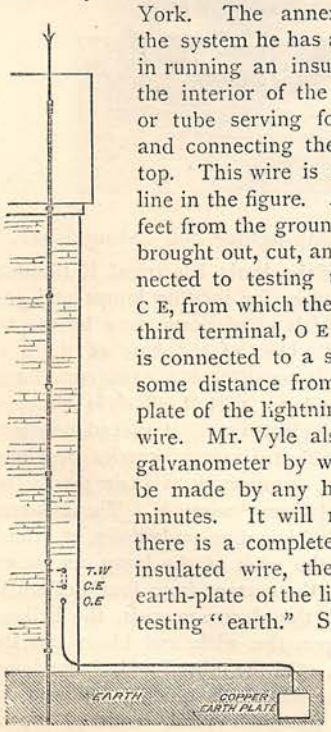
THE GATHERER.

A Cheap Gas.

A cheap gas specially designed for heating purposes has been introduced by Mr. Dowson, and is likely to be largely used in households, or for driving gas-engines in electric lighting. It is made by passing a mixture of steam and air into red-hot anthracite coal, thereby causing combination of the carbonic oxide and hydrogen. The combined gas, after being purified from sulphuretted hydrogen and dust, is ready for use. It is free from tar and ammonia, and is therefore cleanly in preparation ; it does not burn with a smoky flame, and therefore produces no soot, even when the object to be heated is held over it ; and, moreover, it does not require so great a draught to burn it as ordinary coal-gas. These points are advantageous in soldering operations, lacquering, coffee-making, enamelling, ironing, and so on. The cost of the gas is only 3d. per 1,000 cubic feet, or under 1s. for the equivalent power of 1,000 cubic feet of ordinary coal-gas, as about four times the volume of anthracite gas is necessary to give equal power with coal-gas. For motive-power and gas-stoves there is thus an economy of some 60 per cent. in using Dowson's gas.

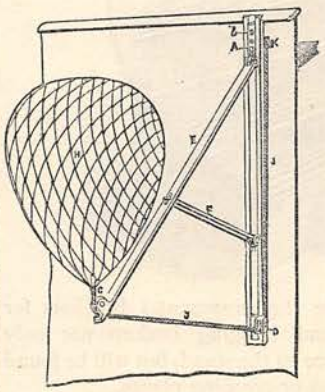
A Testable Lightning-Rod.

It is always advisable to have the means of testing a lightning conductor, to see if it is in good working order, and provision is specially made for this in the conductor introduced by Mr. Samuel Vyle, and exhibited by him at the British Association meeting in York. The annexed woodcut shows the system he has adopted. It consists in running an insulated testing-wire up the interior of the copper or iron rope or tube serving for the lightning-rod, and connecting the two together at the top. This wire is shown by the dotted line in the figure. At a point about four feet from the ground, the testing-wire is brought out, cut, and the two ends connected to testing terminals, T W, and C E, from which the tests are made. A third terminal, O E (ordinary "earth"), is connected to a special earth-plate at some distance from the common earth-plate of the lightning-rod and insulated wire. Mr. Vyle also provides a simple galvanometer by which these tests can be made by any householder in a few minutes. It will readily be seen that there is a complete circuit through the insulated wire, the lightning-rod, the earth-plate of the lightning-rod, and the testing "earth." Should anything have interrupted this circuit, the testing-galvanometer will at once show it.



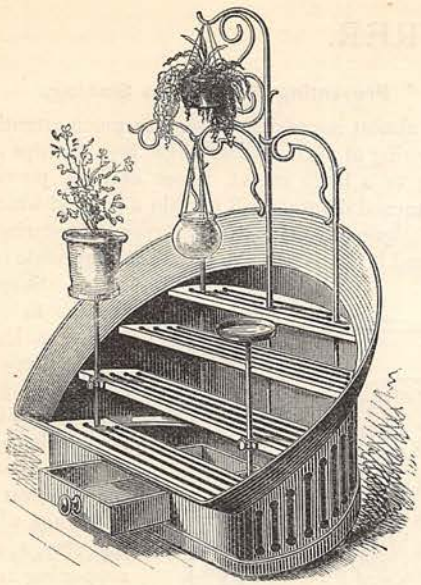
Preventing Ships from Sinking.

It is almost impossible to pay too much attention to the devising of means whereby the loss of ships at sea may be to a large extent, if not entirely, prevented. The annexed diagram will explain a method which has been designed by Mr. R. G. Sayers of securing this end ; and it consists in the use on a large scale of air-bags. Suppose a vessel to have sprung a leak, or to be otherwise in a foundering condition, each of the flexible bags, H, is filled with air with the greatest despatch, the wing, E, and stay, F, of the supporting apparatus being meanwhile fixed in the position shown in the cut ; the bar, B, is then lowered into the grooves provided for it in the fixed bar, A, and is fastened to the ship's side by two or more bolts, *b*. The end of the rope, J, having next been passed through a hole in the vessel's side and over the pulleys, K, D, and C, to a winch or windlass, the bag is thrown overboard and hauled down into the water, as represented in the woodcut. These processes should be completed in eighteen minutes from the time of the accident ; and as each bag is separate from the others, several can be filled and adjusted in position, according to the number of hands at command. The wing, E, and stay, F, act as fenders, helping to keep the bag from swaying against the ship during a heavy sea or gale of wind.



A Portable Window Garden.

A display of flowers is always a handsome ornament to a sitting-room, but the keeping of them often occasions a good deal of trouble and inconvenience, especially when they are contained in a number of separate pots. The flower-stand represented in the accompanying woodcut will obviate all difficulties, for it will suit most window recesses, and may be regarded as a stationary article of furniture. Its construction will be evident from the engraving, and it is intended both for the support of flower-pots and vases, and for hanging baskets, fish-globes, &c. The capacity of the stand is increased by two or more vertical rods with cup sat the upper end for holding flower-pots. The rim around the stand, besides supporting the foliage, prevents the water from getting on to the floor during the sprinkling process. As it is capable of accommodating a considerable number of plants, it makes, when properly filled, a very choice



window garden, while the ornamental brackets for holding fish-globes and hanging baskets not only lend additional elegance to the stand, but will be found useful for training vines or creeping plants.

A Cloth Measurer.

The mode of measuring cloths in vogue at most drapers' shops strikes one as being exceedingly primitive. It certainly involves trouble and, in the case of re-measurement, loss of time, and may perhaps be liable to a certain amount of abuse either against salesman or purchaser. The woodcut represents a really most ingenious appliance for obviating these difficulties, by mechanically registering each yard of material as it is measured off, in view of all parties to the transaction. Fig. 1 shows the manner of fastening the device to the counter; in Fig. 2 the working parts are exhibited. The plate, A, is let into the counter, a projecting knob being laid down three feet distant. To this plate, a case, B, is attached, containing a wheel, C, whose circumference is numbered from 0 to 40 (or more or less if required). These numbers show through an opening, M, in the plate, A, and are visible to both shopman and customer. A lever, E, pivoted in the case, B, carries a pawl, F, which engages the ratchet, D, on the side of the wheel, C, the pawl being furnished with an arrangement for preventing the ratchet from moving more than one tooth at a time. The ratchet wheel, D, is engaged by a retaining pawl, G, against which the

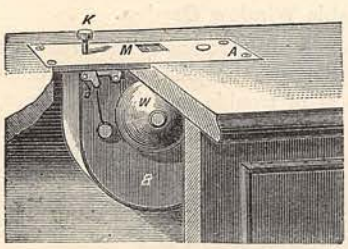


FIG. 1.

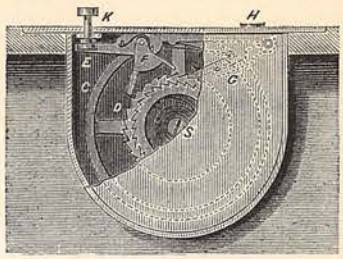
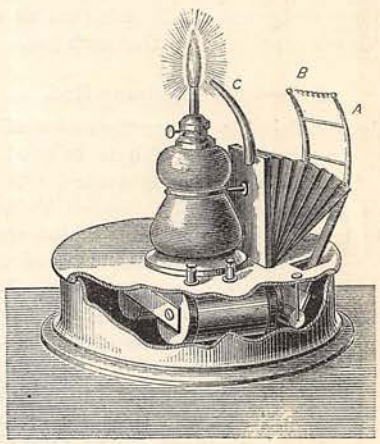


FIG. 2.

teeth of the former are pressed by a spiral spring, S, in the centre of the wheel, C. The pawl, G, is provided with an arm extending backward and engaged by a button, H, which reaches through the top plate, A. The wheel, C, is advanced one number at a time by pressing the knob, K, at the end of every yard measured, when a bell, W, at the side of the case, B, rings, indicating audibly that one yard has been measured. This operation gradually winds the spring in the centre of the wheel, C, and when the measuring has been completed, all that is needed to bring back the numbers to 0 is to release the wheel by pressing the button, H. Whether or not this invention will ever come into extensive use we cannot tell, but there can be no doubt that it is a highly ingenious piece of mechanism, apparently well adapted to secure the end in view.



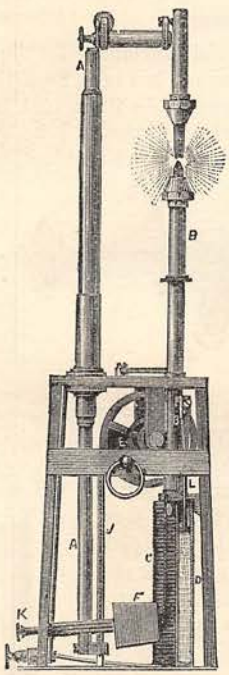
An Automatic Lamp-lighter and Extinguisher.

The minor stalls of the Paris Electrical Exhibition were very rich in devices for lighting lamps and gas by means of fine spirals of platinum wire heated by the electric current. One of the best of these is sketched herewith. It consists of a petroleum lamp placed on a wooden base, part of which is removed to show a horizontal electro-magnet placed beneath. The armature of this electro-magnet carries two long stems of copper, A, connected at their points by a fine spiral of platinum wire, B. These stems actuate also a small blow-pipe or bellows, C, which is directed towards the wick of the lamp, as shown in the figure. When the current from four Leclanché cells is sent through the electro-magnet, the bellows shoots a jet of air upon the wick, and blows out the lamp if it is burning. On the other hand, if the lamp is out the blast of the whistle is quickly followed by the approach of the platinum spiral, rendered incan-

descent by the current, and the heat of the latter lights the flame. Thus the lamp can be either extinguished or lit by letting on the current, which is performed by simply pressing a button on the base-board.

The Jaspar Electric Lamp.

One of the best electric lamps exhibited at the Paris Electrical Exhibition was that of M. J. J. Jaspar, Liége. It is operated by the current from a Gramme dynamo-electric machine, and consists of two carbon holders, A and B, carrying vertical carbons, between the points of which the arc is formed by dissipation of the carbon in the electric stream. The width of the arc is regulated by a pulley, E, over which passes a cord, J, which is counterpoised by the weight, F. The current from the Gramme generator enters the lamp by the terminal screws, K, and passes through the electro-magnet coil or bobbin of insulated wire, C, then through the two carbons, thus establishing the luminous arc. The electro-magnet coil is hollow and in its interior is suspended a core of soft iron, which is connected to one end of the cord passing over the pulley, E. The other end of this cord is fastened to the bottom of the upper carbon holder, A. Now when the arc becomes too wide, the attraction of the current in the bobbin on the soft iron core is weakened, because the current itself is enfeebled, and the result is that the core rises in the interior of the bobbin. But this allows the cord passing round the pulley to slacken, and consequently the upper carbon holder sinks down, thereby lowering the upper carbon nearer to the lower and shortening the arc. On the other hand, should the arc become too short, the current in the bobbin is increased, and the attraction of it on the core increases likewise. The core is therefore pulled down, and consequently the upper carbon holder is raised, thus separating the upper carbon from the lower. In this way the normal width of arc is preserved and a steady light obtained.



The Rocket Torpedo.

A torpedo intended to move along the surface of the water at a very rapid rate has recently been tested at the Torpedo Station, Providence, Rhode Island, U.S. It consists of a floating framework of wood, 11 feet long, covered with tin-plate. In the head are lodged fifty pounds of dynamite, and the tail is fitted with a pair of rudders like the flys of a sky-rocket. The vessel is propelled along the surface of the water at a speed of 150 feet per second, by means of a burning rocket three feet long. It is simply aimed straight at a ship or any other object, and is guided in its passage by the rudders. The experiments in question proved that the rocket was not sensibly affected by a high wind. It travelled 1,375 feet in about nine seconds, at the same time giving off a dense smoke and emitting a roaring sound.

Tests for Water.

A simple method of ascertaining if water is free from organic pollution, is to cork up a small bottle nearly full of it, after putting in a piece of lump sugar. If on letting it stand in the light for two or three days no milky cloud becomes visible, and the water retains its clearness, it may be considered free from sewage phosphates. To test for iron, take a glass of the water and add a few drops of infusion of nutgalls, or suspend a nutgall in it by a thread for twenty-four hours. If iron is present the water will have become dark brown or black. Prussiate of potash is a still more delicate test for detecting iron. If iron is present a crystal of prussiate dropped into the water will immediately turn it blue. Magnesia is detected by boiling down the water to a twentieth of its bulk, and dropping a few grains of carbonate of ammonia into a glassful of it. No magnesia will yet be precipitated; but on adding a small quantity of phosphate of soda, the magnesia if present will settle on the bottom of the glass. For this test, however, the carbonate of ammonia should be in a neutral condition.

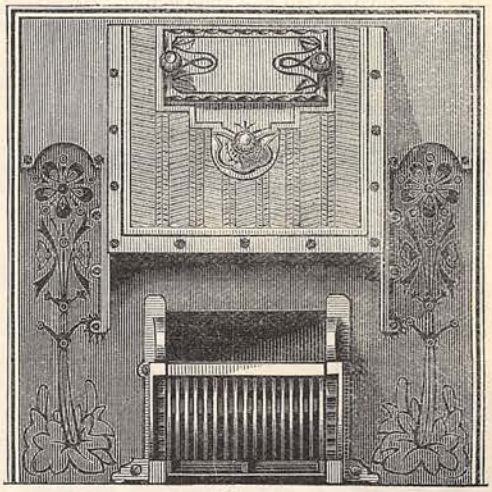


FIG. 1.

A Grate for Anthracite.

The "Wonderful" grate—as it is called by its inventor—is adapted to burn anthracite coal, and is therefore suitable for hospitals, sick-rooms, and public halls, where smoke ought especially to be avoided. Fig. 1 shows the grate in front view, and

Fig. 2, a section through it from face to back. As will be seen from Fig. 2, the grate swings on an axis, on which it is counterpoised by weights, F, in such a manner that its capacity can be increased or diminished at pleasure. The fuel is supplied by a kind of hopper, D, in the morning, and enough can be put into the hopper to last twenty-four hours. From the grate rise two flues, E C, and in the front flue, C, is a damper, worked by a handle, B. On closing this damper the products of combustion are compelled to flow down through the anthracite in the grate and up through the rear flue, E. The combustion is, therefore, very complete, and the heat given out intense. When slower combustion is required, the damper, B, is opened and the action is then similar to that of an ordinary grate.

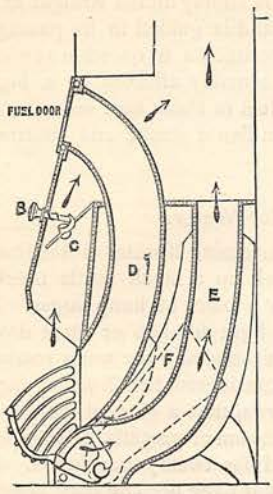


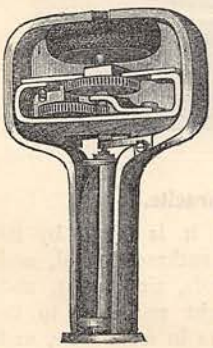
FIG. 2.

The Microphone as a Sonometer.

It has been found by experiment that the resistance of the contact of the two pieces of carbon in a microphone increases in proportion to the intensity of the sound affecting it, and Herr Oberbeck has applied the fact in the construction of a sonometer. He places the microphone in one arm of the electrical arrangement well known as the Wheatstone Balance, and by measuring the resistance of the contacts by its means, he determines the intensity of the sound. The apparatus is not, however, equally sensitive to all sounds, and therefore cannot be called a practicable one, although in a scientific sense it is very interesting.

A Magneto-electric Brush.

To those who believe in the efficacy of electrical stimulation, the new magneto-electric brush which we illustrate will recommend itself as an article of toilet.



The brush is circular, and is mounted on an axle which communicates its motion by means of a train of wheels to a Siemens revolving coil or armature, which rotates between the poles of a permanent magnet. The result is that a current of electricity is generated in the armature, and from thence is led to the brush, which is made of fine metal wires. To the ordinary effects of friction there is therefore added the stimulation of electricity.

Binding a Broken Shaft.

A simple device for clamping the broken shaft of a vehicle without loss of time has been invented by M. Poirot, and is recommended by the Paris Société d'Encouragement. It consists of two screw-presses adapted to the size of the shaft, and connected by a movable rod, to the ends of which are attached a belt with its buckle. To bind the broken shaft one of the presses is fixed firmly on the posterior part; the two broken ends are then brought close together, and the second press is fixed on the anterior part as far as possible from the first press, with the connecting rod on the outside. The belt is then wound tightly round the intermediate splice and the rod, and firmly buckled. The bandage is so secure and strong, that the usual pace of the vehicle can be resumed.

The Gastroscope.

A very ingenious and successful instrument for illuminating the interior of the stomach has been brought out in Vienna by Herr J. Leiter. As illustrated in Fig. 1, it consists mainly of a rigid horizontal tube, *a*, fitted at one end with an eye-piece, L, and terminating

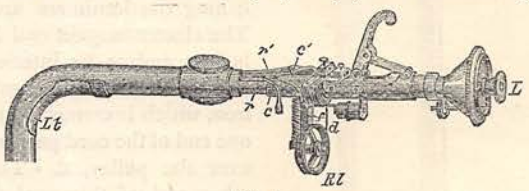


FIG. 1.

in a flexible tube (Fig. 2), which can be passed down the throat into the stomach. This tube is formed of sixty metal rings jointed together at the sides in a way which admits of the tube bending to suit the passage of the gullet. At the end is fixed a tiny lantern, Z, consisting of a small loop of platinum wire, *Pt*, enclosed in a double envelope of glass, K *k*. The ends of the platinum loop are connected to wires which run up inside the tube, and are joined to the poles of a voltaic battery or a small dynamo-electric machine. The current renders this loop brightly incandescent, and the light streams out on the walls of the stomach. Part of the rays are reflected back from the walls into the window of the tube marked O, and are reflected up the tube by means of a prism fixed within it. They are then made parallel by lenses, also in the tube, and again deflected by prisms round the bend of the tube, *Lt* (Fig. 1), from whence they proceed to the eye-piece, L, where they present to the observer a picture of the internal wall of the stomach which is opposite to the window, O. To prevent discomfort from increase of temperature due to the hot platinum wire, the space between the two glass envelopes is filled with cold water, which is kept circulating by means of india-rubber pipes, *r r'*, terminating in nozzles, *c c'*. In order to make the end of the tube within the stomach revolve so as to examine the walls

FIG. 2.

of that organ all round, the observer has simply to revolve the little wheel, *Rl* (Fig. 1), round which is stretched the silk cord, *f d*. This cord passes down the tube and round a second wheel within it. The latter wheel is toothed, and gears into a toothed ring fixed within the movable end of the tube, thereby causing the latter to revolve. A small portable battery is provided with the apparatus for the use of surgeons.

A Molecular Telephone.

The novelty in this apparatus consists in dispensing altogether with a thin metallic diaphragm placed before the poles of the electro-magnet. In it the sounds are produced by one pole of the magnet abutting against a piece of any kind of material not too impervious to sound. For example, pieces of wood, glass, ebonite, and cork will answer very well and give a satisfactory articulation.

Foot-gear for Frost.

To those who indulge in games on the ice, such as curling, or have to walk over very slippery roads, the new "foot-anchor" of Mr. Gibbs may prove of service. It consists of a light steel frame, shod with spikes, and is readily applied to ordinary boots and shoes by means of a leather strap. Mr. Gibbs has also extended his ingenuity from men to horses, and provided a pointed stud which can be fitted to the shoes of horses, to enable them to keep their footing in frosty weather. These cogs are simply inserted in tapered holes in the horse-shoe, and are easily removed with the help of a wrench. These temporary devices of Mr. Gibbs will doubtless recommend themselves in a country where hard weather only lasts a short time.

A Water Velocipede.

His Royal Highness the Prince of Wales has introduced an aquatic novelty into England, in the shape of a velocipede for use on lakes and rivers. It is the invention of Captain Lundborg, and is formed of two long boats, connected firmly together and bearing a platform on which are placed seats for the passengers, and the pedals by which the two paddle-wheels are turned. The mechanism is very simple and admits of two persons working it with their feet while seated in the rear of the platform, as shown in the engraving. The craft has frequently been used by the Prince and Princess of Wales on the Virginia Water at Windsor; and we understand that Captain Lundborg is now constructing a similar one to be driven by a small steam-engine.

The Sorcery of the Telegraph.

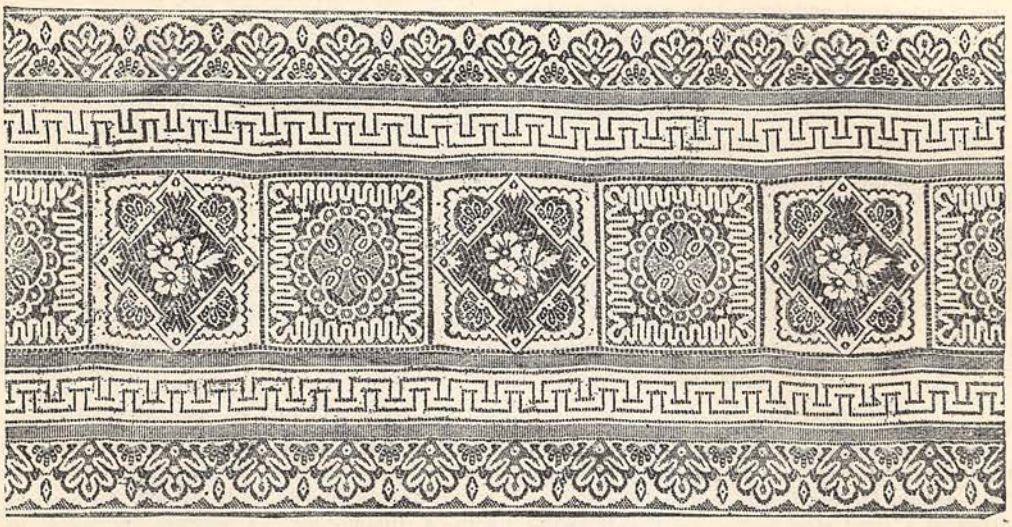
In the Norwegian section of the Paris Electrical Exhibition, there was an interesting specimen of the depredations sometimes made by animals on telegraph lines. A stout telegraph pole of pinewood is shown having a hole bored through and through it, large enough to admit the fist of a man. The woodcut illustrates the irregular nature of this cavity, which has been pecked out by the black and green wood-peckers of Norway. These birds will sometimes peck through a thick pole in a single night, and the explanation of their attack is that they are deluded by the humming of the pole, caused by the vibrations of the wire, into the belief that insects are lurking in the interior. In the same way the Norwegian bear is found to attack the poles, apparently under the impression that a swarm of bees have made their honeyed nest within. This explanation is all the more credible when we recall the experiments made by Mr. Boys on spiders with a tuning-fork, as already reported in the GATHERER. Mr. Boys found that the spiders mistook the sounding-fork for the buzzing of flies and other insects on which they prey. Still another instance of the witchery of the telegraph exists in Norway, since in the mountain districts there it has driven away the wolves, either because of the humming noise made by the poles, or the ensnaring appearance of the wires, for it is well known that wolves are scared by strings suspended on poles.

A Steam-engine without a Boiler.

A steam-engine without a boiler seems at first sight a paradoxical machine, nevertheless an engineering firm at Leobersdorf, near Vienna, are now constructing them after the designs of Herr Hock. It consists of a furnace enclosed in fireproof masonry, and water spray is injected into it above, whilst a blast of air is sent through the bars below. The resulting mixture of steam and gases, or "air steam" as it is called, is cooled by water and sent to the engine through a sieve which keeps back the dust. One advantage of the new process is a saving of fuel at the rate of one kilogramme per effective horse-power. Moreover, the expansive power of the gases generated by the coal is also utilised by this arrangement; and the risk of explosion is said to be diminished.

Celluloid Clichés.

We have already described the manufacture of that useful substance, celluloid, in a former number of the



GATHERER; but a recent application of it to engraving deserves a further mention. In fact, *clichés* or blocks for printing illustrations are now made from it, as well as from copper. The celluloid while in a soft state receives the impression of the engraved wood, and after twenty minutes is become so hard that it will bear a pressure of 250 kilogrammes. The counter-impression which serves for printing from is then taken from the latter by means of sheet celluloid. Prints of lacework are taken by the celluloid with remarkable clearness, and the accompanying illustration is a fac-simile of a lace border printed from a celluloid cliché. It is not unlikely that the more roundabout process of cutting the block, and producing copies of it by electrotype, may be superseded to a great extent by celluloid clichés.

Phosphorescent Ice.

A curious phenomenon has been observed by Mr. J. Allen in the Arctic regions. Whilst voyaging in these parts, and watching the floating ice at night, he noticed that every time the ship struck a block, it glowed with an appreciable light. The effect is probably similar in kind to the phosphorescence given out by sugar when it is broken, flints when they are struck together, or mica when it is cloven in the darkness.

A Universal Calculator.

Inventors seem to have found a peculiar fascination in the production of machines for saving the brain-labour involved in long and intricate calculations; but the so-called "calculating machines" have rarely been of much practical value. The invention of logarithms, and the after-preparation of logarithmic tables, were, however, of almost incalculable assistance to mathematicians; and the well-known slide-rule—an apparatus widely used for technical calculations—is, after all, only an application of logarithms. The Universal Calculator recently patented by the inventor, Mr. J. B. Fearnley, of Castleford, is a further extension of the principle of the straight slide-rule, being in fact the same rule placed on a flat revolving spiral, thus increasing the length from 5½ to 340 inches. Circular slide-rules have been made in France, but the spiral form certainly seems to possess many advantages. The "Calculator" consists of a mahogany box, which when open shows a white japanned surface, in the centre of which is a circular tray containing a dial, tray and dial being made to revolve separately or conjointly. The dial is marked with a series of spiral volutes, and the numbers on its face run up to 10,000. From the centre of the dial run two threads, one fixed and the other movable. The method of working could not possibly be explained to any one who did not see the apparatus itself, as each problem involves several adjustments of the tray, dial, and threads. For this reason it is comparatively useless for easy calculations, as they could be made in less time without its aid; but for difficult problems the economy of time and the accuracy of the result recommend it to notice.

Insoluble China Ink.

China ink is made by burning oils in a limited supply of air, and binding the smoke in cakes by means of vegetable saps. It is liable, however, to dissolve when washed over with water-colour, and the corrective discovered by Dr. Precht may be useful to draughtsmen. This consists in using a weak solution of bichromate of potash for the water ordinarily employed to mix the ink.

SONG COMPETITION.

It is hoped that the award to be made in this Competition will be announced in the January Part.