was done by the ejected ashes, stones, and lava. The sugar-cane is grown on an elevated plain called Los Llanos. *Santa Cruz* on the eastern coast is the principal town (population 4400). Ribands and stockings are manufactured there from silk produced on the island. The anchorage is good. The cultivated soil is fertile, but the labouring classes are in a wretched condition, notwithstanding their industrious habits.

LANZAROTE, the most easterly of the group, has a length of 31 miles and a breadth varying from 5 to 10 miles. It is naked and mountainous, bearing everywhere marks of its volcanic origin. Montaña Blanca, the highest point, attains a height of 2000 feet, and is cultivated to the summit. In 1730 the appearance of half the island was altered by a volcanic outburst. A violent earthquake preceded the catastrophe, by which nine villages were destroyed. In 1825 another volcanic eruption took place accompanied by earthquakes, and two hills were thrown up which still emit smoke. The port of Naos on the south-east of the island affords safe anchorage. It is protected by two forts. A short distance inland is the town of Arrecife (population 2700), where a British vice-consul resides. The climate is hot and dry. There is only a single spring of fresh water on the island, and that is in a position difficult of access. From the total failure of water the inhabitants were once compelled to abandon the island. Grain, wine (which is of superior quality), brandy, barilla, orchil, and raisins made from the muscatel grape are the principal articles of export. Dromedaries are used as beasts of burden. *Teguise* (population 1000), on the north-west coast, is the residence of the local authorities. A strait of about 6 miles in width separates Lanzarote from Fuerteventura.

GRACIOSA, a small uninhabited island, is divided from the north-eastern extremity of Lanzarote by a channel a mile in width, which affords the most capacious and only safe harbour for large ships at the Canaries; but basaltic cliffs, 1500 feet high, prevent intercourse with the inhabited part of Lanzarote. A few persons reside on the little island Allegranza, a mass of lava and cinders ejected at various times from a now extinct volcano, the crater of which has still a well-defined edge.

FUERTEVENTURA lies between Lanzarote and Grand Canary. It has a length of 52 miles, and an average width of 12 miles. Though less mountainous than the other islands, its aspect is barren. The springs of fresh water are only two, and they are confined to one valley. Lava streams and other signs of volcanic action abound, but there has been no igneous activity since the Spaniards took possession. At each of its extremities are high mountains, which send off branches along the coast so as to enclose a large arid plain. The highest peak reaches 2500 feet. In external appearance, climate, and productions this island greatly resembles Lanzarote. An interval of three years without rain has been known. The wine is bad. Barilla and orchil are largely exported. *Oliva*, with 970 inhabitants, is the largest town. A smaller place in the centre of the island named *Betancuria* is the residence of the authorities. *Cabras*, on the eastern coast (population 1000), is the chief port. Dromedaries are bred here.

Gomera lies 20 miles south-west of Teneriffe. Its greatest length is about 23 miles. The coast is precipitous and the interior mountainous, but it has the most wood and is the best watered of the group. The inhabitants are very poor. The palm trees produce excellent dates; and wine, brandy, orchil, raw silk, and dried fruits are sent to Teneriffe. Dromedaries are bred on Gomera in large numbers. *St Sebastian*, the chief town and a port, has 2240 inhabitants. Columbus resided here before sailing in search of the New World.

HIERRO, or *Ferro*, the most westerly and the smallest island of the group, is somewhat crescent-shaped. Its length is about 18 miles, its greatest breadth about 15 miles, and its circumference probably 50 miles. It lies 92 miles W.S.W. of Teneriffe. Its coast is bound by high steep rocks, which only admit of one harbour, but the interior is tolerably level. Its hill-tops in winter are sometimes wrapped in snow, which, however, does not lie long. Better and more abundant grass grows here than on any of the other islands. The island is exposed to westerly gales, which frequently commit great damage. Fountains of fresh water are few, but there is a sulphurous spring, with a temperature of 102° Fahr. The once celebrated and almost sacred Til tree, which was reputed to be always distilling water in great abundance from its leaves, no longer exists. Only a small part of the cultivable land is under tillage, the inhabitants being principally employed in pasturage. Wine, brandy, orchil, excellent dried figs, and sheep are sent to Teneriffe. At *Valverde*, the principal town, with 4640 inhabitants, the local authorities reside. Geographers were formerly in the habit of measuring all longitudes from Ferro, the most westerly land known to them. The longitude assigned at first has, however, turned out to be erroneous; and the so-called "Longitude of Ferro" does not coincide with the actual longitude of the island.

See Bethencourt, *The Canarian*, published by the Hakluyt Society in 1872; Von Buch, *Description des Iles Canaries*, 1803; Bory de Saint Vincent, *Les Iles Fortunées*, 1825; Fritsch, *Reisebilder von den Canarischen Inseln*, published as the 22d supplemental part to Petermann's *Mittheilungen*; C. Piazzi Smyth, *Teneriffe*, 1868.
(J. Y. J.)

CANCALE, a seaport town of France, in the department of Ille-et-Vilaine, 10 miles E. of St Malo, on the bay of St Michael. A considerable trade is carried on in oysters, which are found in the bay in great numbers and of excellent quality. In 1758 the duke of Marlborough disembarked an army of 14,000 English here for the purpose of attacking St Malo, but retired without accomplishing anything. Population in 1872, 3814.

CANCAO, CANCAR, or KANG-KAO, otherwise known as Ponthiamus or Potai-mat, or in Chinese, Ha Thian, the capital of a small state in Western Cambodia, on the eastern side of the Gulf of Siam, at the mouth of the River Cancao or Klong Chanda; in 10° 14′ N. lat. and 104° 55′ E. long. The town was once a great centre of Cambodian trade, its port having been declared free by a man of Chinese origin, who took advantage of the civil troubles of Siam to effect his purpose. In 1717, however, the Siamese expelled the merchants who had flocked to the place; and though a considerable exportation of rice and salt is still maintained, the prosperity of the town has largely diminished. The harbour is shallow, though the river in general has a great depth of water. A canal gives communication with the Mekong River.

CANCER, or CARCINOMA (from *cancer*, or *καρκινος*, an eating ulcer), is the name given to a class of morbid growths or tumours which occur in man, and also in certain of the lower animals. The term is apt to be somewhat loosely employed, partly owing to the fact that there are not a few forms of diseased growth respecting which it is still a matter of debate whether they are to be regarded as cancerous or not; and in some measure also to the difficulty often experienced in recognizing true cancer particularly in its earlier stages.

The disease exists in various forms, which, although differing from each other in many points, have yet certain common characters to which they owe their special significance.

1. In structure such growths are composed of nucleated cells and free nuclei together with a milky fluid called cancer juice, all contained within a more or less dense fibrous stroma or framework.

2. They have no well-defined limits, and they involve all textures in their vicinity, while they also tend to spread by the lymphatics and veins, and to cause similar growths in distant parts or organs called "secondary cancerous growths."

3. They are undergoing constant increase, and their progress is usually rapid.

4. Pain is a frequent symptom. When present it is generally of a severe and agonizing character, and together with the local effects of the disease and the resulting condition of ill health or "cachexia," hastens the fatal termination to which all cancerous growths tend.

5. When such growths are removed by the surgeon they are apt to return either at the same or at some other part.

The chief varieties of cancer are *Scirrhus* or hard cancer, *Encephaloid* or soft cancer, and *Epithelial cancer*.

Scirrhus is remarkable for its hardness, which is due to the large amount of its fibrous, and relatively small proportion of its cell elements. It is of comparatively slow growth, but it tends to spread and to ulcerate. Its most common seat by far is the female breast, though it sometimes affects internal organs.

Encephaloid is in structure the reverse of the last, its softness depending on the preponderance of its cell over its fibrous elements. Its appearance and consistence resemble brain substance (hence its name), and it is of such rapid growth as to have given rise to its being occasionally termed *acute cancer*. Its most frequent seats are internal organs or the limbs. Ulceration and hæmorrhage are common accompaniments of this form of cancer.

Epithelial cancer is largely composed of cells resembling the natural epithelium of the body. It occurs most frequently in those parts provided with epithelium, such as the skin and mucous membranes, or where those adjoin, as in the lips. This form of cancer does not spread so rapidly nor produce secondary growths in other organs to the same extent as the two other varieties, but it tends equally with them to involve the neighbouring lymphatic glands, and to recur after removal.

Various views are entertained, and much discussion has taken place respecting the causation of cancer, but little has as yet been satisfactorily ascertained on the point. By some the disease is held to be from the first an entirely local affection, due to some alteration in the nutrition of the part, irrespective of any condition of the system generally, but in course of time coming to assume a malignant form, and to infect the system secondarily. Others, on the contrary, maintain that a certain constitutional condition, either as regards the blood or some of the tissues of the body, must exist prior to the development of the disease to which it gives rise. A third view is that the concurrence of a constitutional and a local cause is necessary for the production of cancer. Without entering into an examination of these opinions, it appears evident that a constitutional element cannot be excluded in view of such well-known facts as a hereditary liability to cancer, and also of its occasional appearance in several parts of the body at one time.

The hereditary tendency in some persons to this disease has long been recognized by medical men; but its extent was not accurately ascertained till Sir James Paget affirmed, as the result of his observations, that in one out of every three cases of cancer a family history of the malady could be traced, and further, that even this probably does not represent the whole extent of the hereditary predisposition to cancer.

Cancer is essentially a disease of degeneracy, all statistics going to show its relatively great frequency after middle life; and the mortality, according to Dr Walshe, goes on increasing with each decade until the eightieth year. Cancer may, nevertheless, attack persons of any age, and instances of its occurrence are not unknown even among young children. It affects females to a much larger extent than males,—this, however, being fully explained by the greater liability of the female breast and of the uterus to the disease than any other organs of the body; for, apart from this, cancer is quite as common among men. It occurs equally among all ranks of life.

The commencement of a cancerous growth is frequently attributed to some local injury, as in the case of blows on the breast, or in the well-known instance of cancer of the lip following the irritation produced by smoking a short clay pipe. But it is only as exciting causes that the influence of such injuries can be admitted; and there must still remain, as necessary to account for the disease, some antecedent condition of the system which gives the particular direction to the form of morbid action in the part.

Cancer tends to advance steadily to a fatal termination, but its duration varies in different cases according to the part affected, and according to the variety of the disease. Soft cancer affecting important organs of the body often proves fatal in a few months, while, on the other hand, cases of hard or epithelial cancer may sometimes last for several years; but no precise limit can be assigned for any form of the disease. In some exceptionally rare instances cancerous growth may exist for a great length of time, and undergo a kind of spontaneous cure, or at least prolonged arrestment.

With respect to the treatment of cancer the only hope of success lies in the entire removal of the disease. This can obviously be only accomplished where the growth affects parts which are within reach of the surgeon. When in such cases the tumour is of recent formation, is limited in its extent, does not largely affect the neighbouring lymphatic glands, and has not as yet produced any marked deterioration of the general health, the surgeon is warranted in operating. Although it must be admitted that the results are generally disappointing from the intense tendency of the disease to recur sooner or later, yet the relief to suffering and the prolongation of life obtained are alone sufficient to justify operative interference when otherwise admissible, not to mention the fact that in some rare instances a cure has thus been achieved. Nor is the view of the constitutional and hereditary nature of cancer necessarily inconsistent with the adoption of such remedial measures,—since, from the analogy of other hereditary diseases, it is probable that these influences are more potent at certain times of life, and that by prompt treatment the period of special liability may be tided over, although the inherent tendency cannot be eradicated. When from the extent of the disease or its existence in internal organs no attempt at removal can be made, all that can be hoped for is the relief of suffering, and it is certain that even in such circumstances much may be done by appropriate medical treatment. It is painful to think how many of the unfortunate sufferers from this malady place themselves in the hands of ignorant persons who profess to be able to cure cancers, but whose violent remedies, if they do not actually destroy life, as has often been the case, only aggravate suffering and entail disappointment.

Cancer is known to occur in many of the lower animals, being probably most common among the domestic tribes, but it presents no special peculiarities as a disease beyond those already referred to.
(J. O. A.)

CANCRIN, FRANZ LUDWIG VON (1738-1796), a German mineralogist and metallurgist, was born in 1738 at Breitenbach. After acting as professor and holding municipal offices in Hesse and at Altkenirchen, he at-

tracted the notice of the Empress Catherine of Russia, who made him director of the salt-mines of Staraja-Russa, councillor of the Imperial College, and, three years before his death, councillor of state. He is the author of a large number of works in German on mineralogy and metallurgy, of which the most important, the *Grundzüge der Berg- und Salzwerkskunde*, published at Frankfort in 13 vols., during the years 1773–1791, has been translated into several languages. He died in 1796.

CANDAHAR. See KANDAHAR.

CANDELABRUM, in Classical Antiquities, a stand for a lamp or lamps, usually of such a height as, when placed on the floor, to be serviceable to a person seated or reclining on a couch. The material varied according to the circumstances of the owner; only those of bronze have survived; but they are many. Generally the form consists of a heavy base resting on three spreading claws. From the base rises a tall usually fluted stem, branching out at the top into two or more arms from which the lamps were hung. On candelabra of this simple form the only place available for ornament was the top of the stem, on which a statuette or a group of figures could be placed; and it appears that very many of the small bronze statuettes now existing in museums had originally served this purpose. Or the lower part of the stem, immediately above the base, could be converted into a figure supporting the stem, as may be seen in several very beautiful examples in the British Museum. There was, however, no limit to the extent to which the original form might be departed from, as many of the candelabra from Pompeii show.

CANDESH, or KANDEISH. See KHANDESH.

CANDIA, the modern name of the island of CRETE (*q.v.*)

CANDIA, formerly the capital and still the most populous city of Crete, to which it has given its name (see CRETE), is situated on the northern shore somewhat nearer the eastern than the western end of the island, in 35° 20′ N. lat. and 25° 9′ E. long. It is still surrounded by its extensive Venetian fortifications; but they have fallen into disrepair, and a good part of the town is in a dilapidated condition, mainly from the effects of earthquakes. The principal buildings are the pasha's palace, the mosques, which are fourteen in number, the two Greek churches, the Armenian church, the Capuchin monastery, the bazaars, and the baths. The town is the seat of a Greek archbishop, and one of the churches ranks as a cathedral. The chief trade is in oil and soap, both of which are of excellent quality; 900 tuns of the former were exported in 1873, and of the latter 40,000 cwts. The coasting trade, which is of considerable importance, is mainly carried on in Turkish vessels. The manufacture of leather for home consumption is an extensive industry, and wine of good quality is produced in the neighbourhood. The harbour, which had grown almost inaccessible, was deepened by Mustapha Pasha between 1820 and 1840. It is formed for the most part by the ancient moles, and was never deep enough to admit the larger vessels even of the Venetians, which were accustomed to anchor in the port of the neighbouring island of Standia. A short distance from St George's Gate there is a small village exclusively inhabited by lepers, who number about seventy families. The population of the town is estimated at from 15,000 to 18,000, about two-thirds being Turks. Candia, or as it is frequently called, Megalo Castro (the Great Fortress), occupies the site of the ancient *Heracleion*, the seaport of *Gnossus*, and is still known by that name to the Greek speaking population. The ruins of the mother city are situated at the distance of about two miles and a half to the S.E. at the village of Makri Teikos or Long Wall. Founded by the Saracens in the 9th century, Candia was fortified by the Genoese in the 12th, and was greatly extended and strengthened by the Venetians in the 13th, 14th, and 15th centuries. It was besieged by the Turks under the Vizier Aelmet in 1667; and, in spite of a most heroic defence, in which the Venetians lost 30,000 in killed and wounded, it was forced to surrender in 1669. (Spratt's *Travels in Crete*, 1865.)

CANDIAC, JEAN LOUIS PIERRE ELIZABETH DE MONTCALM DE, a child of astonishing precocity, born at the Château de Candiac, in the diocese of Nîmes in France, in 1719. At four years of age he read Latin, either printed or in manuscript; and at six he understood Greek and Hebrew, had an astonishing acquaintance with arithmetic, history, geography, and heraldry, and had read many of the best authors. His extraordinary powers attracted the attention of the learned; and it was for his benefit that the typographic board was contrived by M. Dumas, who superintended his instruction. He died at Paris in 1726.

CANDLE, a cylindrical rod of solid fatty or waxy matters, enclosing a central fibrous wick, and designed for giving light.

The raw materials mostly used for candles are tallow and palm oil; they are also made from wax, cocoa-nut oil, paraffin, spermaceti, the mineral wax called ozokerit, &c. For ordinary tallow candles, the mutton or ox tallow, taken as soon as possible after separation from the carcase, is sorted, cut into pieces, and melted in a pan; the membranous matters, which are known as *graves* or *cracklings*, collect at the surface; and the liquid tallow, after being strained through a sieve and washed with boiling water, is ready for use. The candles are made either by dipping or by moulding.

The common tallow candles, however, are greatly inferior, both as regards illuminating power and absolute expense, to those now obtained from raw fats by processes based on the researches of some French chemists. The stearine or stearic acid industry, which is now of large proportions, originated in M. Chevreul's discovery that fats are composed of one or more inflammable fatty acids combined with a comparatively uninflammable base, glycerine. Thus, tallow or palm oil consists of palmitic, stearic, and oleic acids, with glycerine. An economical method of separating the acids and the glycerine was first discovered in 1831 by De Milly, who used lime for the purpose, in place of potash and soda, the substances adopted by Chevreul and Gay-Lussac in their patent of 1825. The factory established by De Milly and Motard near the *Barrière de l'Étoile*, in Paris, gave the "star candles" their name.

In this saponification by means of lime, the melted fat is stirred some hours with a mixture of lime (about 14 per cent. of the weight of the fat) and water. The lime combines with the acids to form a soap, and the glycerine, dissolved in the water, is then run off. Next, the lime soap is decomposed, under heat, by means of sulphuric acid, which unites with the lime, the fatty acids being set free. 100 parts of the fatty acids, at this stage, give on an average 45·9 parts of a mixture of stearic and palmitic acids. The acids are washed with water, and allowed to cool and solidify. They are then pressed in press bags, both in the cold state and with application of heat, to expel oleic acid, which is liquid. After further purification, they are ready to be made into "stearine candles."

Various other methods of saponification have come into practice. Thus it was found that the amount of lime in the foregoing process might be greatly reduced if the mixture were heated to a higher temperature with superheated steam. In another method, sulphuric acid is added to the fat, and the mixture is heated. The black mass produced is washed with boiling water till all the fatty acids are completely freed from sulphuric acid. Then they are distilled with the aid of superheated

steam, cooled and pressed. This process offers advantages in treatment of impure and refuse fats, but it involves some waste of fat. Distillation has been dispensed with in the simpler process of De Milly (who found that fat could be saponified with sulphuric acid without formation of tarry matter), and more recently in that of Bock. According to the latter, most neutral fats consist of small fat spherules, with thin albuminous skins. A little strong sulphuric acid introduced, under given conditions, has the effect of partly carbonizing the skins and liberating the neutral fat, which is then ready for decomposition by boiling with water in open vessels. The fatty acids obtained after decomposition (they are about 94 per cent. of the original fat) are of a dark colour, from the presence of portions of the carbonized skins. By suitable oxidation with acid, the colouring matters are rendered precipitable. The fatty acids are afterwards pressed. A method of saponification specially suitable for palm oil is that of heating the substance in a still to a temperature of 290° to 315° C., and passing a current of superheated steam through it. Saponification by water under high pressure seems to have been first observed by Faraday in 1823; and the process has been developed industrially by Tilghmann, Melsens, and others.

The wicks of candles are generally of cotton-yarn, and, to secure good steady combustion, they should be of uniform thickness, and free from knots or loose threads. The parallel threads of the wick are commonly twisted into a loose spiral. Plaited wicks were introduced by Cambacérès, his object being to do away with the necessity of snuffing. Through twisting of the plaited wick as it burns, the protruding end is kept just outside the flame, and consumed to ash by the surrounding air. In stearine candles, the combustibility is often aided by impregnating the wicks with a solution of boracic acid; a glass bead is formed at the top of the burning wick through the action of the acid on the constituents of the ash, and this by its weight turns the wick out of the flame. Another form of wick for stearine candles is prepared by first winding cotton-yarn round a wire. The covered rod is inserted in the mould, and after moulding is withdrawn from its covering, which remains as the wick. Machinery is now used in making various kinds of wick.

In the production of candles by dipping, the wicks are first arranged in pendant position on sticks on a frame corresponding in size to the dipping-trough, and each frame is suspended from one of a number of cross arms projecting from and jointed with an upright beam which turns on pivots. The workman turns these arms round, and as each frame comes over the dipping-trough, he presses the frame down, so that all the wicks are immersed in the tallow. This coats the wicks with one thin layer; the arms are then turned round, and each frame, as it successively arrives over the cistern, is treated the same way. The layer of tallow added in the dipping becomes consolidated before the turn comes for that set of candles to receive a second dip; and the arms are turned round and the candles dipped again and again, until all have acquired the requisite thickness and weight, which is known by a counterpoise fixed to the arm.

In the process of moulding, on the other hand, a number of slightly conical pewter moulds (ten to eighteen), finely-polished inside, are fixed by the larger extremity to a kind of trough, their taper ends projecting downwards. The wick is then fixed in the centre of the mould by being drawn through an aperture at the point of the mould which forms the upper end of the candle, and is retained in its place at the open extremity within the trough by means of a wire or other arrangement. The liquid material, being poured into the trough, fills all the moulds, and as soon as it is solidified, any redundance is removed and the candle drawn out of the mould by the end of the wick which has been held by the wire. Moulding-machines are in common use, in which as one set of candles is discharged from the moulds, the latter are, by the same movement, rewicked for the next process of filling. A reel of wick is connected with each mould. The discharged candles are held in a horizontal position, while a knife severs the wicks. Before receiving the fat, the moulds are slid on a railway into a hot closet to be heated. Each machine holds about 200 frames of moulds, and each frame contains 18 bobbins, each of which at first has 60 yards of cotton wick.

The *stearine* candles are made by moulding. A difficulty arose from the tendency of stearic acid to crystallize in large foliated crystals, the candles produced being thus irregular in structure and brittle. The remedy at first adopted was the addition of a little arsenious acid, but this proved detrimental to health. The method now employed is to mix 2 to 6 per cent. of white wax with the stearic acid when molten, or to add about 20 per cent. of paraffin.

Wax is a material not very suitable for moulding on account of its contraction in cooling and adhesion to the moulds. Several varieties of wax, besides that of bees, are used in candle-making. The wax is first submitted to a bleaching process; and the candles are generally made by ladling molten wax upon the wicks from a large basin over which they are suspended from an iron ring. When the proper thickness has been acquired, the candles are taken down and rolled on a marble slab, or wooden table, and are then cut and trimmed. Where wax candles are made by the hand, the wax, being kept soft in hot water, is applied bit by bit to the suspended wick. Presses have been contrived for making wax candles; they are of similar arrangement to those for making continuous lengths of lead and block-tin pipes. The wick is so directed that it is concentrically surrounded with soft wax when ejected from the spout of the cylinder of the press, thus forming a continuous candle, which is afterwards cut up into lengths. Wax tapers of various thickness are produced by drawing the uncut wick through molten wax in a pan, then through a draw iron provided with somewhat conical apertures, arranged like those for wire-drawing, in the side of the vessel. The waxed wick is wound very slowly on a drum, the wax having time to solidify in its passage. The process may be repeated several times with drawing irons of increasing aperture.

Paraffin, now largely made into candles, is obtained from native petroleum (Rangoon oil), or from the products of dry distillation of peat, brown coal, Boghead mineral, lignite, bituminous schist, or ozokerit. The paraffin of candles is generally a mixture of several paraffins having different melting points. A little stearic acid (5 to 15 per cent.) is usually added, in order to make the candles more rigid, and in some instances to raise the temperature of fusion; it also facilitates colouring. The candles are moulded much in the same way as stearine candles. The molten paraffin, however, is solidified suddenly by immersion of the warm moulds in cold water, the paraffin being thus prevented from becoming crystalline and opaque. For black paraffin candles the paraffin is heated with anacardium shells, the resin of which is dissolved by it.

The mineral wax or paraffin known as *ozokerit* is found in the Carpathian Mountains, Galicia, Bohemia, and elsewhere. At the low temperature of 66° C. it becomes fluid, and other less fusible substances can then be added. Dr Letheby has observed that the light of 754 ozokerit candles equals that of 891 paraffin, or 1150 wax candles. *Spermaceti* is the solid matter obtained from the oil of the sperm whale by filtration. In further preparation for candles it is hardened and whitened by pressure, and refined by a weak

alkaline ley. A little wax or paraffin is added to prevent crystallization. Sperm candles have a high illuminating power, and notwithstanding their costliness, a considerable trade is done in them. The well-known *composite* candles are made of a mixture of palm-acid and the stearine of cocoa-nut oil in various proportions. *Belmont sperm* is made of hot-pressed distilled palm-acid; *Belmont wax* of the same mineral tinged with gamboge. *Night lights* are short thick cylinders of fat, with a very thin wick, calculated usually to burn from six to ten hours. In making them, the melted fat is poured into shallow moulds having movable bottoms, with a projecting wire which moulds a narrow tube for the wick. By pressing up the bottom the cylinders of fat are ejected; a wax-covered wick supported on a small piece of tin is afterwards inserted, and is cemented at the bottom part by pressing the night light on a warm porcelain slab. *Child's night lights* are made in paper cases of the nature of pill boxes, having a hole in the bottom through which the tin-supported and waxed wick has been inserted.

A candle is a simple but ingenious contrivance for supplying a flame with as much melted material as it can consume without smoking. If the thickness of the candle be properly adapted to that of the wick, the fatty matter immediately below the flame is melted, so that a cup-like reservoir is produced, always properly filled for feeding the flame. The fibres of the wick act as a congeries of capillary tubes which convey the fluid fat into the flame, where, being exposed to a high temperature and sheltered from the air by the outer shell of flame, it becomes subjected to a dry distillation. The inflammable vapour thus produced rises, and by constant combustion diminishes in quantity and consequently in diameter, until at length it entirely disappears in a point. A current of air from below is produced by the heat of the flame; the oxygen of the air, aided by the high temperature, decomposes the inflammable vapour of the fat into hydrogen and carbon, and unites with these to form water and carbonic acid.

The interior dark part of a candle or other flame contains unignited inflammable vapour which will not of itself support combustion; it may be drawn off with a glass tube and ignited at a distance. According to Frankland, the luminosity of an ordinary candle, lamp, or gas flame is due, not, as commonly supposed, to the separation of solid particles of carbon, but to that of very dense hydrocarbons, which produce the same effect as the vapours of arsenic and phosphorus in their respective flames.

The excise duty of ½d. per lb. on tallow candles, and 3½d. per lb. on wax and spermaceti candles, was repealed in 1832. (A. B. M.)

CANDLEMAS, a church festival, held on the 2d of February, which has in Scotland been chosen as one of the four term-days. The festival commemorates the purification of the Virgin; and the observances to which it owes its name, viz., the lighting of candles, and, in the Roman Catholic Church, the consecration of the candles which are to be used during the year for ecclesiastical purposes, are said to have an emblematical reference to the prophecy of Simeon that the child Jesus should become "a light to lighten the Gentiles." The institution of this feast dates probably from the reign of Justinian, and the year 542 is sometimes fixed upon as that of its first celebration. It is supposed to have grown out of the heathen festivals held in this month,—a view which is supported by the following considerations:—(1), The word February (connected with *februare*) denotes purification; (2), in this month the purification of the people took place; (3), the rites of the Lupercalia, which were celebrated on the 15th, included the lighting of candles, in allusion to those used by Ceres in her search for Proserpine; and (4), the origin of other Christian feasts appears to have been similar.

CANDLESTICK, in the earlier meaning of the word, was the name applied to any form of support on which lights, whether candles or lamps, were fixed; and so it happens that what would now be called a candelabrum is still sometimes spoken of from tradition as a candlestick, *e.g.*, as when Moses was commanded to make a candlestick for the tabernacle, of hammered gold, a talent in weight, and consisting of a base with a shaft rising out of it and six arms, and with seven lamps supported on the summits of the six arms and central shaft. When Solomon built the temple, he placed in it ten golden candlesticks, five on the north and five on the south side of the Holy Place; but after the Babylonish captivity, the golden candlestick was again placed in the temple, as it had been before in the tabernacle by Moses. On the destruction of Jerusalem by Titus, it was carried with other spoils to Rome. Representations of the seven-branched candlestick, as it is called, occur on the arch of Titus at Rome, and on antiquities found in the Catacombs at Rome. The primitive form of candlestick was a torch made of slips of bark, vine tendrils, or wood, dipped in wax or tallow, tied together and held in the hand by the lower end, such as are frequently figured on ancient painted vases. The next step was to attach to them a cup (*discus*) to catch the dripping wax or tallow. See CANDELABRUM.

CANDLISH, ROBERT SMITH, D.D. (1806–1873), an eminent Scottish clergyman, was born at Edinburgh on the 23d March 1806. His father, who was a teacher of medicine, having died a few weeks after his birth, the widow and family removed to Glasgow, where young Candlish was brought up and educated. In 1818 he entered the University of Glasgow, and after a curriculum of five sessions, during which he carried off many honours, he duly graduated M.A. Entering immediately on his professional studies, he passed during the years 1823–26 through the prescribed course at the divinity hall, then presided over by Dr Stevenson MacGill. While carrying on his studies he had been largely occupied, according to the common Scotch practice, with private teaching, and on leaving the divinity hall he accompanied a pupil as private tutor to Eton. On the termination of this engagement in 1829, he entered upon his own proper work, having been licensed to preach during the summer vacation of the previous year. He was employed for two years as assistant to the minister of the parish of St Andrews, Glasgow, and he subsequently occupied a similar situation for about the same period in the parish of Bonhill, Dumbartonshire. In each case the entire duties of the charge devolved upon him, and he fulfilled them with characteristic energy and zeal. It was not until 1834, after he had offered himself for service in Canada, in the belief that he was not to find a sphere of labour at home, that he obtained a settled charge as minister of the important parish of St George's, Edinburgh. Here he at once took the place he so long held as one of the ablest preachers in Scotland. Destitute of natural oratorical gifts, and somewhat ungainly in his manner, he attracted and even rivetted the attention of his audience by a rare combination of intellectual keenness, emotional fervour, spiritual insight, and power of dramatic representation of character and life. His theology was that of the Scottish Calvinistic school, but he combined with the narrowness that springs from strong conviction the breadth that springs from tender sympathy. With such qualities it was natural that he should gather round him one of the largest and most intelligent congregations in the Scottish metropolis.

From the very commencement of his ministry in Edinburgh, Candlish took the deepest interest in ecclesiastical questions, and he soon became involved as one of the chief actors in the struggle which was then agitating the church. His first Assembly speech, delivered in 1839, placed him at once among the leaders of the party that afterwards formed the Free Church, and his influence in bringing about what is known as the Disruption was inferior only to that of Chalmers. As a debater he had powers of the highest order, which would have won for him a foremost place in any deliberative assembly. Great as was his popularity as a preacher, it was in the ecclesiastical arena that his ability chiefly showed itself, and probably no other single man had from first to last so large a share in shaping the constitution and guiding the policy of the Free Church. He was actively engaged at one time or other in nearly all the various schemes of the church, but special mention should be made of his services in the Education Committee, of which he was convener from 1846 to 1863, and in the unsuccessful negotiations for union among the non-established Presbyterian denominations of Scotland, which were carried on during the years 1863–73. In the Assembly of 1861 he filled the moderator's chair.

As a theologian the position of Candlish was perhaps inferior to that which he held as a preacher and ecclesiastic, but it was not inconsiderable. So early as 1841 his reputation in this department was sufficient to secure for him the nomination to the newly-founded chair of Biblical Criticism in the University of Edinburgh. The appointment was, however, not ratified by the Home Secretary in consequence of a representation made in the House of Lords, by the earl of Aberdeen, that Candlish had set himself in opposition to the law of the land by preaching in the parish of Huntly in spite of an interdict from the Court of Session. By a somewhat curious coincidence a second appointment to a professorship was also nullified, though in this case by his own act, and after a few months' tenure of the office. In 1847 Candlish, who had received the degree of D.D. from Princeton, New Jersey, in 1841, was chosen by the Assembly of the Free Church to succeed Chalmers in the chair of divinity in the New College, Edinburgh. After partially fulfilling the duties of the office for one session, he was led to resume the charge of St George's, the clergyman who had been chosen by the congregation as his successor having died before entering on his work. In 1862 he was again connected with the New College, being appointed principal in succession to Cunningham, with the understanding that he should still retain his position as minister of St George's. Some months before this he had obtained the assistance of a colleague in his pastoral work, but he continued to preach, with one or two intervals of somewhat protracted illness, until within a short time of his death, which occurred on the 19th October 1873.

Though his greatest power was not displayed through the press, Candlish made a number of somewhat important contributions to theological literature. In 1842 he published the first volume of his *Contributions towards the Exposition of the Book of Genesis*, a work which was completed in three volumes several years later. In 1854 he delivered, in Exeter Hall, London, a lecture on the *Theological Essays* of the Rev. F. D. Maurice, which he afterwards published, along with a fuller examination of the doctrine of the essays. A treatise entitled *The Atonement; its Reality, Completeness, and Extent* (1861) was based upon a smaller work which first appeared in 1845. In 1864 he delivered the first series of Cunningham lectures, taking for his subject *The Fatherhood of God*. Published immediately afterwards, the lectures excited considerable discussion on account of the peculiar views they represented. Further illustrations of these views were given in two works published about the same time as the lectures, one a treatise *On the Sonship and Brotherhood of Believers*, and the other an exposition of the first epistle of St John. Among his other works were *Life in a Risen Saviour; Scripture Characters; Reason and Revelation;* and *The Christian's Sacrifice and Service of Praise*. A posthumous volume of sermons with a short prefatory biographical sketch appeared in 1874.

CANDOLLE, AUGUSTIN PYRAME DE. See DE CANDOLLE.

CANE, a name applied to many plants which are possessed of long, slender, reed-like stalks or stems, as, for example, the sugar-cane, the bamboo-cane, or the reed-cane. From the use as walking-sticks to which many of these plants have been applied, the name cane is improperly given to sticks irrespective of the source from which they are derived. Properly it should be restricted to a peculiar class of palms, known as ratans, included under the two closely allied genera *Calamus* and *Dæmonorops*, of which there are a large number of species. The plants are found widely extended throughout the islands of the Indian Archipelago, the Malay Peninsula, China, India, and Ceylon; and examples have also been found in Australia and Africa. They were described by the learned Rumphius, under the name of Palmijunci, as inhabitants of dense forests into which the rays of the sun scarce can penetrate, where they form spiny bushes, obstructing the passage through the jungle. They rise to the top of the highest trees and fall again so as to resemble a great length of cable, adorned, however, with the most beautiful leaves, pinnated or terminating in graceful tendrils. The plants creep or trail along to an enormous length, sometimes, it is said, reaching 500 feet. In the Paris exhibition of 1855 two examples of *Calamus verus*, measuring respectively 270 and 230 feet, were exhibited. The stem in few cases exceeds 1 inch in diameter, and it is mostly of much smaller dimensions. When growing it is sheathed in a base of numerous leaves, which the natives, in preparing the canes for the market, strip off by pulling the cut plant through a notch made in a tree. The canes always present distinct rings at the junction of the sheathing leaves with the stem. They assume a yellow colour as they dry; and those imported from Calcutta have a glossy surface, while the produce of the Eastern Archipelago presents a dull exterior.

Canes, on account of their lightness, length, strength, and flexibility, are used for a great variety of purposes by the inhabitants of the countries in which they grow. Split into thin strips they are twisted to form ropes and ships' cables, an application mentioned by Captain Dampier in his *Voyages*. A more important application, however, is for basket-work, and for making chairs, couches, pillows, &c., as the great strength and durability of thin and easily-prepared strips admit of such articles being made at once airy, strong, and flexible. Much of the beautiful and elaborate basket-work of the Chinese and Japanese is made from thin strips of cane, which are besides used by the Chinese for larger works, such as door-mats, houses, and sheds. The use of cane as a material for constructing bridges in Ceylon is mentioned by Sir James E. Tennent, and Dr J. D. Hooker instances a similar application of the material in his *Himalayan Journal*.

A very large trade with Western countries and the United States is carried on in canes and ratans, the principal centres of the trade being Batavia, Sarawak, Singapore, Penang, and Calcutta. In addition to the varieties used for walking-sticks, whip and umbrella handles, &c., the common ratans are in extensive demand for basket-making, the seats and backs of chairs, the ribs of cheap umbrellas, saddles, and other harness-work; and generally for purposes where their strength and flexibility make