. After the execution of those who remained in Abyssinia, six Capuchins, the reformed order of St Francis, were sent with protections from the Grand Signior to facilitate their passage into Abyssinia, where they hoped to revive the drooping or rather lost cause of the Catholic religion. Nothing, however, could be more unfortunate than the event of this undertaking. The Galla murdered two who attempted to enter Abyssinia by the way of Magadoxa. Two who arrived safely in the country were stoned to death; while the remaining two, hearing at Masuah of the fate of their companions, returned home with an account of it. The bad success of these did not deter three others from making the same attempt a short time afterwards; but they having imprudently informed Facilidas of their intention, were murdered by the bashaw of Masuah, who had received orders from him to this purpose. So particular was the emperor with regard to the execution of this order, that he caused the bashaw to send him the skin of their faces and heads; that he might know by their faces that they were Europeans, and by their shaved heads that they were priests.

277 A new mission undertaken by six Franciscan Capuchins.

278 Four of them murdered, and the other two return.

279 Three others murdered by order of Facilidas.

Though the Catholic faith was now totally suppressed, the spirit of rebellion still continued; and Melca Christos continued as much in opposition to his sovereign as when he first took up arms on pretence of religion. At first he met with extraordinary success; totally defeated the royal army though commanded by Facilidas in person; after which, pursuing his good fortune, he made himself master of the capital, entered the palace, and was formally crowned king. This, however, was the last of his good fortune. Facilidas having recruited his army as fast as possible, sent three able generals to attack his rival, who was now acting the sovereign in his palace. The rebels were surrounded before they expected any enemy, and almost entirely cut off, Melca Christos himself being killed in the engagement.

280 Melca Christos still continues in rebellion.

281 Is defeated and killed.

The victory over Melca Christos was followed by several successful expeditions against the Agows and Galla; but in the 6th year of the reign of this emperor, the rebels of Lasta, who seemed determined not to yield while there remained a possibility of resistance, chose the son of Melca Christos for their king, and again began their depredations on the neighbouring provinces. Facilidas marched against them with his usual activity; but had the misfortune to lose the greatest part of his army by cold among the mountains of Lasta, though it was then the time of the equinox, and consequently the sun was only 12° from being vertical, the latitude of Lasta being no more than 12°, and the sun 12 hours in the day above the horizon.—Before this rebellion could be suppressed, another was begun, at the head of which was Claudius the king's brother. He had not the same good fortune with the rebels of Lasta; but was quickly defeated, taken prisoner, and banished to a mountain called *Wechne*; which served from that time for the imprisonment of the princes of the blood-royal. The suppression of one rebellion, however, seemed to have no other effect than that of giving rise to another. A new expedition was to be undertaken against the Agows and Shangalla; but they had posted themselves so advantageously, that the royal army was entirely defeated without being able to make any impression on their enemies. Facilidas, however, knowing that this defeat could be attended with no other bad consequence than the loss of the men, which had already happened, marched directly against the rebels of Lasta without attempting to revenge the defeat he had sustained. The rebel general, weary of contention, in which he probably saw that he would be finally unsuccessful, chose to submit unconditionally to the emperor; who, though he at first affected to treat him with severity, soon after released him from prison, bestowing upon him large possessions in Begemder with his daughter Theoclea in marriage.

282 The rebels choose his son for their leader.

283 The emperor's army perishes with cold.

284 Princes of the blood again imprisoned on a mountain.

285 Facilidas defeated by the Agows and Shangalla.

286 The rebels of Lasta submit.

Facilidas died in the month of October 1665, and was succeeded by his son Hannes. This prince was such an enthusiast for Christianity, that in the very beginning of his reign he issued a proclamation forbidding the Mahometans to eat any flesh but what was killed by Christians; but so far was he from any inclination to favour the Catholics, that he ordered all their books which could be found in the empire, to be collected in a heap and burnt. Much of his time was spent in regulations of church-matters, and in contentions and in trifling disputes with the clergy; which conduct so disgusted his son Yasous, that he fled twice from the capital, but was pursued and brought back. The last time was in the year 1680, when he found his father ill of the distemper of which he died. Hannes expired on the 19th of July that year, having lived at peace during the whole of his reign, excepting some trifling expeditions against the Shangalla and rebels of Lasta.

287 Reign of Hannes.

Yasous, who succeeded to the throne with the approbation of the whole kingdom, was of a very different disposition from his father; being generous, active, and brave to a great degree; he was also much less bigoted, and differed from him considerably in religious principles. Having settled church-matters as he thought proper, his next step, and the most glorious action of his whole reign, was to pay a visit to those of the royal family who were confined on the mountain of Wechne. He found them in the most miserable condition; all in tatters, and many almost naked; their revenue having been ill-paid by his father, who was of a sordid disposition, and the little they received having been embezzled by their keepers. Yasous being greatly moved at this spectacle, ordered a large sum of money to be divided among them for their present necessities, clothed them according to their rank, and settled matters so that no part of their revenue could ever afterwards be applied to improper purposes. To the governor of the mountain he assigned a large tract of territory, to make amends for the profit he had been accustomed to derive from the revenue of the princes; and finally, he left all the prisoners at the foot of the mountain, at perfect liberty either to take up their residence again on it or any where else. By these extraordinary instances of royal munificence the emperor so effectually gained the affection

288 Reign of Yasous.

289 His generosity to the banished princes.

Ethiopia. fection of his relations, that they unanimously determined to return to their former state of confinement; and during the whole time of his reign no competitor for the crown ever made his appearance from among those who resided there.

Though Yasous is said to have possessed all the qualities which constitute a great and good monarch, the natural turbulence of his subjects, and the pestilent disposition of the monks soon began to show themselves by new seditions. These were preceded by a violent irruption of the Galla, who were overthrown, as usual, with great slaughter; but soon after, being solicited by some monks who had drawn over a party of the Agows to their side, the disturbances were renewed. A grandson of Socinios, who had fled to the Galla when Facilidas first banished the princes to Wechne, was proclaimed king. A multitude of savages immediately flocked to his standard, so that he was soon at the head of a very formidable army, while the Agows and other malcontents were ready to join him as soon as he should repass the Nile. The king, however, entirely disconcerted the scheme by his activity; for, advancing with the utmost celerity, he reached the banks of the Nile, before the Galla on the other side were ready to join their allies on this side of it. The Agows were so confounded at his presence, that they allowed him to pass the river unmolested. The Galla were equally surprised at seeing the war transferred into their own country; and, with their usual fickleness, deserted the prince whose cause they had pretended to espouse. A few remained faithful, but were utterly defeated by the forces of Yasous; the unhappy prince himself, whose name was *Isaac*, being taken prisoner, and put to death in the presence of his rival. After this many great exploits were performed against the rebellious Agows, Galla, and other savages: but which, as they produced no other consequence than that of establishing the emperor's character for valour and skill in military affairs, we shall here pass over; only remarking, that, in the opinion of his subjects, one of his campaigns was the most glorious ever recorded in the annals of Abyssinia. The most memorable events in the present reign regarded religion, and a renewal of the correspondence betwixt Europe and Abyssinia; of which we have a particular account from Mr Bruce to the following purpose. About the end of the 17th century a number of Franciscans from Italy settled at Cairo in Egypt, and were maintained at the expence of the fathers in Palestine, though pretending to be independent of their superior the guardian of Jerusalem. The latter, displeased at this method of proceeding, offered to supply the mission to Egypt entirely at the expence of Palestine, and likewise to furnish from thence missionaries capable of instructing the people in the Christian religion. This offer meeting with a favourable reception at Rome, a new set of missionaries from Jerusalem, called by our author *Capuchins*, appeared at Cairo, from whence the Franciscans were banished, only two of them being allowed to remain in that city. The others returned to Rome; where, finding that they could not re-establish themselves by fair means, they had recourse to artifice and fiction. It was now pretended, that, on the expulsion of the Jesuits from Abyssinia, a great number of Catholic Christians had fled into the neighbouring countries of Nubia and Sennaar, where they found themselves so grievously oppressed by the Mahometans, that, without some spiritual assistance, they would be under the necessity of renouncing their religion. This story being confirmed by the two Franciscans who remained at Cairo, the cause of these supposed Christians was eagerly espoused by the religious in Italy, and a new mission set on foot at the expence of the pope for their relief, which continues to this day under the title of the *Ethiopic mission*. The missionaries had it also in charge to penetrate if possible into Abyssinia; and to keep up, as far as was in their power, the Catholic faith, until a better opportunity should offer of making an attempt to convert the whole empire. For this purpose a convent was procured for them at Achmim in Upper Egypt; and permission was granted, notwithstanding their former banishment, to settle two of their order at Cairo independent of the fathers of Palestine.

290 Irruptions of the Galla, seditions of the monks, rebellion, &c.

291 Quelled by the emperor.

292 Attempts to revive the religious missions from Europe.

While these transactions passed in Italy and Egypt, Louis XIV. of France was in the height of his glory. He had attempted to rival the ancient Greeks and Romans in the magnificence of his works; but his conduct with regard to religion, his persecution of the Protestants, and revocation of the edict of Nantz, had stigmatized him throughout the greatest part of Europe as a bloody and merciless tyrant. To wipe off this stain, the Jesuits, his great spiritual directors, formed a scheme of inducing the emperor of Abyssinia to send an embassy to France; after which they hoped that they might get themselves replaced in the Ethiopic mission, to the exclusion of the Franciscans. The king, whose pride was very much flattered by the proposal, readily came into it; but the Pope's consent was still necessary. His Holiness was by no means pleased with this intrusion of a temporal prince into spiritual affairs; nevertheless he did not choose to enter into any contest; but that he might undo with one hand what he did with the other, he appointed six Jesuits, of whom Verseau, the ambassador of Louis to himself, was one, to be missionaries to Abyssinia, but the superior of the Franciscans to be his legate *à latere* at that court; providing him with suitable presents for the emperor and principal nobility.

The Jesuits now finding themselves in danger of being supplanted by the Franciscans, applied to the Pope to know which of the two orders should make the first attempt to enter Abyssinia; but received no other answer than that those who were most expert should do so. Verseau, probably displeased at this conduct of the Pope, went to a convent in Syria of which he was superior, without making any attempt to enter Ethiopia: therefore the mission remained in the hands of two persons of opposite professions, a Jesuit and Franciscan, the name of the latter being *Paschal*, an Italian; and of the former *Brevedent*, a Frenchman. The latter was accounted a man of learning and probity, zealous in the cause of his religion, but by no means imprudent or rash in his attempts to promote it.

293 Yasous falls sick, and sends for an European physician.

In the mean time an unforeseen accident procured admittance to the missionaries into Abyssinia more readily than could have been expected in the present situation of affairs. Yasous and his son had both been attacked by a scorbutic disorder which threatend to turn

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turn to a leprosy; on which one Hagi Ali, a Mahometan factor at Cairo, received orders to bring with him an European physician on his return to Abyssinia. It happened that this man had formerly been acquainted with Friar Paschal, who had administered some medicines to him. He now proposed that Paschal should accompany him to Abyssinia in the character of a physician; and that Friar Anthony, another of his own order, should go with him as his companion. But this scheme was frustrated by Maillet the French consul, who had the charge of the whole from Louis XIV. and wished that the Jesuits alone should have the conduct of the mission. For this purpose he represented to Hagi Ali, that Friar Paschal understood nothing of medicine; but he promised to furnish him with another, whose skill he extolled above all those of ancient or modern times. Hagi Ali, who knew nothing of the matter, readily agreed to Maillet's proposal; and Charles Poncet, a Frenchman, who had been bred a chemist and apothecary, was appointed to the office of physician, with Father Brevedent to attend him as a servant. Thus the scheme of the Franciscans was for the present overthrown: but unluckily Maillet employed one Ibrahim Hanna, a Syrian, to write letters to the Abyssinian monarch and some of his principal nobility, which he desired him to submit to the inspection of one Francis a capuchin or monk of the Holy Land, and consequently an enemy to the Franciscans. Ibrahim, not being acquainted with the monk he mentioned, and thinking any other would answer as well, carried the letters to one of the same name, but of the Franciscan order. Thus the whole secret was divulged at once; and the Franciscans, with the malevolence essential to such religious miscreants, resolved on the destruction of Poncet and his attendants. At present, however, their sanguinary intentions were defeated; Poncet set out immediately after he had received his commission, and arrived safe at Gondar the capital of Abyssinia, with his attendant Father Brevedent, on the 21st of July 1699. Brevedent died on the 9th of August; but Poncet lived to execute his commission, by making a full cure of his royal patient. On the 2d of May 1700, he set out on his return for Europe, and arrived at Masuah without any bad accident.

294 Friar Paschal and another Franciscan undertake the office.

295 Disappointed by M. Maillet.

296 Poncet and Brevedent appointed.

297 The Franciscans resolve the destruction of the missionaries.

298 Poncet sets out on his return after curing Yasous.

It has already been observed, that the main end of this undertaking was to procure an embassy from Abyssinia to the French monarch; and this end also was gained. An ambassador was procured, but unluckily not such a one as M. Maillet the chief manager of the whole project desired. This man, intoxicated with absurd notions of nobility and distinctions of rank, could not make allowance for the difference between the appearance of an ambassador from a barbarous monarch, however powerful, and one from the sovereign of a civilized and polite nation. The ambassador sent by Yasous, therefore, having been originally no other than a cook, could not be agreeable to a man of such a disposition. The presents sent by the Abyssinian monarch indeed, had they arrived, would have probably conciliated matters. These were, an elephant, some Abyssinian young women, &c. but unluckily the elephant died, and the ambassador was robbed of all the rest by a Turkish bashaw. Maillet, therefore, naturally proud, imperious, and covetous, thought proper to call in question the authenticity of Morat the ambassador's mission, to call Poncet himself a liar, and not to allow the former to proceed to France. The transactions on this occasion are set forth at length by Mr Bruce, greatly to the disgrace of Maillet; but as details of this kind would swell the present article beyond due bounds, we must refer the curious reader to the work just mentioned.

299 The Abyssinian ambassador disagreeable to M. Maillet.

300 He is not allowed to proceed to France.

Thus the scheme of procuring an embassy from Abyssinia having proved abortive, the next project of the Jesuits was to get an embassy sent from France, whose object was to be the cementing a perpetual peace betwixt the two nations, and to establish a lasting and commercial intercourse; though, whatever friendship or good-will might take place, it was evident that there was not a single article that could be exchanged between them, nor was there any ready communication betwixt the two countries either by sea or land. The person pitched upon as ambassador was M. de Roule, vice consul at Damietta. He is characterised by Mr Bruce as "a young man of some merit, who had a considerable degree of ambition, and a moderate skill of the common languages spoken in the east; but absolutely ignorant of that of the country to which he was going, and, what was worse, of the customs and prejudices of the nations through which he was to pass. Like most of his countrymen, he had a violent predilection for the dress, carriage and manners of France, and a hearty contempt for those of all other nations: this he had not address enough to disguise; and this endangered his life." Besides these disadvantages, he had the misfortune to be under the displeasure of all those of his own nation who resided at Cairo: so that the merchants were very much averse to his embassy; and, as the Francisans and Capuchins were his mortal enemies, he had not a single friend in the world except Maillet and the Jesuits. Unluckily the consul missed him in one of the most material articles, and which was undoubtedly of the utmost consequence to him in the accomplishment of his purpose, viz. the presents necessary to be taken with him for the barbarous people through whose country he was to pass. Brocades, sattins, and trinkets of various kinds, according to Mr Bruce, were the proper wares; but, instead of this, he had taken along with him mirrors of various kinds, with the pictures of the king and queen of France, wearing crowns upon their heads. The former of these subjected him to the imputation of being a magician; while the latter, if shown to a Mahometan, would bring upon him the charge of idolatry. The worst misfortune of all was the malice and treachery of the Franciscans, who had already prejudiced against him the people of the caravan with whom he was to go, the governors of the provinces through which his road lay, and the brutal and barbarous inhabitants of Sennaar, who lie in the way betwixt Egypt and Abyssinia. The consequence of all this was, that he was murdered at the last mentioned place with all his retinue. The Franciscan friars, who had preceded him to Sennaar, left it before his arrival, and returned immediately after. There cannot therefore be the least doubt that they were the authors of his murder; though the bigoted disposition of Louis XIV. prevented all enquiry into the matter; so that the particular

301 M. de Roule sent ambassador from France.

302 He is murdered.

Ethiopia.

cular ſteps they took to accompliſh their deſigns were never publiſhed to the world.

303
Yaſous aſſaſſinated.

The aſſaſſination of de Roule was preceded by that of Yaſous emperor of Abyſſinia, who fell by a conſpiracy of his wife and ſon, occaſioned by a fit of jealouſy in the former. He was ſucceeded by his ſon Tecla Haimanout, who had conſpired againſt him. Before his death, he had diſpatched a meſſage to the king of Sennaar, requiring him to afford M. de Roule protection at his court, and a ſafe conduct from it; but when the meſſenger was within three days journey of the capital of that kingdom, he received news of the aſſaſſination of Yaſous. On this he returned in great haſte to Gondar, in order to have the letters of protection renewed by Tecla Haimanout the reigning prince. This was readily done: but before the meſſenger could reach Sennaar, he was informed that de Roule was already

304
The new emperor intends to revenge his death.

aſſaſſinated; on which he returned with ſtill greater haſte than before. The Abyſſinian monarch, provoked at ſuch a ſcandalous violation of the law of nations, declared his intention of commencing hoſtilities againſt the king of Sennaar; and for this purpoſe aſſembled his army. But this was ſcarce done, before he was informed that a rival, named Amda Sion, had been ſet up againſt him by the friends of his father Yaſous, and had been for ſome time privately collecting troops to ſurpriſe him before he could be ready to make any oppoſition. It was therefore neceſſary to employ the army deſtined againſt Sennaar to reduce this rebel to obedience: and ſcarce was this

305
But is himſelf murdered.

done, when the emperor himſelf was aſſaſſinated; ſo that all thoughts of revenging the death of M. Roule were laid aſide.

306
Reign of Theophilus

Tecla Haimanout periſhed in 1706, and was ſucceeded by his uncle Tiffilis, or Theophilus; whoſe firſt care was to apprehend all thoſe ſuſpected to have been concerned in the death of his predeceſſor. Thus the murderers of Yaſous, whom Tecla Haimanout had inſtigated, imagined themſelves ſecure, and came to court without any fear of danger: but no ſooner did Theophilus get them into his power, than he cauſed them all to be put to death without exception; the

307
Execution of the queen and other regicides.

queen herſelf being publicly hanged on a tree. Not ſatisfied with avenging the death of Yaſous by the execution of his murderers, he did the ſame with thoſe of Tecla Haimanout; putting to death all who were immediately in his own power, and commanding the governors of the provinces to do the ſame with thoſe

308
Tigi revolts but is defeated, taken and put to death.

whom they could find within their juriſdiction. One of theſe named Tigi, who had been formerly betwudet, having eſcaped into the country of the Galla, raiſed a very conſiderable army, with which he invaded Abyſſinia, where he committed the moſt dreadful cruelties. Theophilus engaged him on the 28th of March 1709; when, with a force greatly inferior, he gained a complete victory. A number of the Galla fled to a church, hoping to be protected by the ſanctity of the place; but the emperor telling his ſoldiers that it was defiled by thoſe who were in it, commanded it to be ſet on fire, ſo that every one periſhed. Tigi, with his two ſons, were taken priſoners, and put to death. The king himſelf did not long ſurvive his victory; falling ſick of a fever, of which he died in September 1709.

302
Line of Solomon ſet aſide.

After the death of Theophilus, the line of Solomon by the queen of Sheba was ſuperſeded a ſecond time, and a ſtranger of the name of *Ouſtas* ſeated on the Abyſſinian throne. The extreme ſeverity of Theophilus in puniſhing the murderers of both Yaſous and Tecla Haimanout gave occaſion to this; for as both princes had been aſſaſſinated in conſequence of conſpiracies formed by the principal people of the nation, the number of conſpirators was ſo great, that the parties concerned had intereſt ſufficient to influence the election of the new monarch even in this moſt capital reſpect, of his not being a deſcendant of Solomon. Excepting this ſingle defect, he was in every reſpect worthy of the kingdom, and was already the higheſt ſubject in it. Scarce was he ſeated on the throne, however, when a dangerous conſpiracy was formed againſt him by the very perſons by whom he had been placed upon it. Ouſtas baffled their deſigns, by ſeizing the principal conſpirators before they had time to bring their ſchemes to a bearing; and ſeveral people of the firſt rank were condemned to loſe their noſes, or to be put to death. After this the emperor undertook an expedition againſt the Shangalla, according to the barbarous cuſtom of the Abyſſinian monarchs, who hunt theſe poor people merely for the ſake of making ſlaves; ſlaughtering the men without mercy as well as many of the women, and carrying off only the boys and girls into captivity. In this he met with perfect ſucceſs; and was about to attempt the conqueſt of the whole country, when he was called back by the news that his prime miniſter Tafa Chriſtos 310

310
The emperor falls ſick.

was dead. While the emperor remained in his capital at Gondar, he was taken ſuddenly ill; which he at firſt imputed to witchcraft, and therefore uſed ſome antidotes; among which the ſmoaking of the palace with gun-powder was one. But this was done ſo careleſsly by the ſervants, that the whole building was conſumed; an accident looked upon by the people in general as a very bad omen, eſpecially as the king's complaint increaſed every day. At laſt the principal officers came to pay him a viſit of condolence, as they pretended; but in reality to obſerve the nature of his diſtemper, and to conſult whether or not it was likely to continue till they could fall upon means to deprive him of the government. Ouſtas underſtood their intentions, and therefore ſummoned all his ſtrength to put on for a moment the appearance of health; ſo that the officers found him attending buſineſs as uſual. Being thus diſconcerted, it became neceſſary to make ſome apology for a viſit ſo extraordinary and formal; for which they were at firſt ſomewhat at a loſs: on recollection, however, they told him, that, hearing he had been ſick, which they happily found was not the caſe, they had come to make a propoſal concerning the ſucceſſion; profeſſing a deſire that he would quiet the minds of his own family, and of the people in general, by appointing his ſon Faſil ſucceſſor to the throne after his

311
Ouſtas depoſed, and David proclaimed emperor.

deceaſe. Ouſtas gave them an equivocal anſwer; but the diſcourſe concerning Faſil happened to be overheard by the ſoldiers, a violent mutiny enſued, and all the officers who had come to viſit Ouſtas were killed. Part of the town was ſet on fire in the confuſion; and at laſt a proclamation was made, that David ſon of Yaſous was king of Abyſſinia. The prince was then ſent for from the mountain, and arriving at Gondar was crowned on the 30th of January 1714. The

Ethiopia. distemper of Oustas in the mean time continuing to increase, he died on the 10th of February the same year.

312 Death of Oustas.

313 Reign of David.

The new emperor was a rigid Alexandrian in principle; but Oustas had been so far favourable to the Catholics as to entertain some of their priests, though in a private manner. As it was the custom, however, to call a convocation of the clergy on the accession of every new emperor, the monks and others insisted upon one being called on the present occasion; the more especially that a new Abuna was come from Egypt, and the lenity shown to the Catholics by Oustas had excited the jealousy of the Abyssinian clergy in the highest degree. This assembly proved fatal to three Romish priests, whom Oustas had protected and supported for some time. They were brought before the king and Abyssinian clergy; who shortly asked them, whether they believed that the council of Chalcedon was to be accepted as a rule of faith, and that Pope Leo lawfully presided in it? To both these questions they answered in the affirmative: on which, without more trial they were condemned to be stoned; and the sentence was instantly put in execution by the furious and ignorant multitude, only one person in the whole assembly exclaiming against it as unjust. The priests being thus gratified in one instance, insisted that Abba Gregorius, who had acted as an interpreter to the three just mentioned, should also be put to death; but this was prevented by David, who found, upon enquiry, that he had only done so in obedience to the express command of Oustas his sovereign.

314 Three Roman priests executed.

Here we must take notice, that though the faith of Abyssinia is always said to be the same with that of Alexandria, it is not for that reason to be imagined that the clergy are all of the same mind. On the contrary, many different parties exist among them, who hate one another no less than all of them do the church of Rome. The principal of these in the time we speak of were the monks of Debra Libanos and those of St Eustathius, to which last the emperor himself belonged. On the arrival of a new abuna, it is customary to interrogate him before the emperor and assembly of the clergy, which of the two opinions he adheres to. The emperor at present, not thinking his presence necessary, sent the betwudet with the principal persons of both parties to hear the profession of the new abuna, which was afterwards to be proclaimed to the people. The latter, probably not willing to contend with either party, gave an equivocal answer. But with this the king himself was dissatisfied; and therefore, without consulting the abuna farther, he caused it to be proclaimed, that the new abuna's profession was the same with that of the monks of St Eustathius. This was highly resented by the monks of Debra Libanos, who instantly ran to the abuna, and from him received a profession directly contrary to what had been proclaimed by the king's order. Not satisfied with this, they continued their tumult, disregarding the imminent danger they were in of falling under the king's displeasure. One of their number was so infatuated as to cry out, that he saw a cherub with a flaming sword guarding the door of the house where they were. Unluckily, however, they continued their assembly so long, and behaved in such a seditious manner, that the emperor sent against them a body of pagan Galla; who falling upon them sword in hand, killed upwards of 100 of the ringleaders, and then sallying out into the street destroyed indiscriminately every one they met.

315 Dissensions among the Abyssinian clergy.

316 Great massacre of the clergy and others.

The massacre continued till the next day at noon, when a stop was put to it by the king's proclamation. The vast quantity of blood so wantonly shed, however, could not but occasion great discontent throughout the capital, and the bad effects of it soon appeared. The king was universally hated, and numberless conspiracies were talked of; but before any pretender to the crown appeared, David himself fell sick, the cause of which was found to be poison. The perpetrators of this crime being known, were instantly put to death; but nothing could save the life of the emperor, who died the 9th of March 1719 in great agony.

317 The king poisoned.

David was succeeded by his brother Bacuffa; who in the beginning of his reign proved very severe and cruel, cutting off almost all the nobility who could be supposed to have had any share in the conspiracies and seditions of former reigns. In the latter part of it he became much more mild, and was beloved by his subjects. He was succeeded in 1729 by his son Yasous II. who continued long under the regency of his mother; and as soon as he took the management of affairs upon himself, was disturbed with continual seditions and rebellions. In one of these the city of Gondar was made a field of battle, and was so frequently set on fire, as to be almost entirely reduced to ruins. Having at last succeeded in reducing all his enemies to obedience, he applied himself to the arts of peace, repairing and ornamenting his palaces, in which he employed some Greek artists. For this he renounced the diversion of hunting, and the barbarous expeditions against the Shangalla; but this way of life proved so disagreeable to his turbulent subjects, that a severe satire was published against him under the title of "The expeditions of Yasous the Little." Nettled at this reproach, he determined on an expedition against the kingdom of Sennaar; and having made the necessary preparations, invaded it with a formidable army, without the least pretence of provocation or making any declaration of war. As he proceeded into the country of the enemy, he allowed his soldiers every where to exercise the greatest cruelties, to destroy every living creature with the sword, and every thing combustible with fire. Some of the Arabs joined him as he went along; many more fled from his presence; and a body of them tried to oppose him. These last were utterly defeated; and Yasous without delay prepared to march to Sennaar the capital of the kingdom. As he still went on, the king Baady being assisted by Hamis prince of a territory named *Dar Fowr*, surprised one division of his army so effectually, that they were all cut off to the number of 18,000. Yasous, however, still continued his destructive progress; though he gave over all thoughts of reducing the capital, or subduing the kingdom. He returned triumphant to Gondar, making a great show of the plunder he had acquired; though the dejected countenances of many of his army showed that they were by no means pleased with expeditions of this kind. The king himself was supposed to behold the distress of his subjects on this occasion with a malicious pleasure, on account of their impatience and turbulence in times of

318 Reign of Bacuffa.

319 Of Yasous II.

320 Applies himself to the arts of peace.

321 Is ridiculed by his subjects, and undertakes an expedition against Sennaar.

322 A division of his army cut off.

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of peace, and their forcing him into a war when he had no inclination for it. In a short time, however, the people were perfectly comforted for the loss of their brethren.

323
Religious utensils redeemed at an extravagant rate.

In the late unfortunate action they had lost all those holy utensils, which it is usual in Abyssinia to carry into the field of battle in order to ensure victory. Among these was a true picture of the crown of thorns which was put upon our Saviour's head; some pieces of the cross upon which he suffered; a crucifix which had spoken on many occasions; with many other sacred relicts of equal value. Soon after the battle all these were redeemed by the priests at an extravagant rate; no less than 8000 ounces of gold having been given for the speaking crucifix; and for the rest, we are to suppose a proportional price had been paid. On the arrival of this trumpery at Gondar, the greatest rejoicings were made, and Yasous was astonished at the people having so soon forgot the loss of their countrymen and relations.

Soon after these transactions the abuna died; but though it was customary for the Abyssinian monarchs to advance the money necessary to bring a new one from Alexandria, Yasous found himself obliged to lay a tax upon the churches for defraying it at this time, having spent all his ready money in repairing and ornamenting his palaces.

324
The messengers sent for the new Abuna insulted and robbed.

Three priests, consigned to the care of as many Mahometan factors, were sent to Egypt for the new patriarch; but they were detained for some time by the naybe or prince of Masuah, who extorted from them one half of the money given by the emperor for bringing the abuna from Cairo. Yasous no sooner heard that they were detained at Masuah, than he sent orders to Suhul Michael governor of Tigré to refuse provisions to the inhabitants of Masuah, which would soon reduce the naybe to obedience: but as Michael intended soon to quarrel with the king himself, he was not in any haste to obey the orders he received. The travellers were therefore detained so long, that on their arrival at Jidda, they found they had lost the monsoon; and, what was worse, the scherif of Mecca would not allow them to pass without a fresh extortion. Their money was now exhausted; but the rapacious scherif put one of their number in prison, where he continued for a twelvemonth till the money arrived;

325
A stated tribute for the passage of the Abuna.

and from this time these extortions were changed into a stated tribute; 75 ounces of gold (about L. 186 sterling) being granted for leave of passage to Cairo for the abuna; 90 ounces to the scherif, and as many to the naybe, for allowing the abuna to pass from Cairo; an agreement which subsists to this day. Several other insults of this kind being received from the naybe, Yasous at last discovered that there was a strict alliance betwixt him, the governor of Tigré, and the Baharnagash; any one of whom, had he thought proper, could have crushed this pitiful prince with the smallest effort.

326
The emperor determines to punish the Naybe of Masuah; but is prevented.

On this the emperor determined to march against him in person; but was prevented by a rebellion which had been purposely excited in the country of Azab and that of the Dobas. The rebels were easily overthrown: but thus the expedition against the naybe was delayed for a year; during which interval the emperor sent for Michael to Gondar.

327
War with Michael governor of Tigre.

This order was positively refused, and a war ensued. Michael, unable to contend with the emperor in the open field, took to a high mountain, the usual refuge of Abyssinian rebels. Here also his bad fortune pursued him; all his posts were taken by storm excepting one, which, it was evident, would likewise have been carried, though not without a very great expence of men.

328
Michael obliged to capitulate.

Here Michael requested a capitulation; and to ensure favourable terms, he desired to put into the hands of Yasous a great quantity of treasure, which would otherwise be dissipated among the common soldiers. This being done, Michael descended with a stone upon his head, as confessing himself guilty of a capital crime, with a design to make submission to the emperor. This was prevented for one day by a violent storm of wind and rain; from which moment the Abyssinians believe he began to converse with the devil; but Mr Bruce informs us, that he has often heard him say it was Michael the archangel who was his correspondent.

329
Yasous is obliged to pardon him contrary to his own inclination.

Yasous was firmly determined to put this rebel to death, notwithstanding the quantity of gold he had received; nevertheless a promise was extorted from him that he would grant him his life. As soon as Michael came into his presence, the emperor was filled with indignation, retracted his promise, and ordered him to be carried out and put to death before his tent-door. The execution of the sentence, however, was prevented by the intercession of all the officers of any consideration in the court or army. Such universal solicitation could not be withstood; Michael was pardoned; but with these remarkable words, that the emperor washed his hands of all the innocent blood which Michael should shed before he brought about the destruction of his country, which he knew he had been long meditating.

330
He is set at liberty and raised to the highest honours.

Michael continued for some time in prison; but was afterwards set at liberty, and even restored to his government of Tigré. No sooner was he reinstated in this dignity, than collecting an army, he attacked Kasmati Woldo governor of Amhara, defeated him in two battles, and forced him to take refuge among the Galla, whom he soon after bribed to murder him. In other respects he behaved as a most dutiful subject, gave the king the best intelligence, and supplied him with soldiers better accoutred than he had ever before beheld. He was also more humble than before his misfortune; nor did an increase of his favour and influence make him deviate from the line he had prescribed. Having begun to gain friends by bribery, he continued to add one bribe to another to secure the old, and to gain new ones by the same means, pretending all the while to no kind of dignity or honour, not even to such as was justly due to his own rank. Thus he became such a favourite with the emperor, that he bestowed on him the government of Enderta and Sire, in addition to that of Tigre; so that he was now master of almost one half of Abyssinia. During the reign of Yasous, however, he attempted nothing.

331
Cause of the great civil war in Abyssinia.

The foundations of the disturbances which succeeded were laid by the queen-mother, towards the end of the reign of Yasous. This emperor had been married when very young to a lady of Amhara, by whom he had two sons named Adigo and Aylo; but as his wife pretended to interfere in matters of state, he was persuaded by his mother to banish both her and her children to Wechne. After this his mother chose a wife for him from among the Galla; a people of all others the most obnoxious to the Abyssinians, both

both on account of the horrid barbarity of their manners, and the continual wars which from time immemorial had taken place between the two nations. The new queen was the daughter of one Amitzo, a prince who had once hospitably entertained Bacuffa before he became emperor; and his people were esteemed the least barbarous of the whole. A prejudice against her, however, against her offspring, and the emperor himself, never to be effaced, now took place among the Abyssinians; but this did not show itself during the reign of Yasous.

332 Death of Yasous.

The emperor died on the 21st of June 1753, being the 24th year of his reign, not without suspicion of being poisoned by his mother's relations, who were now attempting to engross the whole power of the empire into their hands.

333 Reign of Ioa.

On the death of Yasous, his son Ioas by the Galla princess just mentioned succeeded to the throne without any opposition. The discontent which had taken place in the former reign about the power assumed by the relations of the old queen, now began to show itself more openly; and it was complained that a relationship to her was the only way to preferment, by which means the only families, whose merit had often saved the state, were totally excluded from every share of favour.

334 The Galla introduced into Abyssinia.

On the accession of the young king, a party of Galla horse, said to be about 1200 in number, were sent as the portion of his mother; and these were quickly followed by a number of private persons from motives of curiosity, or hopes of preferment, who were embodied to the number of 600 into a troop of infantry, the command of which was given to Woosheka. The great favour in which these people were at court soon induced many others to make their appearance.

335 Two of the king's uncles arrive, and engross all the power.

Two of the king's uncles were sent for by his express desire; they brought along with them a troop of 1000 horse. By the time they arived the queen was dead; but her two brothers, named *Brulho* and *Lubo*, finding that the king put an entire confidence in them, determined to make a party at court. This was easily effected; every thing was governed by Gallas; even the king himself affected to speak their language; while the Abyssinians were to the last degree mortified at seeing their inveterate enemies thus establishing a dominion over them in the heart of their own country. At last the king thought proper to appoint his uncle Lubo to the government of Amhara; but this produced such extensive discontent, that he was fain to retract his nomination, lest a civil war should have ensued. While the empire was thus divided into two parties,

336 Suhul Michael arrives at court.

Suhul Michael came to Gondar in a very splendid manner, on an application from the exiled prince of Sennaar to be restored to his kingdom. When conducted into the presence of the emperor, he prostrated himself before him, owned himself his vassal and was put in possession of the government of Ras-el Feel upon the frontiers, with a large revenue, where he was advised to stay till the disputes which subsisted at that time should subside. This salutary advice, however, he had not prudence to comply with;

337 King of Sennaar murdered.

but suffering himself to be decoyed from his asylum into Atbara, was taken prisoner and murdered.

In the mean time, the Abyssinian prime minister, Welled de l'Oul, died. He had hitherto moderated the fury of the opposite parties by his wise and prudent conduct: but no sooner was he taken out of the way than a most dreadful scene of confusion and civil war took place, which raged with the utmost violence while Mr Bruce was in Abyssinia, and seemed not likely to come to any determination when he left it.

338 State of the different parties.

The whole empire was divided into two great factions; at the head of one was the old queen-mother of Yasous; and at the head of the other, Ioas himself the emperor, with his Galla relations. Matters were first brought to a crisis by the imprudence of the emperor himself in bestowing the government of Begemder upon Brulhe one of his Galla uncles. The government of this province had been lately resigned into the hands of the queen by an old officer named *Ayo*; and it was supposed that his son named *Mariam Barea*, universally allowed to be one of the most accomplished noblemen of the kingdom, was to succeed him in this government. This opinion was farther confirmed by the marriage of Mariam himself with Ozoro Esther, a daughter of the old queen by her second husband. Unfortunately a quarrel had happened between Kasmati Ayo, the old govenor of Begemder, and Suhul Michael; a little before the resignation of the former, and continued undecided till Mariam took the office upon him. The occasion was quite trifling; nevertheless, as Mariam had refused to submit on the decision of the judges, whom he stigmatized as partial and unjust, insisting that the king should either decide the affair in person, or that it should be referred on the decision of the sword, he thus fell under the imputation of being a disobedient and rebellious subject. In consequence of this, Ioas looked upon him ever afterwards with an evil eye;

339 Brulhe made governor of Begemder.

and now deprived him by proclamation, of the government of Begemder, giving it to his own Galla uncle Brulhe, of whom we have already made so much mention.

340 An universal ferment ensues.

This unexpected promotion threw the whole empire into a ferment. As Begemder was a frontier province bordering on the country of the Galla, there was not the least doubt, that, immediately on the accession of Brulhe to his new office, it would be over-run by that race of barbarians, remarkable for their savage manners almost beyond all the other nations in Africa. This was the more dangerous as there was not above a day's journey betwixt the frontiers of Begemder and Gondar, the capital of the whole empire. Mariam Barea himself, who had a high sense of honour, was particularly hurt at the manner in which he was deprived of his dignity, and condemned with his family to be subject to a race of Pagans, whom he had often defeated in battle, and obliged to acknowledge him as their superior All remonstrance, however, was vain. Brulhe, under the sanction of the imperial command, advanced with an army to take possession of his new dignity: but so exceedingly averse were the Abyssinians to follow him in this expedition, that the army disbanded itself several times after it had been collected; and it took up almost a year before he could proceed from the place where his camp was, at the lake Tzana or Dembea, to the frontiers of Begemder, though scarce half a day's journey distant.

341 Is opposed by Mariam Barea:

Mariam Barea beheld his operations with great contempt, employing his time in the dispatch of ordinary business, and endeavouring to reconcile himself to the king, but without success. As his last effort, he sent a remonstrance to the

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the emperor; in which after many protestations of duty and obedience, he reminded him, that, at his investiture into the office of governor of Begemder, he had sworn not to allow any of the Galla to enter his province; that, should he deviate from the observance of this oath, the safety of the princes in Wechne would be endangered; they would constantly be liable to the invasions of the Pagans, and probably be extirpated, as had already happened at two different times: and he begged of the emperor, if he was determined to deprive him of his government, to bestow it rather upon some Abyssinian nobleman; in which case he promised to retire, and live in private with his old father. He had, however, formed a resolution, which he thought it his duty to submit to the emperor, that if his majesty should think proper to come, at the head of a Galla army, to invade his province, he would retire to the farthest extremity of it, till he was stopped by the country of the Galla themselves; and, so far from molesting the royal army, he might be assured, that though his own men might be straightened, every kind of provision should be left for his majesty. But if an army of Galla, commanded by one of that nation, should enter the province, he would fight them at the well of Fernay, on the frontiers, before one of them should drink there, or advance the length of a pike into the province.

This remonstrance had no effect upon the emperor. He returned a scoffing answer, announcing the speedy arrival of Brulhe, whom he thought sure of victory: but, at the same time, to show that he did not put confidence entirely in his prowess, he created Suhul Michael governor of Samen, which lay next to Tigre in the way to Samen, so that no obstruction might lie in the way of that officer's march to Gondar, in case there should be any occasion for him. Mariam, provoked at the manner in which he was undervalued in the king's message, gave an ironical reply, in which he alluded to the name of *Brulhe*, in the Abyssinian language signifying a kind of *bottle*; this he told him would be broken on the rocks of Begemder, if sent into that country.

342 Farther promotion of Michael.

343 Brulhe defeated and killed.

On receiving this last message from Mariam, the king instantly ordered the army to be put in motion; but the Abyssinians had unanimously determined not to act offensively against their countrymen. Brulhe therefore was left to decide the affair with his Galla. Mariam kept exactly to his word in the declaration he had made to the king, not stirring out of his province, nor allowing the least attempt to be made to harass his enemy, till they were drawn up at the well abovementioned, where he met them with his army. The Galla, unsupported by the Abyssinian troops, were utterly unable to bear the shock of Mariam's army, and therefore soon betook themselves to flight; but a part of them, who were surrounded by the cavalry, fought valiantly till they were all cut to pieces. Mariam had given the most express orders to take Brulhe alive; or, if that could not be done, to allow him to make his escape. One of his servants, however, observing him in the field, pushed up through the enemy to the place where he was, and running him twice through with a lance, left him dead on the spot.

Mariam Barea was no sooner informed of the death of his rival, than he cried out in great emotion, that Suhul Michael, with the whole army from Tigre, would attack him before autumn. In this he was not deceived. Ioas instantly dispatched an express for Michael, ordering his attendance, and investing him with the dignity of Ras, by which he became possessed of unlimited power both civil and military. Michael himself had for a long time seen that matters would come to this crisis at last, and had provided for it accordingly. He now set out with an army of 26,000 men, all of them the best soldiers in the empire, and 10,000 of them armed with muskets. As he passed along, his troops desolated the country wherever they came, but he encumbered his army by nothing useless; allowing his men to carry along with them neither women, tents, beasts of burden, nor even provisions. The subsistence of his troops was abundantly provided for by the miserable inhabitants of the provinces thro' which he passed; and, not satisfied with this, he insisted on a contribution in money from all the districts within a day's march of those places where he was; the least delay was followed by the slaughter of the inhabitants and destruction of their houses. Towns, villages, and buildings of every kind, were set on fire as he passed along; the people fled from all quarters to the capital for refuge, as from the face of the most inveterate enemy; and Ioas himself was now sensible of his having been in the wrong to invest him with such unlimited power. On his arrival at the capital, Michael took possession of all the avenues, as if he meant to besiege it; so that an universal consternation ensued. Instead of offering any hostility, however, he waited with the utmost respect on the emperor, proceeding immediately from the royal presence to his own house, where he sat in judgment, as the nature of his office required him to do. No sooner had he taken upon him this new office, however, than he executed justice in such a rigorous and impartial manner as made the boldest offenders tremble. Some parties of his own soldiers, presuming upon the licence that had hitherto been granted them, entered Gondar and began to plunder as they had done in other places; but, on the very first complaint, their commander caused 12 of them to be apprehended and hanged. Their execution was followed by 50 others in different quarters of the city; after which he gave the charge of the capital to three officers who were to preside over three quarters, himself taking care of the fourth. Two civil judges were appointed to assist each officer in a district, two were left in the king's house, and four of them held a court of judicature in his own. Thus the inhabitants, finding, that instead of bloodshed and massacre, they were to expect nothing but strict equity, and moderation, became reconciled to Michael the day after his arrival, and lamented only that he had not come sooner to relieve them from the anarchy and confusion in which they had been held so long. To so great a degree of perfection indeed did he bring his legislation, that a very short time after he entered the city, a loaf of bread, a bottle of water, and an ounce of gold, were, exposed in the market place on the head of a drum night and day for some time, without any one offering to take them away. This was the more remarkable as there was then a scarcity of provisions, and Michael himself would allow but a very scanty supply of water to be carried into the city, thereby

344 Michael created Ras.

345 Commits great devastations.

346 Arrives at Gondar.

347 Executes justice impartially.

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thereby giving the inhabitants to understand, that if he should set fire to it as he had done to other places, it would not be in their power to quench the flames.

348 Marches against Mariam Barea.

The capital being thus secured in perfect obedience, Michael next prepared to set out on his expedition against Mariam Barea. Sensible, however, that the destruction of this worthy nobleman would be attended with a great degree of odium, he was resolved that none of it, or at least as little as possible, should fall upon himself. For this purpose, he insisted that the emperor should march in person fm Gondar, and carry all his soldiers along with him. Thus he had an opportunity of throwing the whole blame upon Ioas, and representing himself as no more than a passive instrument in the affair. He also took every occasion of praising his antagonist for his virtues, and censuring the emperor for attempting to cut off such an excellent officer.

In the mean time Mariam Barea keeping exactly to the terms of the last remonstrance he had sent to Ioas, retired before him to the extremity of the province. Ioas and Michael advanced furiously, burning and destroying every thing as they went along. An engagement at last took place at a place called *Nefas Musa*, on the extreme borders of Begemder, when Mariam could not retreat without going out of the province.

349 Mariam defeated.

As the royal army was more than twice the number of the other, and commanded by an officer of superior skill, victory was not long of being decided in its favour. Mariam, with 12 of his officers, took refuge in the country of the Galla; but were immediately delivered up by that faithless people.

350 Betrayed by the Galla, and cruelly murdered.

He was put to death by Lubo the brother of Brulhe, who is said with his own hands to have cut his throat as a sheep is commonly killed in this country, and afterwards to have disfigured the body in a shocking manner. The head was cut off, and carried to Michael's tent, who would not allow it to be uncovered in his presence. It was afterwards sent to the family of Brulhe in the country of the Galla, to show them what attention had been given to revenge his death; and this displeased the Abyssinians even more than any thing that had yet happened since the beginning of the contest.

351 Some of his officers protected by Michael.

The 12 officers, who were taken along with him sought protection in the tent of Ras Michael, to which they were suffered to escape by Woosheka their keeper. Lubo, however, intended likewise to have sacrificed them as he had done Mariam, and therefore sent Woosheka to demand them: but no sooner had he unfolded his errand, than Michael in a rage, called to his attendants to cut him in pieces before the tent-door; which would certainly have been done, had he not fled with the utmost precipitation.

352 Disagreement between the king and Michael.

The scandalous ascendency which the Galla always manifested over the king, had greatly displeased Michael; who expressed himself so freely on the subject, that a coolness took place between them. Another officer named *Waragna Fasil*, a Galla by birth, had insinuated himself into the king's favour, and greatly distinguished himself at the battle of Nefas Musa. It was no wonder, therefore, that he soon became a rival to Michael; and this rivalship was greatly augmented by the following circumstance. Near the field of battle at Nefas Musa was a house of Mariam Barea, where Ozoro Esther his widow now was. Being surrounded by pleasant and verdant meadows, Fasil encamped there for the sake of his cavalry. No other design was at that time apparent; however, his presence greatly alarmed the princess. She had along with her at that time a nobleman named *Ayto Aylo*, who had been at the battle of Sennaar; but had there been terrified to such a degree, that he resolved to renounce the world ever after and turn monk. In this character he was now with Ozoro Esther; and though he refused to be concerned in any military affairs, he was still consulted by both parties as a kind of oracle. In the present emergency, therefore, he told the princess that there was only one why by which she could secure herself from the cruelty of the Galla, and becoming a prey to one or other of the murderers of her husband; and that was by immediately espousing Ras Michael. Ozoro was perfectly sensible of the propriety of the advice, and therefore set out next morning in company with Aylo to Michael's tent. Here she threw herself at his feet on the ground; and refusing to rise, Aylo explained her errand, informing the Ras that she intended to bestow herself upon him in marriage, as being the only person not guilty of her former husband's death capable of affording her protection in her present situation.

353 Michael marries the princess Ozoro Esther.

Michael saw clearly the advantages attending such a match; and therefore having caused the army to be drawn up in order of battle, as if for a review, he sent for a priest, and was married to the princess in the sight of all his men. The ceremony was followed by the loud acclamations of the whole army; and Ioas was soon informed of the reason. He expressed his displeasure at the match, however, in such unequivocal terms, that a mutual hatred commenced from that moment. This was soon made public by a very trifling accident. One day while the army was marching, Michael being much incommoded by the sun which affected his eyes, threw a white handkerchief over his head to keep off the heat. This was instantly told the king, who took it as an affront offered to himself; for in Abyssinia it is unlawful to cover the head on any occasion whatever in presence of the emperor, or even within sight of the palace where he lodges. Ioas was no sooner informed of the supposed affront, than he sent to the Ras to know upon what account he presumed to cover his head in his presence; but though the covering was instantly taken off, it was thought that no atonement could ever be made for such a grievous offence. Soon after this a quarrel happening between Fasil and a person named *Gusho*, likewise a man of great consequence, complaint was made to the Ras, who, as civil judge, summoned both parties before him. Fasil absolutely refused to obey any such jurisdiction; and the affair being laid before the other judges, it was given in favour of Michael, and Fasil declared to be in rebellion.

354 Final quarrel betwixt Michael and Fasil.

This was followed by a proclamation depriving him of his government of Damot, and every other public office he held. Fasil, however, had no mind to submit to this disgrace; and therefore, after holding a long conference with the king, departed with his army, encamping on the high road betwixt Damot and Gondar, where he intercepted the provisions coming from the southward to the capital.

355 A shot fired at Michael from the palace window.

This was followed by an attempt to assassinate the Ras. A shot was fired from one of the windows of the palace into the

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356 Fasil defeated by Michael. days. An engagement took place a short time after, in which Fasil was totally defeated, and obliged to retire into Damot. In this engagement some of the king's black horse were taken. These are all slaves, and subject to no other command but those of his majesty himself. The appearance of them therefore showed that they must have been sent by the king to fight against the Ras. All of them were therefore brought before the latter, and interrogated by whose orders they had come to the battle. Two refused to give any answer, and had their throats cut in presence of their companions. A third plainly told him that they had been sent by the king; who had likewise ordered an Armenian to fire out of the palace window at Ras Mi-

857 Ioas assassinated. chael. On this the prisoners were dismissed; but assassins instantly dispatched to put an end to the king's life; which they accomplished, and buried him in a church dedicated to St Raphael.

358 Hannes set up by Michael, and soon after poisoned.

On the death of Ioas, Michael, now absolute master of Abyssinia, set up for emperor Hannes, brother to the late king Bacuffa, an old man who had resided almost all his lifetime in the mountain of Wechne, and being entirely unacquainted with the affairs of the world was on this account probably supposed by Michael to be the more proper for his purposes. Hannes had been maimed by the loss of his hand, on purpose to incapacitate him for the throne; but this objection was laughed at by the Ras. He found him, however, possessed of a quality much more inimical to his own purposes; and that was, an absolute aversion at meddling with the affairs of government: so that he could not by any means be induced to take the field against Fasil. Michael therefore was obliged to set out by himself; but thinking it improper to leave a king of any kind behind him in the capital, he had the old man poisoned before his departure; putting his son Tecla Haimanout in his place.

359 Reign of Tecla Haimanout.

The young emperor, according to Mr Bruce's account, was of a fair complexion, less tawny than a Neapolitan or Portuguese, owing to his having been born in the mountain. He was endowed with many princely accomplishments; and so much attached to Michael Ras, that he called him *Father* from the time of his accession, waiting upon him when indisposed

360 Fasil defeated.

with the affection of a son. There being now no objection therefore, Michael marched against Fasil without delay, and entirely defeated him on the 3d of December 1769. On this occasion Woosheka was taken prisoner, and afterwards flead alive, notwithstanding the intercession of some of Michael's officers for him; his skin being afterwards formed into a bottle. This piece of cruelty was attributed to Ozoro Esther; whom Mr Bruce represents as the most humane and merciful of women; though he is obliged to allow, that on the present occasion, as well as on every other which regarded her former husband, she entirely forgot her character. The night on which this miserable victim was destroyed, she appeared in the king's tent dressed like a bride; and in a little time returned in triumph to Gondar.

361 Mr Bruce's arrival and adventures in Abyssinia.

Soon after these transactions, Mr Bruce entered Abyssinia. He arrived at Masuah when there was only a report of Hannes's being ill, and Mr Bruce was supposed to be his physician, though in truth that emperor was already dead. Here he was ill-treated by the naybe, with a design to extort money, and afterwards probably to put him to death, as was his custom with other strangers. He escaped the danger, however, by the protection of Achmet, nephew and heir apparent to the naybe; and by his own prudent and resolute behaviour, threatening his adversaries with the arrival of a British man of war in case of any injury; showing the Grand Signior's protection; making use of the name of Ras Michael, now so formidable, and to whom he had obtained a recommendation, &c. After many vexations and delays, he was at last allowed to depart; and a guide, by name *Saloome*, was sent along with him. This man was brother-in-law to the naybe, and a professed Christian; but a traitor in his heart, and who wished to do every thing in his power to hurt our traveller. He was furnished with another guide, however, by his friend Achmet, to inform him where to pitch his tent and other necessary particulars.

362 Sets out from Arkeeko.

On the 15th of November 1769 Mr Bruce left Arkeeko on the eastern coast of Africa, and proceeded southward for Gondar the capital of Abyssinia. After an hour's journey, he pitched his tent near a pit full of rain-water, where he remained all day; and in the evening a messenger arrived from the naybe, who took away the guide *Saloome*. Next day the latter returned in company with Achmet the naybe's nephew, already mentioned. The latter caused him to deposit in his hands Saloome's full hire, as though he had gone the whole length he had promised. Four of the men were commanded to go back to Arkeeko, and others put in their place: after which Achmet told Mr Bruce, that he was not to take the road through Dobarwa, though near, because it belonged to the naybe; but that Saloome knew another by a place called *Dixan*, which belonged to himself, and where he could ensure him of a good reception. In this journey he told him, that he would be obliged to cross the mountain Taranta, the highest in Abyssinia;

ſinia; but the fatigue of this would be more than recompenſed by the aſſurance of ſafety and the curioſity of the place. Taking leave of Achmet in a very friendly manner, therefore, Mr Bruce with his company finally ſet out on their journey the evening of the

363 Account of the country through which he paſſed.

16th. For the ſhort ſpace they had travelled, the ground was covered with graſs broader in the leaf than ours; but in a little time the ſoil became hard, dry, gravelly, and full of acacia or Egyptian thorn. Next day (17th) they changed their courſe from ſouth to weſt; and ſoon arrived at a range of mountains ſtanding ſo cloſe to one another, that there was no paſſage between them excepting what was worn by torrents of water; the bed of one of which conſequently now became their road. In the evening they pitched their tent at ſome diſtance from this torrent, which had ſcarcely any water in it when they left it; but all the afternoon there had been an appearance of rain, with much thunder and lightning, at a diſtance. On a

364 Sudden ſwell of a torrent.

ſudden they heard a noiſe among the mountains louder than thunder; and inſtantly ſaw the torrent, ſwelled immenſely by the diſtant rains, now running like a rapid river, and the foremoſt part of it advancing in its bed in a body of water about the height of a man. Having run for ſome time in this violent manner, the current, no longer ſupplied by the rains, began to diminiſh and by the next morning was quite gone. Among theſe mountains the nights are cold even in ſummer.

On the 18th the journey was reſumed in the bed of the torrent, which now ſcarcely had any water; though the ſtones were rendered very ſlippery by the quantity of rain which had fallen. Leaving this diſagreeable road, they came to a fine rivulet; which being the firſt clear water they had ſeen from the time Mr Bruce left Syria, was exceedingly agreeable. They proceeded along the banks of this river for ſome time; and ſoon after leaving it, they came to another of the ſame kind: but next day were obliged to reſume their courſe in the bed of a torrent. The mountains in this part of the world are exceſſively rugged and full of precipices, entirely deſtitute of ſoil, and covered with looſe ſtones of a black colour. On the ſide of the torrent in which they marched, however, there grew very large ſycamore trees, ſome of them little leſs than

365 Notes of the African birds different from thoſe of Europe.

7½ feet in diameter. Their branches afforded ſhelter to an infinite number of birds; many of them without ſong; but others having notes very different from the European kinds, and peculiar to the continent of Africa. Moſt of thoſe which had very beautiful colours were of the jay or magpie kind. The trees were loaded with figs; but they come to nothing, by reaſon of the ignorance of the ſavages, who know not the proceſs of caprification. The ſtreams of water themſelves, which at this ſeaſon were found ſo delightful, run only after October: they appear on the eaſt ſide of the mountains when the ſummer rains in Abyſſinia are ceaſing; at other times, no water is to be met with, except what is contained in ſtagnant pools.

366 Account of the mountain Taranta.

On the 20th of November they began to aſcend the high mountain of Taranta. Their road was now exceſſively rugged and uneven, interſected with monſtrous gullies and holes made by the torrents, as well as by huge fragments of rocks tumbled down by the torrents. It was with the utmoſt difficulty that they could carry the aſtronomical inſtruments up this hill; in which work Mr Bruce himſelf, and one of his attendants named *Yaſine*, a Moor, bore a principal ſhare. The only misfortune they met with was, that their aſſes being unloaded, and committed to the care of a ſingle perſon refuſed to aſcend this barren mountain; and in ſpite of all that their driver could do, ſet off at a briſk trot for the fertile plains below. Luckily, however, they were afterwards recovered by four Moors ſent after them, and the journey reſumed without any material interruption. The beaſts were now become much more tractable, having been ſeen and purſued by the hyænas with which that mountain abounds.

Taranta is ſo deſtitute of earth, that there was no poſſibility of pitching a tent upon it; ſo that our travellers were obliged to take up their lodging in one of the caves with which it abounds. The under part of the mountain produces in great plenty the tree called *Kolquall*, which was here obſerved in greater perfection than in any other place throughout the whole journey. The middle part produced olives which carried no fruit; and the upper part was covered with the oxycedraſs or virginia cedar called *arze* in the language of the country. On the top is a ſmall village named *Halai*, inhabited by poor ſhepherds, who keep the flocks of the rich people of the town of Dixan below. They are of a dark complexion inclining to yellow; their hair black, and curled artificially by means of a ſtick, and which our author ſuppoſes to be the ſame with the *criſping-pin* mentioned Iſa. iii. 22.

367 Of the village Halai, and inhabitants of the mountains.

The men have a girdle of coarſe cotton-cloth, ſwathed ſix times round their middle; and they carry along with them two lances, and a ſhield made of bulls hides. Beſides theſe weapons, they have in their girdles a crooked knife with a blade about 16 inches in length, and three in breadth at the lower part. There is here great plenty of cattle of all kinds; the cows generally of a milk white, with dew-laps hanging down to their knees; their horns wide like thoſe of the Lincolnſhire cattle; and their hair like ſilk. The ſheep are all black both here and throughout the province of Tigré; having hair upon them inſtead of wool, like the reſt of the ſheep within the tropics; but remarkable for its luſtre and ſoftneſs, without any briſtly quality.

368 Beautiful cattle, &c.

On the top of the mountain is a plain, which at the time our author was there, they had ſown with wheat. The air ſeemed exceſſively cold, though the barometer was not below 59° in the evening. On the weſt ſide the cedars, which on other parts are very beautiful, degenerate into ſmall ſhrubs and buſhes.

The road down this mountain was for ſome time nothing inferior in ruggedneſs to what they had met with in aſcending it; but as they approached Dixan, it became conſiderably better. This is the firſt town on the Abyſſinian ſide of Taranta. It is ſeated on the top of an hill of a form exactly conical ſurrounded by a deep valley like a ditch; and no acceſs to it but by a path which winds round the hill. The inhabitants were formerly exterminated by Michael Ras; and the ſucceeding race, in Mr Bruce's time were of a very indifferent character, being, as he ſays, compoſed of the worſt people from the territories of the Baharnagaſh and the province of Tigré, on both of which

369 Town of Dixan deſcribed.

Ethiopia.

which it borders. Here he was in danger from the treachery of Saloome, who wished to have decoyed him into the power of some assassins. Finding that this could not be done, he surrounded Mr Bruce and his retinue with a body of armed men; but they were dispersed by the authority of Hagi Abdelcader, the friend of Achmet, who had received orders to provide for the safety of the travellers. The only trade carried on here is that of buying and selling slaves; who are stolen from Abyssinia, chiefly by the priests, and sent into Arabia and India.

370 Journey to Adowa, the capital of Tigré.

The next stage was from Dixan to Adowa, capital of the province of Tigré. Leaving Dixan on the 25th of November, they pitched their tent the first night under a large spreading tree called *Daroo*, which Mr Bruce says was one of the finest he saw in Abyssinia, being about 7¼ feet in diameter. They had been joined by some Moors driving 20 loaded asses and two bulls, which in that country are likewise used as beasts of burden. Here, our author says, he recovered a tranquillity of mind which he had not enjoyed since his arrival at Masuah; but they were now entirely without the dominions of the naybe, and entered into those of the emperor. Saloome attended them for some way, and seemed disposed to proceed; but one of the company, who belonged to the Abyssinian monarch, having made a mark in the ground with his knife, told him, that if he proceeded one step beyond that, he would bind him hand and foot, and leave him to be devoured by wild beasts.

371 His treacherous guide obliged to return.

Being now in a great measure delivered from their fears and embarrassments, the company proceeded on their journey with pleasure, through a much better country than they had hitherto passed. In some places it was covered with wild oats, wood, high bent-grass, &c. but, in not a few places, rocky and uneven. Great flocks of a bird as large a turkey, called, in the Amharic language, *Erkoom*, were seen in some places. A large animal of the goat kind, called *Agazan*, was found dead and newly killed by a lion. It was about the size of a large ass, and afforded a plentiful repast. Numbers of kolquall trees were also seen; and the sides of the river Habesh were adorned with a beautiful tree of the same name with the stream. There were in this place also many flowers of various kinds, particularly jessamine. The mountains of Adowa, which they came in sight of on the 5th of December, are totally unlike any thing to be met with in Europe; their sides being all perpendicular rocks like steeples or obelisks of many different forms.

372 The country becomes more fertile as he passes along.

363 Adowa described.

Adowa, though the capital of an extensive province or kingdom, does not contain above 300 houses; but occupies nevertheless a large space by reason of the inclosures of a tree called *Wanzey*, which surrounds each of the houses. It stands on the declivity of a hill, situated on the west side of a small plain surrounded by mountains. It is watered by three rivulets which never become dry even in the greatest heats. A manufacture is carried on here of a kind of coarse cotton cloth, which passes for money throughout all Abyssinia. The houses are built of rough stone cemented with mud; lime being only used in the construction of those at Gondar, and even there it is very bad.

Our traveller was very hospitably entertained at Adowa by one Janni, with whom he resided during his stay there. Leaving it on the 17th of December, he visited the ruins of Axum, once the capital of the empire. Here are 40 obelisks, but without any hieroglyphics. A large one still remains, but the two largest are fallen. There is also a curious obelisk, of which he gives a figure, with other antiquities which our limits will not allow us to enlarge upon. The town has at present about 600 houses, and carries on manufactures of the coarse cotton-cloth already mentioned. It is watered by a small stream which flows all the year, and is received into a fine bason 150 feet square, where it is collected for the use of the neighbouring gardens. Its latitude was found by Mr Bruce to be 14° 6′ 36″ north.

377 Visits the ruins of Axum.

On the 20th of January 1770, our traveller set out from Axum. The road was at first smooth and pleasant, but afterwards very difficult; being composed of stones raised one above another, the remains of a magnificent causeway, as he conjectures. As they passed farther on, however, the air was every where perfumed by a vast number of flowers of different kinds, particularly jessamine. One species of this, named *Agam*, was found in such plenty, that almost all the adjacent hills were covered by it; the whole country had the most beautiful appearance; the weather was exquisitely fine, and the temperature of the air agreeable. In this fine country, however, Mr Bruce had the first opportunity of beholding the horrible barbarity of the Abyssinians in cutting off pieces of flesh from the bodies of living animals, and devouring them raw; but notwithstanding this extreme cruelty, they have the utmost horror and religious aversion at pork of every kind; insomuch that Mr Bruce durst not venture to taste the flesh of a wild boar, just after having assisted in the destruction of five or six.

375 Monstrous barbarity of the Abyssinians.

During the remaining part of the journey from Adowa to Siré, the country continued equally beautiful, and the variety of flowers and trees greatly augmented; but as a report was propagated that Ras Michael had been defeated by Fasil, they now met with some insults. These, however, were but trifling; and on the 23d in the evening they arrived safely at Siré, situated in N. Lat. 14° 4′ 35″.

376 Siré described.

This town is still larger than Axum: but the houses are built of no better materials than clay, and covered with thatch; the roofs being in the form of cones, which indeed is the shape of all those in Abyssinia. It stands on the brink of a very steep and narrow valley, through which the road is almost impassable. It is famous for a manufacture of cotton-cloth, which, as we have already observed, passes for money throughout the whole empire. At some times, however, beads, needles, antimony, and incense, will pass in the same way. The country in the neighbourhood is extremely fine; but the inhabitants subject, by reason of the low situation, to putrid fevers. On leaving it on the 24th, our travellers passed through a vast plain, where they could discern no hills as far as the eye could reach, excepting some few detached ones standing on the plain, covered with high grass, which the inhabitants were then burning. The country to the northward is flat and open. In the way to Gondar, however, lie that ridge of mountains called *Samen*; of which one named *Lamalmon* is the most remarkable, and by some supposed to be the highest in Abyssinia. Betwixt Sirè and these mountains

mountains the river Tacazze runs, which next to the Nile, is the largest in Abyssinia. Mr Bruce informs us that it carries near one third of the water which falls on the whole empire; and when passing it, he saw the marks of its stream, the preceding year, 18 feet perpendicular above the bottom; nor could it be ascertained whether this was the highest point to which it had reached. It has its source in the district of Angot, rising from three sources like the Nile, in a flat country, about 200 miles to the S. E. of Gondar. It is extremely pleasant; being shaded with fine lofty trees, the water extremely clear, and the banks adorned with the most fragrant flowers. At the ford where they crossed, this river was fully 200 yards broad, and about three feet deep; running very swiftly over a bottom of pebbles. At the very edge of the water the banks were covered with tamarisks, behind which grew tall and stately trees, that never lose their leaves. It abounds with fish, and is inhabited by crocodiles and hippopotami; the former of which frequently carry of people who attempt to cross the river upon blown up skins. The neighbouring woods are full of lions and hyænas. The Taccazze is marked by Mr Bruce in his map as a branch of the Astaboras, which falls into the Nile. The latitude of the ford was found to be 13° 42′ 45″.

377 Tacazze river described.

378 Mountainous country of Samen described.

This river was passed on the 26th of January; after which our travellers entered into the country of Samen; the governor of which, Ayto Tesfos, had never acknowledged the authority of Ras Michael; nor any of the emperors set up by him since the death of Ioas. The country therefore was hostile; but the uncertainty of the event of the war, and the well-known severity of Michael's disposition, preserved our traveller and his company from any insult, excepting a feeble and unsuccessful attempt to extort money. Here Mr Bruce observes that the people were more flat-nosed than any he had hitherto seen in Abyssinia. The path among the mountains was for the most part exceedingly dangerous, having a precipice of vast height close by it which way soever you turn. The mountains appeared of very extraordinary shapes; some being like cones; others high and pointed like columns, pyramids, or obelisks. In one place a village was observed in such a dangerous situation, that scarce the distance of a yard intervened between the houses and a dreadful precipice. Below it is a plain of about a mile square, covered with citron and lemon trees. A river named *Mai-Lumi* rises above this village, and falls into the wood, where it divides in two; one branch surrounding the north and the other the south part of the plains; then falling down a rock on each side, they unite; and having run about a quarter of a mile farther, the stream is precipitated in a cataract 150 feet high. The lions and hyænas were very numerous among these mountains, and devoured one of the best mules our travellers had. The hyænas were so bold, that they stalked about as familiarly as dogs, and were not intimidated by the discharge of fire-arms. Their voracity was such, that they eat the bodies of those of their own species which our travellers had killed in their own defence.

379 Extreme voracity of the hyænas.

380 Lamalmon mountain described.

On the 7th of February they began to ascend Lamalmon by a winding path scarcely two feet broad, on the brink of a dreadful precipice, and frequently intersected by the beds of torrents, which produced vast irregular chasms in it. After an ascent of two hours, attended with incredible toil, up this narrow path, they came to a small plain named *Kedus* or *St Michael*, from a church of that name situated there. This plain is situated at the foot of a steep cliff, terminating the western side of the mountain, which is as perpendicular as a wall, with a few trees on the top. Two streams of water fall down this cliff into a wood at the bottom; and as they continue all the year round, the plain is thus preserved in continual verdure. The air is extremely wholesome and pleasant. On ascending to the very top of the mountain, where they arrived on the 9th of February, our travellers were surprised to find, that though from below it had the appearance of being sharp-pointed, it was in reality a large plain, full of springs, which are the sources of most rivers in this part of Abyssinia. These springs boil out of the earth, sending forth such quantities of water as are sufficient to turn a mill. A perpetual verdure prevails; and it is entirely owing to indolence in the husbandman if he has not three harvests annually. The Lamalmon stands on the north west part of the mountains of Samen; but though higher than the mountains of Tigré, our author is of opinion that it is considerably inferior to those which are situated on the south-east. The plain on the top is altogether impregnable to an army, both by reason of its situation and the plenty of provisions it affords for the maintenance of its inhabitants; even the streams on the top are full of fish. Here the mercury in the barometer stood at $20\frac{7}{8}$ inches.

381 Journey to Gondar.

During the time our travellers remained at Lamalmon, a servant of Ras Michael arrived to conduct them safely to the capital, bringing a certain account of the victory over Fasil; so that now the difficulties and dangers of their journey were over. The country appeared better cultivated as they approached the capital; and they saw several plantations of sugar-canes, which there grow from the seed. In some places, however, particularly in Woggora, great damage is done by swarms of ants, rats, and mice, which destroy the fruits of the earth. Mr Bruce had already experienced the mischief arising from a small species of ants, whose bite was not only more painful than the sting of a scorpion, but issued out of the ground in such numbers as to cut in pieces the carpets and every thing made of soft materials to which they could have access.

382 Mischief done by ants.

383 Arrival at Gondar.

When Mr Bruce approached the capital, he was dressed like a Moor: and this dress he was advised to keep until he should receive some protection from government; his greatest, indeed, his only, danger arising from the priests, who were alarmed at hearing of the approach of a Frank to the capital. This was the more necessary, as the emperor and Michael Ras were both out of town. For this reason also he took up his residence in the Moorish town at Gondar; which is very large, containing not fewer than 3000 houses. The only inconvenience he underwent here was the not being allowed to eat any flesh: for we have already taken notice of a law made by one of the emperors, that none of his subjects should eat flesh but such as had been killed by Christians; and a deviation from this would have been accounted equal to a renunciation of Christianity itself. Here he remained till the 15th of February; when Ayto Aylo waited upon him, and addressed him in the character of physician, which he had assumed. By this nobleman he was carried to the palace

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palace of Koscam, and introduced to the old queen. His advice was required for one of the royal family who was ill of the small-pox; but a saint had already undertaken his cure. The event, however, proved unfortunate; the patient died, and the saint lost his reputation. Our limits will not allow us to give any particular account of the steps by which Mr Bruce arrived at the high degree of reputation which he enjoyed in Abyssinia. In general his success in the practice of medicine, his skill in horsemanship, and the use of fire-arms, which by his own account must be very extraordinary; his prudence in evading religious disputes; as well as his personal intrepidity and presence of mind, which never once failed him, even in the greatest emergencies; all conspired to render him agreeable to people of every denomination. By the king he was promoted to the government of Ras-el-Feel, was his constant attendant on all occasions, and was with him in several military expeditions; but never met with an opportunity of distinguishing his personal valour, though he had the command of a body of horse at one of the battles fought at a place named *Serbraxos*. Thus honoured and employed, he had an ample opportunity of exploring the sources and cataracts of the Nile, as well as the geography and natural products of the whole country; obtaining also leave at last to return home. We cannot, however, praise the benevolence of his spirit at his departure. It has already been observed, that he was in some danger from the priests on his first arrival, on account of their suspecting him to be a Jesuit; for that is the meaning which they affix to the word *Frank* or *European*. As he constantly attended the established worship of the country, however, and carefully avoided all disputes on the subject of religion, he became at last not only unsuspected, but very intimate with many of the principal ecclesiastics. From one of these, named *Tensa Christos*, he asked a benediction immediately before he departed; which piece of unexpected humility so affected the priest, that it brought tears in his eyes. The benediction was conveyed in the simple form, "God bless you." A troop of inferior priests who attended would needs bless him also; and probably were pleased at having it in their power to bestow a benediction publicly on a man of such consequence: but to the blessings of these poor monks Mr Bruce replied *in English*, "Lord send you all a halter, as he did Abba Salama!" This Abba Salama had been an ecclesiastic of great consequence: but of a very dissolute life, and at last hanged for his crimes. The monks imagined he had been recommending them to their patriarch Abba Salama, and with great devotion answered "Amen."

384 Mr Bruce introduced to the queen.

385 Is promoted and held in great estimation.

386 His departure from the country.

387 Event of the war before he left the country.

The history of the war after Mr Bruce's arrival is related at great length in his work. The king Tecla Haimanout still keeping his ground, and was at last acknowledged by almost the whole empire, though success did not always attend his arms. An usurper, named *Socinios*, was reduced and made a servant in the king's kitchen; but was afterwards hanged for theft. Ras Michael, notwithstanding all his skill in military affairs, was not able to get the better of Fasil; and his excessive cruelty, avarice, and ambition, disgusted every one. An attempt was even made to assassinate him; and his spiritual friend (Michael the archangel, according to his own report, or the devil, according to that of the Abyssinians) at last forsook him; so that he was carried off prisoner by a party of the rebels. After this misfortune he was much dejected, imputing it to the want of the spiritual assistance just mentioned, and which it seems had withdrawn itself some time before. His wife Ozoro Esther, whom Mr Bruce characterises as the handsomest woman he ever saw, was in great favour with the king at the time our traveller left Abyssinia. As the king himself was a handsome young man, there is no improbability in supposing with Mr Bruce, that "they were not insensible to each other's merits;" and as she was sometimes honoured with a *private audience*, where Michael himself "bore no part in the conversation," we shall conclude our history of this singular empire by a conjecture, that soon after Mr Bruce's departure, Michael either died by course of nature, he being then very old, or was cut off by his enemies; on which Tecla Haimanout, having fully settled the affairs of his empire, became possessed of the beautiful Ozoro Esther, and commenced his reign with great glory.

388 Geography of ancient Ethiopia.

With regard to the geographical description of ancient Ethiopia, little can be said; as not even the boundaries of the empire itself, much less those of the particular districts which composed it, were known. The ancient writers, however, agreed that it was very mountainous: but they mention no mountains of any consequence excepting Garbata and Elephas, whose situation is not well ascertained, tho' it is generally supposed that they answer to the mountains of Tigrè. The most noted cities were Axum, Napata, Premis or Premnis, Melis, Mondus, Abalis, Mosylon, Caloe, Opone, &c.

389 Customs of the inhabitants.

Diod. Sic. p. 101, 102.

The nations which inhabited ancient Ethiopia have already been enumerated; and it is not to be supposed that all, or indeed any two of them, would agree in many respects. The ancient historians, however, give the following information. They had many laws which were very different from those of other nations; especially their laws relating to the election of kings. The priests chose the most reputable men of their body, and drew a large circle around them, which they were not to pass. A priest entered the circle, running and jumping like an *Ægipan* or a satyr. He of those that were inclosed in the circle who first catched hold of the priest, was immediately declared king; and all the people paid him homage, as a person entrusted with the government of the nation by Divine Providence. The new-elected king immediately began to live in the manner which was prescribed to him by the laws. In all things he exactly followed the customs of the country; he paid a most rigid attention to the rules established from the origin of the nation, in dispensing rewards and punishments. The king could not order a subject to be put to death, though he had been capitally convicted in a court of justice; but he sent an officer to him, who showed him the signal of death. The criminal then shut himself up in his house, and was his own executioner. It was not permitted him to fly to a neighbouring country, and substitute banishment for death; a relaxation of the rigour of the law, with which criminals were indulged in Greece.

We have the following extraordinary information with regard to the death of many of their kings: The priests of Meroe, who had acquired great power there, when they thought proper, dispatched a courier to the king

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king to order him to die. The courier was commissioned to tell him, that it was the will of the gods, and that it would be the most heinous of crimes to oppose an order which came from *them*. Their first kings obeyed these groundless despotical sentences, though they were only constrained to such obedience by their own superstition. Ergamenes, who reigned in the time of Ptolemy the second, and who was instructed in the philosophy of the Greeks, was the first who had the courge to shake off this iniquitous and sacerdotal yoke. He led an army against Meroè, where, in more ancient times, was the Ethiopian temple of gold; where he put all the priests to the sword, and instituted a new worship.

The friends of the king had imposed on themselves a very singular law, which was in force in the time of Diodorus Siculus. When their sovereign had lost the use of any part of his body, by malady, or by any other accident, they inflicted the same infirmity on themselves; deeming it, for instance, shameful to walk straight after a lame king. They thought it absurd not to share with him corporal inconveniences; since we are bound by the ties of mere friendship to participate the misfortunes and prosperity of our friends. It was even customary among them to die with their kings, which they thought a glorious testimony of their constant loyalty. Hence the subjects of an Ethiopian king were very attentive to *his* and their common preservation; and therefore it was extremely difficult and dangerous to form a conspiracy against him.

The Ethiopians had very particular ceremonies in their funerals. According to Ctesias, after having salted the bodies, they put them into a hollow statue of gold which resembled the deceased; and that statue was placed in a niche on a pillar which they set up for that purpose. But it was only the remains of the richest Ethiopians that were thus honoured. The bodies of the next class were contained in silver statues; the poor were enshrined in statues of earthen ware.

Herodotus * informs us, that the nearest relations of the dead kept the body a year in their houses, and offered sacrifices and first-fruits during that time to their deceased friend; and at the end of the year, they fixed the niche in a place set a part for the purpose near this town.

* *Lib.* iii. 24.

The Ethiopians made use of bows and arrows, darts, lances, and several other weapons, in their wars, which they managed with great strength and dexterity. Circumcision was a rite observed amongst them, as well as among the Egyptians, from very early antiquity; though which of these nations first received it, cannot certainly be known. The Ethiopian soldiers tied their arrows round their heads, the feathered part of which touched their foreheads, temples, &c. and the other projected out like so many rays, which formed a kind of crown. These arrows were extremely short, pointed with sharp stones instead of iron, and dipped in the *virus* of serpents, or some other lethiferous poison, insomuch that all the wounds given by them were attended with immediate death. The bows from which they shot these arrows were four cubits long; and required so much strength to manage them, that no other nation could make use of them. The Ethiopians retreated fighting, in the same manner as the Parthians; discharging vollies of arrows with such dexterity and address whilst they were retiring full speed, that they terribly galled the enemy. Their lances or darts were of an immense size, which may be deemed a farther proof of their vast bodily strength.

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Thus far chiefly with regard to the Ethiopians who lived in the capital, and who inhabited the island of Meroè and that part of Ethiopia which was adjacent to Egypt.

There were many other Ethiopian nations, some of which cultivated the tracts on each side of the Nile, and the islands in the middle of it: others inhabited the provinces bordering on Arabia; and others lived more towards the centre of Africa. All these people, and among the rest those who were born on the banks of the river, had flat noses, black skins, and woolly hair. They had a very savage and ferocious appearance; they were more brutal in their customs than in their nature. They were of a dry adust temperament; their nails in length resembled claws: they were ignorant of the arts which polish the mind: their language was hardly articulate; their voices were shrill and piercing. As they did not endeavour to render life more commodious and agreeable, their manners and customs were very different from those of other nations. When they went to battle, some were armed with bucklers of ox's hide, with little javelins in their hands; others carried crooked darts; others used the bow; and others fought with clubs. They took their wives with them to war, whom they obliged to enter upon military service at a certain age. The women wore rings of copper at their lips.

Diod. Sic. p. 102.

Some of these people went without clothing. Sometimes they threw about them what they happened to find, to shelter themselves from the burning rays of the sun. With regard to their food, some lived upon a certain fruit which grew spontaneously in marshy places: some ate the tenderest shoots of trees, which were defended by the large branches from the heat of the sun; and others sowed Indian corn and lotos. Some of them lived only on the roots of reeds. Many spent a great part of their time in shooting birds; and as they were excellent archers, their bow supplied them with plenty. But the greater part of this people were sustained by the flesh of their flocks.

The people who inhabited the country above Meroè made remarkable distinctions among their gods. Some, they said, were of an eternal and incorruptible nature, as the sun, the moon, and the universe; others having been born among men, had acquired divine honours by their virtue, and by the good which they had done to mankind. They worshipped Isis, Pan, and particularly Jupiter and Hercules, from whom they supposed they had received most benefits. But some Ethiopians believed that there were no gods; and when the sun rose, they fled into their marshes, execrating him as their cruelest enemy.

These Ethiopians differed likewise from other nations in the honours which they paid to their dead. Some threw their bodies into the river, thinking that the most honourable sepulchre. Others kept them in their houses in niches: thinking that their children would be stimulated to virtuous deeds by the sight of their ancestors; and that grown people, by the same objects, would retain their parents in their memory. Others put their dead bodies into coffins of earthen ware, and buried them near their temples. To swear with the hand laid upon a corpse, was their most sacred and inviolable oath.

The savage Ethiopians of some districts gave their crown to him who of all their nation was best made. Their reason for that preference was, that the two first gifts of heaven were monarchy and a fine person. In other territories, they conferred the sovereignty on the most vigilant shepherd; for he, they alledged, would be the most careful guardian of his subjects. Others chose the richest man for their king; for he, they thought, would have it most in his power to do good to his subjects. Others, again, chose the strongest; esteeming those most worthy of the first dignity who were ablest to defend them in battle.

390 Account of the missionaries.

The Jesuit missionaries were the first who gave any information to the Europeans concerning this country; and indeed, excepting them and the late accounts by Mr Bruce, we have no other source of information concerning it. The missionaries confirm what is said by the ancients, that Ethiopia is a very mountainous country. The provinces of Begemder, Gojam, Waleka, Shoa, &c. according to them, are only one continued chain of mountains. Many of them were said to be of such enormous height, that the Alps and Pyrenees are but mole-hills in comparison of them. Those called *Aorni* were said to be of this kind; but Mr Bruce informs us, that these accounts are greatly exaggerated. Amongst those mountains, and even frequently in the plains, there are many steep and craggy rocks to be met with of various and whimsical shapes; some of them so smooth, that men and oxen are craned up to the top by means of engines: but what is most surprising, the tops of these rocks are covered with woods and meadows, full of springs and streams of water; of the truth of which we have an attestation by Mr Bruce in his description of Lamalmon. The most remarkable of these, according to the authors we are now speaking of, is that called *Amba Geshen*, mentioned in the course of this article as one of the mountains used for a prison to the princes of the blood. Its top is described as only half a league in breadth, though it is said that it would require near half a day to go round it. Kircher mentions also a rock which resembles a mirror at a distance; though this is probably not to be depended upon.

391 Climate, &c.

The climate of Ethiopia varies, as may naturally be supposed, according to the situation and elevation of the ground. On the coast of the Red Sea, as well as the open flat parts of the country in general, the heat is intense, insomuch that at Suakem, an island in the Red Sea, Gregory the Abyssine relates that it was so great, as to excoriate any part of the body exposed to the solar rays, melt hard sealing-wax, and sear a garment like red hot iron. In several districts, however, the heat is milder than in Portugal, and in Samen the air is rather cold than otherwise. In some other provinces the winter is very severe, though snow is seldom seen. Hail indeed sometimes falls, which resembles snow at a distance: and Mr Bruce mentions an account of snow having once fallen which lasted three days, and was looked upon to be a kind of prodigy. There are frequent and violent thunders, with excessive deluges of rain during one part of the year, and there are likewise violent storms of wind. The missionaries mention a kind of wind named *Sendo*, which, according to Gregory, may be seen like a serpent of vast magnitude with its head on the ground, and the body twisted in vast curls up to the skies. This, in all probability, is no other than that violent species of whirlwind named *Typhon*, frequent in America and other warm countries; and its being visible is owing to the dust which it takes up in its passage.

392 Violent whirlwinds.

393 Mr Bruce's account of its divisions.

Modern Ethiopia, or *Abyssinia*, as it is now called, is divided, according to Mr Bruce, into two parts, named *Tigré* and *Amhara*; though this rather denotes a difference in the language than in the territory of the people. The most easterly province properly so called is Masuah. It is of considerable length, but no great breadth; running parallel to the Indian Ocean and Red Sea, in a zone of about 40 miles broad, as far as the island Massuah. The territories of the Baharnagash include this province as well as the districts of Azab and Habab. In the former are mines of fossil salt, which in Abyssinia passes current instead of money. For this purpose the mineral is cut into square solid pieces about a foot in length. Here also is a kind of mint from which great profits are derived. The Habab is likewise called the land of the *Agaazi* or Shepherds; who speak the language called *Geez*, and have had the use of letters from the most early ages. This province was formerly taken by the Turks, when the rebellious Baharnagash Isaac called them to his assistance against the emperor Menas. From that time the office fell into disrepute, and the Baharnagash at present has much less power than formerly. The province of Masuah is now governed by a Mahometan prince or officer called a *naybe*.

Tigré is bounded on the east by the territories of the Baharnagash, of which the river Mareb is the boundary on the east, and the Tacazze on the west. It is about 200 miles long from north to south, and 120 broad from west to east. All the merchandise sent across the Red Sea to Abyssinia, or from Abyssinia across the Red Sea, must pass through this province, so that the governor makes his choice of it as it goes along. Thus the province itself is very wealthy; and as the Abyssinian fire-arms are brought from Arabia, the governors of Tigré, by purchasing quantities of them, may easily render themselves very powerful. No arms of this kind can be sent to any person without his permission; nor can any one buy till the governor has first had an offer.

Siré was some time ago united to Tigré, on account of the misbehaviour of its governor; but was disjoined from it at the time Mr Bruce was in Abyssinia, with the consent of Ras Michael, who bestowed the government of it upon his son. It is about 25 miles long, and as much in breadth. Its western boundary is the Tacazze.

Samen is a very mountainous province lying to the westward of the river Tacazze, about 80 miles long, and in some places 30 broad, though in most it is much narrower. It is mostly inhabited by Jews.

Begemder lies to the north-east of Tigré. It is about 180 miles long and 60 broad; bounded by the river Nile on the west. It comprehends the mountainous country of Lasta; and there are now several small governments dismembered from it. The inhabitants are fierce and barbarous, but reckoned the best soldiers in Abyssinia; and it is said that this province with Lasta can furnish 45,000 horsemen. It abounds with iron mines, which in Abyssinia would be very valuable if properly managed. It is also well stored with beautiful cattle. Near the south end it is cut into vast

gullies,

gullies, seemingly by floods, of which we have no account. This province is reckoned the great barrier against the incursions of the Galla; and though they have often endeavoured to make a settlement in it, they have never yet found it practicable. Several of their tribes have been cut off in the attempt.

Next to Begemder is the province of Amhara, in length about 120 miles, and somewhat more than 40 in breadth. It is very mountainous; and the men are reckoned the handsomest in all Abyssinia. In this province is the mountain or rock Geshen, formerly the residence of the royal family. This province is parallel to Begemder on the south; being separated from it by the river Bashilo. On the west it is bounded by the Nile. The river Geshen is another boundary.

Walaka lies between the rivers Geshen and Samba. It is a low unwholesome province, having upper Shoa to the southward. It was in this province that the only surviving prince of the family of Solomon was preserved after the massacre by Judith, formerly mentioned; and on this account great privileges were conferred upon the inhabitants, which in some degree continue to this day. The governor is considered as an ally, rather than a subject, of the emperor of Abyssinia; and to preserve his independency, he has allowed the Galla to surround his province entirely, yielding them up the territory of Walaka abovementioned. Trusting to the valour of his own people, he is under no apprehension of his barbarous neighbours the Galla. This province is also remarkable for the monastery of Debra Libanos, where the famous Saint Tecla Haimanout, the founder of the power of the clergy, was bred.

Gojam is remarkable for having in it the sources of the Nile. It is bounded on the north by the high mountains of Amid Amid, on the south by the river Nile, on the west by another river named *Gult*, and on the east by the river Temci; on the north-east it has the kingdom of Damot. It is about 40 miles long from north to south, and somewhat more than 20 in breadth from east to west. It is very populous, but the men are accounted the worst soldiers in Abyssinia. There is great plenty of very beautiful cattle.

Beyond the mountains of Amid on the east lies the country of the Agows; on the west it has Burè, Umbarma, and the country of the Gongas; on the south, those of Damot and Gafat; and Dingleber on the north.

Dembea occupies all the space along the lake of the same name from Dingleber below the mountains bounding Guesque and Kuara. Mr Bruce is of opinion, that the lake has formerly overflowed the whole of it; and the decrease of this lake he brings as an instance of the decrease of large pools throughout the world.

To the south of Dembea is the country of Kuara, bordering on that of the Shangalla, the Macrobii of the ancients. The neighbouring countries, inhabited by the pagan savages, produce gold, which is introduced in plenty into this province. None is produced in the province itself, nor indeed does Mr Bruce mention any part of Abyssinia where gold is naturally found. In the lower part of this country is a colony of pagan blacks named *Ganjar*; derived, according to our author, from the black slaves who came into the country with the Arabs after the invasion of Mahomet. These deserting their masters, formed the colony we speak of; but it is now more increased by vagabonds from other parts than by the multiplication of the inhabitants themselves.

The governor of this country is one of the great officers of state: he has kettle-drums of silver, which he is allowed to beat through the streets of Gondar; a privilege allowed to none but himself. This privilege was conferred upon the first governor by David II. who conquered the country.

The frontier countries of Nara, Ras-el-Feel, Tchelga, &c. are wholly inhabited by Mahometans, and the government of them is usually given to strangers. The country is very hot, unwholesome, and covered with thick woods. The people are fugitives from all nations; but excellent horsemen, making use of no other weapon but the broad sword; with which, however inadequate we might suppose the weapon to be, they will attack the elephant or rhinoceros.

The most distinct idea of the situation of the Abyssinian provinces is to be had from the map which Mr Bruce has given of it in his 5th volume. According to this, the empire is bounded on the south by a vast chain of mountains, extending with very little interruption from 34° to 44° E. Long. and between 8° and 9° N. Lat. In the more prosperous times it extended beyond these southward, particularly into the kingdom of Adel; but the mountains just mentioned are undoubtedly to be reckoned its natural boundaries on this side. On the east and north-east it has the Red Sea, and on the south-east the kingdom of Adel. On the west and north its boundaries are less distinctly marked; having on both these quarters the barbarous kingdom of Senaar, whose limits will no doubt frequently vary according to the fortune of war betwixt the two princes. From Arkeeko, situated near the foot of the Basaltes mountains, in about 15° 30′ N. Lat. it extends to near 7° N. Lat. where the mountains of Caffa, the most southerly province of Abyssinia, terminate. Along the coast of the Red Sea lie the territories inhabited by the Hazorta-Shiho, the district of Engana Shiho, and the kingdom of Dancali, including the territory of Azab and the salt-pits already mentioned. To the westward of these are the province or kingdom of Tigrè, including the country of the Dobas, part of the kingdom of Bali, and that of Dawaro. Still farther west are those of Sirè, Lasta, Amhara, the greatest part of Bali, and part of Fatigar, which last reaches beyond the mountains. Proceeding still in the same direction, we come to Tcherkin, Tchelga, Abargale, Salao, Begemder, Shoa, and Ifat; reckoning always from north to south; Tcherkin, for instance, being to the northward of Tchegla, &c. Shoa extends a considerable way to the westward; so that, besides Ifat, it has to the south of it also the kingdoms of Hade and Cambut; the latter extending beyond the southern ridge of mountains. To the westward are Ras-el-Feel, Dembea, Gojam, and Damot; and beyond these are the kingdoms of Dembea, Bizamo, Gooderoo, and Guraque; those of Nare or Enarea and Caffa occupying the south-west corner of the empire.

394 Climate.

With regard to the climate of Abyssinia, Mr Bruce does not mention any thing materially different from what has been already said; only he gives a very particular description of the rains which produce the inundation of the NILE; and of which the substance shall be given under that article. We shall therefore close our account of this country with an enumeration of its products, and some detail of the manners and customs of the present inhabitants.

The

Ethiopia.

395 Soil and vegetable productions.

The great difference of climate, owing to the vast extent and variety of elevation in different parts of this empire, is very perceptible in its soil and productions. The mountains in many places are not only barren, but altogether inaccessible, except by those who make it their constant practice to climb amongst them; and even by them they cannot be ascended without great difficulty and danger. The shapes of these mountains, as we have already had occasion to observe, are very strange and fantastical; exceedingly different from those of Europe; some resembling towers and steeples, while others are like a board or slate set up on end; the base being so narrow, and the whole mountain so high and thin, that it seems wonderful how it can stand. In the valleys, however, and flat parts of the country, the soil is excessively fruitful, though in the warmest places grain cannot be brought to perfection. Wine is also made only in one or two places; but the greatest profusion of fruits of all kinds is to be met with every where, as well as many vegetables not to be found in other countries. There is a vast variety of flowers, which adorn the banks of the rivers in such a manner as to make them resemble fine gardens. Among these a species of roses is met with, which grows upon trees, and is much superior in fragrance to those which grow on bushes. Sena, cardamon, ginger, and cotton, are likewise produced here in great quantities. Among the variety of rare plants to be met with in Abyssinia, Mr Bruce particularly describes the following.

396 Plants described by Mr Bruce.

1. The papyrus, the ancient material for paper; which our author supposes to have been a native of Ethiopia, and not of Egypt as has been supposed. 2. Balessan, balm, or balsam plant; a tree growing to the height of 14 or 15 feet, and used for fuel along with other trees in the country. It grows on the coast of the Red Sea, among the myrrh trees behind Azab, all the way to Babelmandel. This is the tree producing the balm of Gilead mentioned in Scripture. 3. The sassa, myrrh, and opocalpasum trees. These grow likewise along the coast of the Red Sea. The sassa or opocalpasum is used in manufactures; and, according to our author, resembles gum *adragant*, probably tragacanth. The tree which produces it grows to a great size, and has a beautiful flower, scarce admitting of description without a drawing. 4. The ergett, a species of the mimosa, is of two kinds; one called *ergete y' dimmo*, or the bloody ergett, from the pink colour of its filaments; the other *ergett el krone*, or the horned ergett, with a flower resembling the acacia vera or Egyptian thorn. These were both found on the banks of a river named *Amo*, near the great lake Dembea. 5. Ensete, an herbaceous plant, growing in Narea, in swampy places; but it is supposed to grow equally well in any other part of the empire where there is heat and moisture sufficient. It forms a great part of the vegetable food of the Abyssinians. It produces a kind of figs, but these are not eatable. When used for food, it is to be cut immediately above the small detached roots, or perhaps a foot or two higher, according to the age of the plant. The green is to be stripped from the upper part till it becomes white; and when soft, it affords an excellent food when eaten with milk or butter. 6. Kolquall, a kind of tree, only the lower part of which is woody, the upper part being herbaceous and succulent. The flowers are of a beautiful golden colour, and the fruit turns to a deep crimson; so that the trees make a very beautiful appearance. The whole plant is full of a very acrid and caustic milk. 7. Rack is a large tree, growing not only in Abyssinia but in many places of Arabia Felix. Its wood is so hard and bitter, that no worm will touch it; for which reason it is used by the Arabs for constructing their boats. It grows, like the mangrove, among the salt-water of the sea, or about salt-springs. 8. Gir-gir, or geshe-el-aube; a kind of grass found about Ras-el-Feel, growing to the height of about three feet four inches. 9. The kantuffa, a very noxious species of thorn, much more troublesome than any with which we are acquainted, and growing to the height of eight or more feet. The flowers have a strong smell like the flower migni-onet. 10. The gaguedi, is a short tree only about nine feet high, a native of Lamalmon. The flowers, which are yellow and very beautiful, turn towards the sun like those of the helianthus. 11. The wansey, a tree common throughout all Abyssinia; flowers exactly on the first day the rains cease. It grows to the height of 18 or 20 feet; having a thick bark and close heavy wood; the first part of which is white, but the rest of a dark colour. The flowers are of a beautiful white colour; but it does not appear to possess any other remarkable property, though it is held in great estimation by the Abyssinians, and is even worshipped by the Galla. 12. The farek, or bauhinia acuminata, grows in the country immediately adjacent to the sources of the Nile; being found by Mr Bruce scarce 400 yards distant from the fountain. 13. Kuara, is a beautiful tree, growing in the south and south-west parts of Abyssinia. It has a fruit like a bean, of a red colour, which in the early ages was made use of as a weight for gold and diamonds; and hence Mr Bruce is of opinion that the name of the imaginary weight *carat* is derived. 14. The Walkuffa, grows in the hottest parts of Ethiopia. It is a flowering tree, with beautiful white blossoms, which do not appear till towards the middle of January. The flowers have no smell, and are accounted pernicious to bees. The wood is very heavy. 15. The wooginoos, or Brucea antidysenterica, is common throughout the whole empire, but principally on the sides of the valleys. It is a sovereign remedy against the dysentery, a very common and fatal disease in hot countries. Mr Bruce had experimental proof of its antidysenteric virtues. 16. Cusso, or Banksia anthelmintica, is a very beautiful and useful tree, being a strong anthelmintic, and used as such by the Abyssinians. Every person there, whether male or female, is troubled with that kind of worm called *ascarides*; a great number of which are evacuated every month, and the evacuation is promoted by an infusion of this plant. While taking this medicine, the patients sequestrate themselves from all their acquaintance, and keep close at home. It is said, that the want of this medicine in other countries is the reason why the Abyssinians do not go out of their own country; or, if they do, that they are short-lived. Teff, is a kind of grain sown generally throughout Abyssinia; and constituting the bread commonly made use of by the inhabitants. They have indeed plenty of wheat, and are as skilful in forming it into bread as the Europeans; but this is only made use of by people of the first rank: however, the teff is sometimes of such an excellent quality, that the bread made from it is held in equal estimation with the finest wheat. From the bread made of this grain

grain a sourish liquor called *bouza* is prepared, which is used for common drink like our small beer. A liquor of the same kind, but of inferior quality, is made from barley cakes. Some have been of opinion, that the use of teff occasions the worms abovementioned; but this is controverted by Mr Bruce. Nook, a plant not to be distinguished from our marigold either in shape, size, or foliage, is also sown very generally over the country, and furnishes all Abyssinia with oil for the kitchen and other uses.

397 Quadrupeds.

Abyssinia abounds with a vast variety of quadrupeds both wild and tame. Immense numbers of cattle every where present themselves, some of them the most beautiful in the world. Some have monstrous horns, said to be capable of holding 10 quarts each; but this, as our author informs us, is a disease which proves fatal to them. Buffaloes are here met with in great numbers, and are very fierce and untractable: but there are no such animals as carnivorous bulls, which have been said to exist in this and other internal parts of Africa. Antelopes and other wild animals are met with in great numbers in the uncultivated parts; feeding chiefly on the leaves of trees. They abound most of all, however, in those parts which have been once cultivated, but since desolated by the calamities of war; and where wild oats abound in such quantities as to hide them from pursuit. Hyænas, lions, foxes, jackals, wild boars, &c. are also found, as well as the elephant, rhinoceros, cameleopard, and others of the larger and more uncommon kinds. Great havock is made in the cultivated fields by multitudes of baboons, apes, rats, and mice. There is plenty of hares; but these being reckoned unclean, as well as wild boars, are not used as food. The rivers abound with crocodiles and hippopotami, at least the Nile, and those large streams which flow into it: but a great number have water in them only during the rainy season, and these have neither fish nor any animal that feeds upon them.

398 Birds.

The number of birds in this country is immense; nor are those of the carnivorous kind at all deficient. Great numbers of eagles, vultures, hawks, and others of that kind are met with, and come punctually every year after the tropical rains have ceased. They feed at first upon the shell-fish which are met with in great quantities on the edges of the deserts, where they had lived in the salt springs; but, being forced from their natural habitations when these springs were swelled by the rains, are afterwards left to perish on dry land. When these fail, their next resource is from the carcases of the large animals, such as the elephant and rhinoceros, which are killed in the flat country by the hunters. Their next supply is the multitude of rats and field-mice which infest the country after harvest. The vast slaughter of cattle made by the Abyssinian armies, the multitude of persons killed whose bodies are allowed to rot on the field of battle, &c. furnish them also with another resource. These supplies, however, all fail at the beginning of the rainy season, when the hunters and armies return home, and the vast quantity of water which continually overflows the ground renders it impossible for them to find any other food.

There are other birds which feed upon insects, and multitudes which live on grain or seeds of various kinds; all of which are amply supplied by the immense quantity of fruits and berries which grow in Abyssinia, and are ripe at all seasons of the year. A very remarkable particular concerning this is, that the trees which bear fruit all the year round do not carry it always in the same place. The west side is that which blossoms first, and where of consequence the fruit first comes to perfection; the south side succeeds, and goes through the same process; after which, the north blossoms in like manner; and last of all is the east side, which produces flowers and fruit towards the beginning of the rainy season. All the trees of Abyssinia are ever-green; and their leaves are of a thick leathery consistence, and highly varnished to enable them to resist the violent rains which fall during a certain season. The granivorous birds have likewise this advantage, that the rains do not fall at the same time all over the country. It is intersected by a chain of mountains that divide the seasons also; so that they have but a short way to fly in order to become birds of passage, and supply themselves with such food as is necessary for them beyond the mountains. All the pigeons, of which there are many species, are birds of passage, excepting one kind. The owls are extremely large and beautiful, but few in number. There is a great variety of swallows, several kinds of which are unknown in Europe; but, says our author, "those that are common in Europe appear in passage at the very season when they take their flight from thence. We saw the greatest part of them in the island of Masuah, where they alighted and tarried two days, and then proceeded with moon-light nights to the south-west." The large birds which reside constantly among the mountains of Samen and Taranta have all their feathers tubular, the yellow part being filled with a kind of yellow dust which issues out in great abundance on hunting them. This was particularly observed by Mr Bruce in a species of eagle which he calls the *golden eagle*; and the dust being viewed through a miscroscope with a very strong magnifying power, appeared like fine feathers. The brows are spotted white and black, almost in equal proportions. The raven has his feathers intermixed with brown; the tip of his beak white, and a figure like a cup or chalice of white feathers upon his head. Our author saw no sparrows, magpies, nor bats; neither are there many water fowl, especially of the web-footed kind; but there are vast numbers of storks, which cover the plains in May, when the rains become constant. There are no geese, excepting one species called the *golden goose* or *goose of the Nile*, which is common all over Africa; but there are snipes in all the marshes.

399 Fishes.

Our author describes very few fishes; though he says that an account of these, and other marine productions of the Red Sea which he has painted and collected, would occupy many large volumes, and the engraving cost a sum which he could not by any means afford. He mentions one named *binny*, which is good food, and grows to a pretty large size; that from which he took the drawing being about 32 pounds weight. Its whole body is covered with beautiful scales resembling silver spangles.

400 Reptiles.

401 Few serpents in Abyssinia.

Of the reptiles in Abyssinia Mr Bruce describes the fly already mentioned as destructive to cattle, and which in his 5th volume he calls *tsaltsalya*. He gives a particular description of a kind of lizard, and of the cerastes or horned serpent; but denies that serpents are numerous in Abyssinia, as almost all authors have supposed, and as we should be led naturally to suspect.

He

Ethiopia.

He vouches also for the power that some persons have of inchanting serpents and scorpions, which in some is natural, in others communicated artificially by certain medicines. He prevailed upon those who knew the secret to prepare him by these means as they had done others; but notwithstanding this assistance, he acknowledges, that when it came to the trial his heart always failed him.

402 Manners, &c. of the Abyssinians.

Mr Bruce gives an ample description of the manners of the Abyssinians, who in some respects are barbarous beyond measure. The continual state of warfare in which they are engaged, must no doubt contribute to confirm them in their barbarity. That, again, according to Mr Bruce, arises from an error in the regulations

403 Method of settling the succession to the crown detrimental to the empire.

concerning the succession. The crown is indeed hereditary in the line of Solomon, but it depends on the minister to choose the particular person who is to enjoy it; and as it is always his inclination to have the government in his own hands, he never fails to choose an infant, who is seldom suffered to live after he comes to the years of maturity. Thus perpetual wars and commotions take place, insomuch that the ravenous birds, as has been observed, find one great supply of food in the slaughters made by the Abyssinians of one another.

404 Excessive destruction by the Abyssinian armies. *Bruce's Travels*, vol. v. p. 160.

All authors indeed agree that the devastations committed by the armies of this country are excessive; insomuch, that after a long encampment is removed, nothing is to be seen all round the place where it was but bare earth. When an army marches through the country, says Mr Bruce, "an inconceivable number of birds and beasts of prey, especially the former, follow it from the first day of its march to its return; increasing always in proportion the more it advances into the country. An army there leaves nothing living behind, not the vestige of an habitation; but the fire and the sword reduce every thing to a wilderness and solitude. The beasts and birds unmolested have the country to themselves, and increase beyond all possible conception. The slovenly manner of this savage people, who after a battle, bury neither friends nor enemies; the quantity of beasts of burden that die perpetually under the load of baggage, and variety of mismanagement; the quantity of offal, and half-eaten carcases of cows, goats, and sheep, which they consume in their march for sustenance; all furnish a stock of carrion sufficient to occasion contagious distempers, were there not such a prodigious number of voracious attendants who consume them almost before putrefaction.

405 Immense number of birds which follow them.

There is no giving the reader any idea of their number, unless by comparing them to the sand of the sea. While the army is in motion, they are a black canopy which extends over it for leagues. When encamped, the ground is discoloured with them beyond the sight of the eye; and all the trees are loaded with them."

The prodigious number of criminals executed for high treason, whose bodies are cut in pieces and thrown about the streets, invite the hyænas to the capital, in the same manner that the carrion of the camp invites

406 Curious method of keeping off the hyænas from the king's palace.

the birds of prey to follow it. The method of keeping off these voracious animals is certainly very curious. "An officer (says Mr Bruce) called *Serach Massery*, with a long whip, begins cracking and making a noise worse than 20 French postilions at the door of the palace before the dawn of day. This chases away the hyænas and other wild beasts: this too is the signal for the king's rising, who sits in judgment every morning fasting; and after that, about 8 o'clock, he goes to breakfast."

Ethiopia.

407 Method of anointing and crowning the king.

From these and other circumstances we should be apt to imagine that the Abyssinians, instead of becoming more civilized, were daily improving in barbarity. The king is anointed at his election with plain oil of olives; "which (says Mr Bruce) being poured upon the crown of his head, he rubs into his long hair indecently enough with both his hands, pretty much as his soldiers do with theirs when they get access to plenty of butter." In former times, however, matters seem to have been conducted with more decency. Socinios, the greatest monarch that ever sat on the Abyssinian throne, was crowned, after having gained a great victory over the Galla, in a very different manner, and with the ceremonies which we are told were in use among the ancient kings of Tigrè. At that time he had with him an army of about 30,000 men; and was besides attended by all the great officers dressed in the gayest manner, as well as by the ladies of the first quality in the empire. The king himself, dressed in crimson damask, with a great chain of gold about his neck, his head bare, and mounted on a horse richly caparisoned, advanced at the head of his nobility, passed the outer court, and came to the paved way before the church. Here he was met by a number of young girls, daughters of the *Umbares* or supreme judges, together with many noble virgins standing on the right and left of the court. Two of the noblest of these held in their hands a crimson cord of silk, somewhat thicker than common whip-cord, stretched across from one company to another, as if to shut up the road by which the king was approaching the church. When this cord was prepared and drawn tight about breast-high by the girls, the king entered; advancing moderately quick, and showing his skill in horsemanship as he went along. Being stopped by the tension of the string, the damsels asked, Who he was? To this he answered, "I am your king, the king of Ethiopia." But they replied, "You shall not pass; you are not our king." He then retired some paces, and again presented himself. The question was again put, "Who he was?" To which he answered, "I am your king, the king of Israel." But the same reply was still given by the girls. The third time, on being asked, "Who he was?" he answered, "I am your king the king of Sion:" and drawing his sword, he cut the cord asunder. The damsels then cried out, "It is a truth, you are our king; truly you are the king of Sion." On this they began to sing Hallelujah, and were joined by the whole army and the rest of the king's attendants. Amidst these acclamations the king advanced to the foot of the stair of the church, dismounted, and sat down upon a stone; which, in Mr Bruce's opinion, was plainly an altar of Anubis or the Dog-star. After the king, came a number of priests in proper order. The king was first anointed, then crowned, and accompanied half up the steps by the singing priests. He stopped at a hole made on purpose in one of the steps, where he was fumigated with myrrh, aloes, and cassia; after which divine service was celebrated; and he returned to the camp, where 14 days were spent in feasting and rejoicing.

Ceremonies of this kind are now given over on account of the expence. Our author was informed by Tecla Haimanout, that when he was obliged to retire into Tigrè from his enemies, Ras Michael had some thoughts of having him crowned in contempt of his enemies; but by the moſt moderate calculation that could be made, it would have coſt 20,000 ounces of gold, about 80,000 l. ſterling; on which all thoughts of it were laid aſide.

408 Manners of the Abyſſinians.

With regard to the manners of the Abyſſinians, they are repreſented by Mr Bruce as highly barbarous. Their continual warfare inures them to blood from their infancy; ſo that even children would not have the leaſt ſcruple at killing one another or grown up perſons if they were able. Many ſhocking inſtances of hardneſs of heart are related by our author in Tecla Haimanout himſelf, though otherwiſe an accompliſhed prince. Their cruelty diſplays itſelf abundantly in the puniſhments inflicted upon criminals, one of which is flaeing alive, as has been already related of Wooſheka. Cutting in pieces with a ſabre is another, and this is performed, not by executioners, whoſe employment is reckoned diſgraceful as in this country, but by officers and people of quality. So little is this thought of indeed in Gondar, the capital of the empire, that Mr Bruce happening to paſs by an officer employed in this work, who had three men to diſpatch, the officer called to him to ſtop till he had killed them all, as he wanted to ſpeak to him upon a matter of conſequence. Stoning to death is a capital puniſhment likewiſe common in this country; and uſually inflicted on Roman Catholics if they happen to be found, or upon other heretics in religion.

409 Their horrid manner of feeding.

It is not to be ſuppoſed that people who regard the lives of one another ſo little, will ſhow much compaſſion to the brute creation. In this reſpect, however, the Abyſſinians are cruel and ſavage beyond all people on the face of the earth. There are many inſtances of people eating raw fiſh or fleſh, and we call them barbarous that do ſo; but what name ſhall we give to thoſe who cut off pieces of fleſh from animals while ſtill living, and eat it not only raw but ſtill quivering with life! Mr Bruce labours much to prove, that the way of eating not raw, but *living* fleſh was cuſtomary among the nations of antiquity: but whatever be in this, he is the only author who mentions it directly; and it is on his ſingle teſtimony that the fact is eſtabliſhed. The Jeſuits mentioned in their books that the Abyſſinians eat raw fleſh, but not a word of eating it it this manner; and indeed there are ſome circumſtances which he himſelf relates ſeemingly very difficult to be reconciled with known indubitable facts. He informs us, for inſtance, that when at no great diſtance from Axum, the capital of Tigré, he fell in with three ſoldiers "driving a cow. They halted at a brook, threw down the beaſt, and one of them cut a pretty large collop of fleſh from its buttock; after which they drove the cow gently on as before." In another place he tells us, that the fleſh was taken from the upper part of the buttock; that the ſkin was flapped over the wound, faſtened with a ſkewer, and a cataplaſm of clay put over all. Now, it is known to anatomiſts, that no piece of fleſh can be cut off without deſtroying a muſcle; and that the muſcles of the buttocks are ſubſervient to the motion of the legs. The Abyſſinians therefore muſt have been expert anatomiſts to know how to cut off ſuch muſcles as would allow the creature ſtill to go on; and if their repaſt had been two or three times repeated, it is plainly impoſſible that the cow could at any rate have ſtirred a ſtep. In his deſcription of their feaſts there is more conſiſtency; for there the animal is tied ſo that it cannot move: after ſtripping off the ſkin, the fleſh of the buttocks is cut off in ſolid ſquare pieces, without bones or much effuſion of blood; and the prodigious noiſe the animal makes is a ſignal for the company to ſit down to table. Every man ſits between two women, having a long knife in his hand. With this he cuts the fleſh, while the motion of its fibres is yet viſible, into pieces like dice. Theſe are laid upon pieces of bread made of the grain called *teff*, already mentioned, after being ſtrongly powdered with Cayenne pepper and foſſile ſalt. They are then rolled up like as many cartridges; the men open their mouths, ſtooping and gaping like idiots, while the women cram them ſo full of theſe cartridges, that they ſeem every moment in danger of being choaked; and in proportion to the quantity their mouths can hold, and the noiſe they make in chewing, they are held in eſtimation by the company. All this time the animal bleeds but little; but when the large arteries are cut and it expires, the fleſh becomes tough; and the wretches who have the reſt to eat, gnaw it from the bones like dogs!

END OF THE SIXTH VOLUME.

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