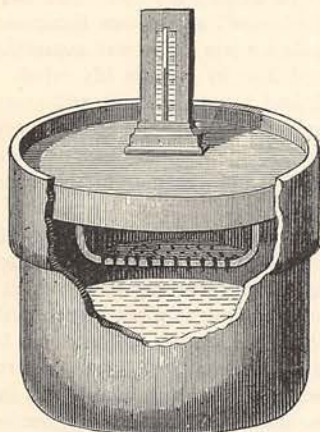


## THE GATHERER.

### A Seed Germinator.

M. Keffel, a French horticulturist, has devised a useful germinator for testing the vitality of seeds. A



cylindrical vase, as shown in the figure, contains a layer of water several inches deep. Over this is a curved disk containing 100 small holes, in which are placed the grains to be tested, the sprouting ends pointing downwards to the liquid. Sand is then placed over the seeds, and the germinator taken to a place free from draughts, where the temperature is kept at 18° Centigrade (equal to about 60° Fahrenheit) or thereabouts, and in twenty-four hours the seeds will be found to germinate. The warmth and moisture are essential to the result. A thermometer rises from the cover to tell the degree of warmth the seeds experience.

### A Fireless Locomotive.

M. Francq, a French engineer, has just been awarded a Montyon prize for perfecting a fireless locomotive, and applying it to traction on railways and canals. The locomotive in question takes in a sufficient supply of steam from a fixed generator to last a trip of the train or vessel, and thus the necessity of carrying coals and a furnace is obviated. A reservoir containing hot water is charged with steam at the beginning of each trip. A line of tramway between Rueil and Marly, another between Lille and Roubaix, and a tow-boat on the Canal de l'Est are now being worked by M. Francq's locomotive.

### Grape-Seed Oil.

Oil from the grape-seed is now used in Italy for illuminating purposes. As extracted at Modena, thirty-three pounds of grape-seed yield about thirteen quarts of oil, or about eighteen per cent. The seeds of the black grape yield more oil than the white varieties, and those of young vines are more prolific than old stocks. The colour of the oil is golden yellow, and twenty-five per cent. is lost in the process of purification.

### Cast-Iron Boilers.

Cylindrical steam-boilers with cast-iron heads are now in common use in America. These have been tested by experiment, and found to be perfectly safe when the pressure is not excessive. They are found to outlast the wrought-iron shell.

### Natural Coke.

A vein of natural coke is reported to have been discovered in New Mexico, at the town of Los Cerrillos. The vein is three feet thick and lies between strata of bituminous and anthracite coal. The coke has the appearance of the manufactured article, and burns with a clear bright flame. It is said to burn better than the ordinary oven-coke, and has probably been made by volcanic heat acting on a bed of bituminous coal.

### Effects of Cold on Microbes.

Microbes, the insidious germs of so many diseases, are extremely difficult to kill with cold, as the recent researches of MM. Pictet and Yung have shown. Tubes of glass containing various kinds of microbes, such as bacillus, bacteria, vaccine-lymph, micrococcus, were subjected for 108 hours to a cold of 70° Centigrade below freezing point, followed by 20 hours' exposure to a temperature of no less than 130° C. below freezing point; and though the pox-lymph, yeast, and some of the micrococcus had lost their powers and were evidently dead, the bacillus and bacteria were apparently as active and virulent as ever.

### A New Fog-Horn.

Mr. Bryceson has invented a continuous blast fog-horn, which gives a sustained note for as long as may be desirable. The length of blast can be regulated at will, and therefore the horn may be used for telegraphing by its sound, after the plan proposed by Sir W. Thomson, who suggested that light-houses should flash their distinctive names like a heliograph. Recent trials of this fog-horn made on Blackwall Reach for the Trinity House Committee and the Admiralty, proved that the blasts of the horn could be heard  $\frac{3}{4}$  of a mile in the teeth of a north-east wind, and over 1 $\frac{1}{4}$  miles with the wind.

### Remarkable Uses of the Telephone.

A match between the Cardiff and County and the Swansea Chess Clubs was played recently by the help of the telephone. The postal authorities gratuitously placed the two towns in telephonic communication, and the match resulted in a victory for Cardiff. Marriages by telephone are no longer a novelty in America; and recently the King and Queen of Portugal, being prevented by a royal decease from publicly



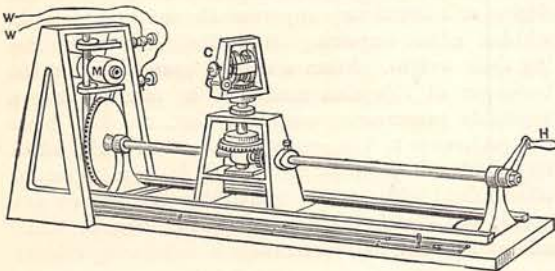
attending a musical performance, had it wired to the palace by telephone, and listened to the music there.

#### Electric Light Conductors.

The question of providing suitable conductors for conveying the strong electric currents probably soon to be used for illuminating purposes on a large scale, is a serious one. If copper be used the cost will be enormous. Again, what size must the conductor be to carry a current sufficient to light, say 10,000 lamps, without over-heating it and causing fire? Electricians are now settling these important points, and among them, Professor G. Forbes has pointed out that iron is clearly the best suited in point of cost. This was Mr. Edison's original idea; but Professor Forbes shows that the conductors should be in the form of a flat sheet, giving a large radiating and therefore cooling surface. Professor Forbes also shows that these conductors, if covered by heat-absorbents, such as plaster of Paris, may convey a much larger current for a short time (say the several hours of night that the light is wanted) without over-heating, than they would do if the current flowed continuously. This is due to the fact that the absorbent absorbs the heat almost as fast as it is generated, and keeps the wire cool. Plaster of Paris, however, is not suitable if over-heated, as it becomes conductive, and the current would escape through it from the wire.

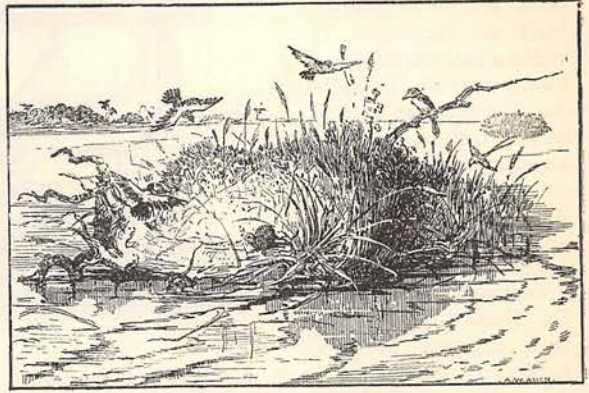
#### A Watch Demagnetiser.

The most valuable chronometer watches are sometimes rendered useless by being magnetised, and it is satisfactory to find that Mr. Hiram Maxim, the electrician, has devised the machine we illustrate for removing every trace of magnetism from a watch without taking the works out of the case. The watch is firmly clamped at C, and the handle, H, turned for a minute, when every trace of magnetism is found to have disappeared. The principle on which the demagnetiser works, is to rotate a powerful bar electromagnet, M, on a vertical spindle on a level with the watch, which is gradually withdrawn from the neighbourhood of the magnet, while at the same time



revolving round in front of it. These movements are effected by turning the handle, H. The wires, w w, convey an electric current to the magnet to magnetise it. In this way, by rapidly changing the magnetism of the watch, while lessening it at each change, the

demagnetism is effected. Mr. Maxim's apparatus is in daily use for demagnetising impaired watches; but for those who have the facilities, it may serve the purpose to revolve a bar-magnet near the watch, while gradually withdrawing the latter by hand. The revolving poles of some dynamos may be used instead of the magnet.



#### A Floating Reed Island.

Our illustration represents one of the floating islands which are found in Stanley Pool and on the Congo. These are masses of aquatic vegetation closely matted together, and often strong enough to bear the weight of a man. They are borne along by the swift current of the river, and are peopled with various forms of vegetable and animal life, which are thus transported a long way from their original homes. It is highly probable that such natural rafts have been the means of distributing species in past ages.

#### A Ventilated Garden-Frame.

The glass hand-frames now in use have the drawback that they exclude fresh air from the plants. At the same time a ventilating screen should be such as not to create a draught. M. Reynier, a Frenchman, has introduced a frame on this principle. Holes are drilled in the bottom end to admit the air, but this does not blow directly on the plant. On the contrary, it is curved upwards to the glass by a curving guard-plate or gutter running along the interior opposite the holes. A chimney or bent pipe proceeding from the other end of the frame and rising into the air carries off the waste air.

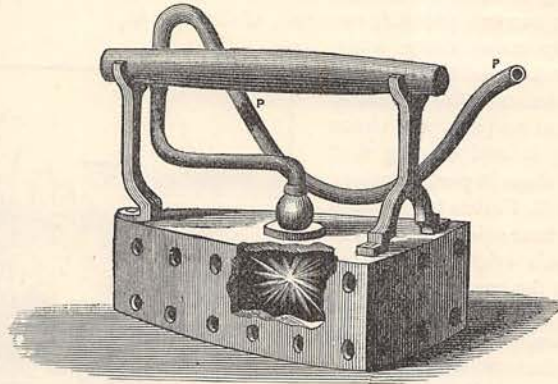
#### Solid Carbonic Acid.

Professor Landolt, of Berlin, recently exhibited a cylinder of solid carbonic acid to the Physical Society of that city. It was prepared by allowing a stream of liquid carbonic acid to flow from a Naterer compressing vessel into a conical cloth bag. The bag became filled with a loose snow of carbonic acid, which was stamped into a solid form. Cylinders of solid carbonic acid made in this way can be touched gently by the hand, and resemble lumps of chalk in appearance, but are far more brittle and cannot be cut by a knife. The specific gravity of the solid acid is 1.2.



### A Gas Flat-iron.

An American inventor has introduced a flat-iron which is kept hot by a gas-flame burnt in the hollow interior of the iron. Our engraving illustrates this useful device; P being the flexible india-rubber pipe conveying the gas to the burner, which is inside the hollow box-like body of the iron. It yields a uniform temperature, hence the linen is not likely to be singed, and it can be used for any length of time without cooling.



### Pictures in Stone.

For some years past Dr. Hand Smith has been engaged in perfecting a process for producing pictures beneath the surface of marble, ivory, terra-cotta, and various other dense substances, thereby combining the twin arts of painting and sculpture. By using metallic oxides as pigments, worked in a special medium and fixed by a special treatment, he is now able to produce designs and paintings within the stone. Every hue and tint applied penetrates at right angles to the surface without soaking laterally. Samples of the new art were recently exhibited at Piccadilly Hall, and included decorative scrolls and delicate paintings of foliage and flowers. The process is applicable to statuary, pottery, and architectural mouldings.

### A Giant Orchid.

Our engraving illustrates a splendid orchid of great size which Mr. H. H. Johnston, the African traveller, has found growing in clumps out of shallow pools on the banks of the Congo. The botanical name is *Lissochilus giganteus*, and the plant rises to a height of six feet. The flower is of a red-mauve colour, with golden centres, and is to all appearance one of the most beautiful in the world. The leaves are light green in hue, and of a spear-like shape. "Their tall swaying flower-stalks," says Mr. Johnston, "grow in groups of forty to fifty together, often reflected in the shallow pools of stagnant water round their bases,



and filling up the foreground of the high purple-green forest with a blaze of tender peach-like colour, upon which no European could gaze unmoved."

### A Cheap Lightning-Rod.

In France, America, and some other countries, iron lightning-rods are coming into use in preference to

copper ones, which are very expensive. In Canada a church was recently protected by a round iron rod three-quarters of an inch in diameter, welded at each joint. The upper end of the rod was drawn to a point, and a damp ground connection was provided at the lower end. The rod was secured to the church by galvanised iron staples, and the total cost was under £3. Some caution is necessary in regard to earth or ground connections of iron and copper lightning-rods. It is sometimes stated that the end of the rod should be buried in a pit containing coke or charcoal, but this is a very unsatisfactory "earth;" for the damp of the ground, collecting

round the rod, forms a voltaic element of the iron (or copper) and carbon, which facilitates the decay of the latter. The iron or copper rod had better be soldered to gas or water piping running under ground, where such is available; and failing that, to a plate of copper buried in a moist spot. A French experimenter recommends painting copper rods with minium or peroxide of lead, which preserves them from decay, and is at the same time a conducting material.

### Etching on Glass.

A Sydney newspaper is now illustrated by typographic etchings done on glass by a process due to Mr. H. S. Crocker. The drawing is made by a resisting crayon of waxy material, and hydrofluoric acid is used to "bite" the glass on the exposed parts which the crayon does not protect. The glass plates are cemented down on metal blocks for use in the printing machine like the ordinary electrotype "block."

### Tanning Linen.

M. Piron, a Belgian, has invented a method of rendering cellulose tissues impermeable and very durable, without either impairing their flexibility or increasing their weight. From a careful examination of the bandages of Egyptian mummies he inferred that a vegetable preservative would be best, and has given the preference to the green tar of birch-bark, which furnishes the perfume of Russia leather. The tar when mixed with alcohol penetrates the tissues and covers them with a tanning varnish. The aromatic odour of the tar, and its freedom from injuring colours, are greatly in its favour, as the first keeps away insects, and the second prevents the dyes from changing.

### The Dynamo and the Telegraph.

Trials have recently been made at Berlin, on the Government telegraph lines, of the electricity supplied



by the dynamo machine for telegraphing, in preference to that produced by the voltaic battery; and with the result that, for long lines requiring from twenty-five to eighty voltaic cells to work them, the dynamo current was very suitable, and much more economical than the battery current. For small local offices, however, the battery is the more convenient apparatus.

#### Voting by Electricity.

An electric vote recorder is now being exhibited at Washington. At the desk of each voter is a small lever, which when turned to the right means "Yes," and when to the left means "No." The vote is recorded on paper in the tellers' room, and a bell and annunciator further signal it. All danger of error is guarded against, and the member need not leave his seat.

#### A Neolithic Roadway.

The Rev. C. W. Markham, of Saxby Rectory, Barton-on-Humber, has described a newly-discovered wooden way unearthed by some excavators in the Valley of Ancholme, near Brigg, in Lincolnshire, and some seven feet below the surface. The roadway consists of massive oak beams laid transversely, and fastened by oak pins into the soil below, which is "glacial drift." The way extends nearly a mile across the valley, and is thought by experts to be a relic of neolithic or "new stone age" man in England. Above the roadway are six feet of solid clay, and one foot of peat which appears to have been in existence in Roman times.

#### A Marine Gyroscope.

The gyroscope is a well-known scientific instrument for illustrating the tendency of a wheel, or other revolving body, to keep its position by virtue of its rotational velocity. It is in fact a scientific spinning-top. The ordinary top tends to revert to its upright position when spinning, if it be displaced by the finger; and in the gyroscope the plane of the axis round which the rotating mass spins tends to keep the same direction in space. This property has been applied by M. Dubois as a means of telling the angle through which an ironclad turns in performing her evolutions; the plane of the axis of the spinning gyroscope being the zero or reference line from which the angle is measured. Tried recently on the French ironclad *Turenne*, it was found that she could turn through one degree or angle in one and a half seconds.

#### An Automatic Flute.

Mr. Victor Smedley, an American, has devised the automatic flute which we illustrate. It is simply a white-iron flute of six holes, having a sheet of paper drawn over it, with square holes cut where the notes are to come. The paper plays the part of fin-

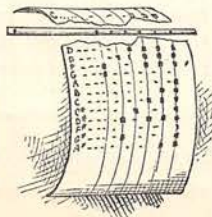


FIG. 1.

gers in the ordinary way of using the instrument. Fig. 1 shows the flute and a paper of this kind opened out; while Fig. 2 shows the flute with its mounting,

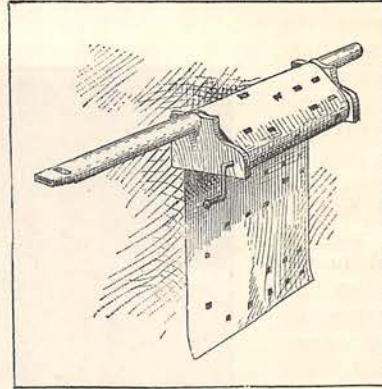


FIG. 2.

and a handle to turn in order to move the paper and play a tune. The apparatus is so simple that any one can make it with a little trouble and the requisite musical knowledge—that is, if they consider it worth making.

#### A Sodium Battery.

Mr. Jablochhoff, the well-known inventor of an electric lamp, has lately produced a new variety of battery which, in a scientific sense, is very interesting. It gives an electromotive force far higher than that of any other known voltaic combination. Each cell consists of a thin plate of the metal sodium connected with carbon, and the humidity of the air is sufficient to set the element working. The electromotive force is four volts, or about that of four Daniell cells coupled in series; but it can be raised to six volts by impregnating the carbon with certain metalloidal solutions. The battery should be kept in naphtha except when it is active, to prevent the sodium absorbing oxygen so rapidly as to take fire.

#### Danger from Flies.

Dr. B. Grassi has called attention to the fact that flies are winged instruments in carrying infection from place to place. They have a habit of alighting on moist substances, whatever they may be, and hence are defiled by virus. Dr. Grassi has exposed moist matter impregnated with the eggs of parasites, and found these afterwards deposited on sheets of note-paper hung on the wall. The specks of dirt which flies leave on mirrors, and other smooth surfaces, may therefore be contaminated by dangerous germs. Since flies are very apt to settle on human food, it seems impossible to prevent them from disseminating disease. In countries where flies are numerous, and even in England, it behoves persons to guard themselves against this danger as well as they can.

#### An Electric Mountain Railway.

The Hôtel des Alpes at Territet, Chillon, is to be connected by an electric railway with the Hôtel de



Mont Fleury on the mountain-side, some 800 feet above Chillon. Between the two rails is a rack which gears with a pinion attached to the locomotive. This pinion is to be driven by electricity through the agency of a dynamo. The dynamo supplying the electric current will be driven by a turbine worked from a neighbouring waterfall, and the current will be conveyed to the dynamo on the locomotive by means of copper cables laid beside the rack, and brushed by the ordinary copper "brushes" for tapping the current.

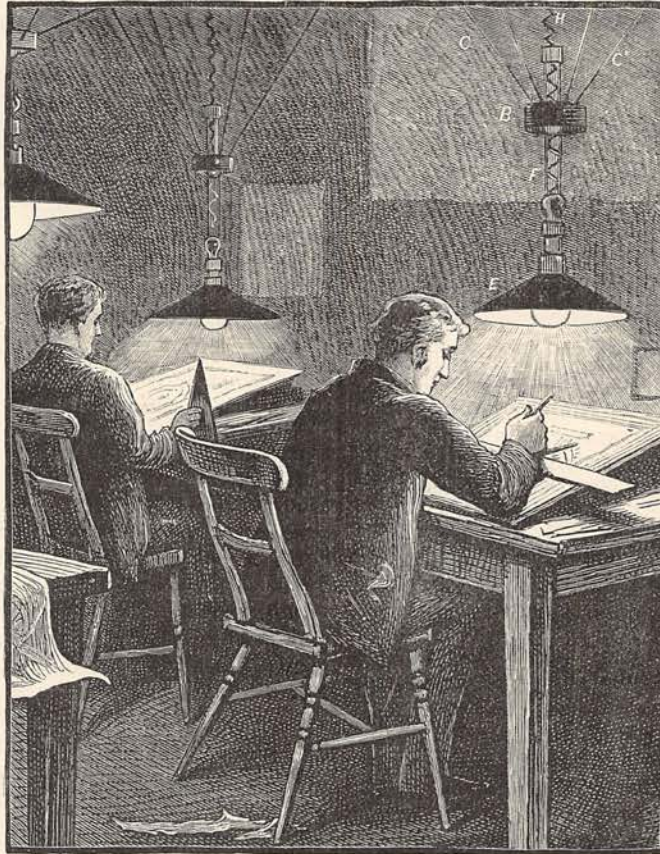
#### New Applications of the Electric Light.

At the new University College, Dundee, the drawing office attached to the engineering classes is lighted by Swan 100-volt incandescent lamps. Each table is detached, and allows a student to work by himself. Over it is suspended an electric lamp from four points of the ceiling by two cords, which allow the lamp to have a sidelong and to-and-fro motion, so that it can be shifted over the drawing in order to avoid shadows thrown by the squares employed. The lamp has also an up-and-down play of a few inches. The figure illustrates the mode of suspension by the cords C C. Wires convey the current by a flexible conductor, H, to the lamp E, which can be moved up and down the rod F. The piece B, from which the lamp immediately depends, is of wood, and perforated with two holes through which the cords run.

In crucible-making, the crucibles are carefully examined inside for flaws, and this is done after dark, at

present, by means of a gas-jet, which is inserted into the crucible. Owing to the fumes and flame, however, this is inconvenient and disagreeable; and one of the largest firms have adopted the electric light for the purpose.

Small 5-candle incandescent lamps, fed by the primary battery of Mr. H. Thame, are employed. Ten cells of this battery keep from five to seven lamps at work.



NEW APPLICATION OF THE ELECTRIC LIGHT.

#### Telegraphing 7,000 Miles.

A feat in telegraphy has lately been accomplished upon the overland Indo-European line. London, Emden on the Baltic, Odessa on the Black Sea, Teheran in Persia, Kurrachee, and Calcutta were connected up, and messages were sent and received over this enormous length of wire—some 7,000 miles—at the rate of from twelve to fourteen words a minute, with an ordinary Morse

printing instrument. In 1866 only one message traversed this distance in twenty-four hours.

#### A Sinking Mountain.

An isolated mountain termed Jebel Naiba, about 25,000 feet high, situated near Bona in Algeria, is found to be rapidly decreasing in height, and around its base a considerable cavity has formed. The whole mass of the mountain is evidently sinking; and the environs of Bona seem to show that a similar phenomenon has taken place there before. Lake Fezarra, now some thousand acres in extent, did not exist in the time of the Romans, and investigations made in 1870 show that its bed was once the site of a Roman town.

*The Editor begs to remind his readers that the Extra Holiday Number of "Cassell's Magazine," entitled "SUMMER DAYS," is published with this Part, and may be obtained through all Booksellers, or at the Railway Bookstalls. Price 7d.*