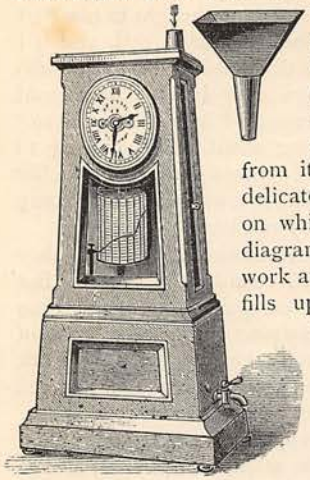
THE GATHERER.

An Indicating Rain-Gauge.

Self-registering gauges of the rainfall at a particular spot have been often invented, but that of Mr. W. Gadd, C.E., appears to be all that is desired. It consists of a cylindrical vessel in which is a float having a vertical stem rising from it, which terminates in a delicate spring pencil. A drum, on which is fixed a prepared diagram, is rotated by a clockwork attached, and as the water fills up the vessel, the float rises and actuates the pencil, which draws a line on the diagram indicating the water-level. As the instrument is kept under cover, the water may be led to the vessel by a pipe from the exposed rain-gauge shown in the right upper corner of the figure. The area of collection can be so proportioned, if required, that an inch of rainfall may be represented on the diagram by four or more inches of space. This large allowance gives great accuracy to the readings.

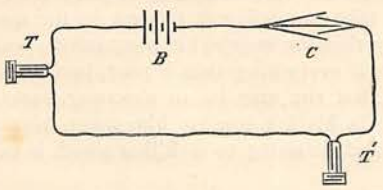


Crayons for Glass-Painting.

M. Lacroix, a Parisian chemist, has introduced a species of crayon which is like an ordinary lead-pencil in appearance, but is made of a colour which can be vitrified by heat. It is intended for drawing designs on glass or other baked ware. The designs are executed on a slightly roughened glass surface, and the vessel is then subjected to the heat of a muffle furnace, which fixes the tints like a painting upon glass.

A New Telephone Transmitter.

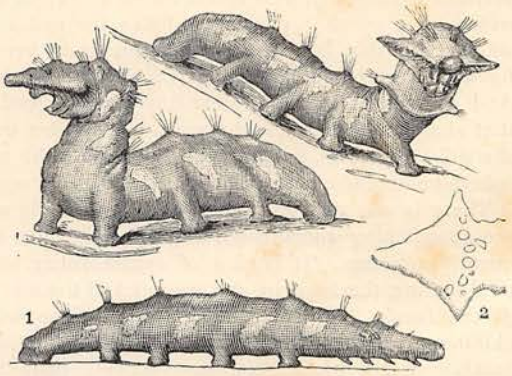
In a recent GATHERER we described the use of an electrical "condenser" as a receiver of telephonic sounds sent by a microphone transmitter. We have now to chronicle the success of the condenser as a transmitter of speech in lieu of the microphone. M.



J. W. Giltay, of Delft, has connected up an ordinary electrical condenser, C, with a battery, B, of thirty Faure "accumulators" and two telephones, T T', as shown in the figure. Then on speaking into the condenser, C, the sounds are heard in the telephones. If a musical box is placed on the wooden base of an ordinary induction coil, and the condenser of the coil is connected up in the manner shown with thirty Faure elements charged with electricity, the music will be heard in the telephones. This result is interesting as a scientific fact, especially as showing that the effects of nature are generally reversible, and the instrument which operates as receiving telephone will also operate as a transmitter. But it is of little practical value, at least in its present state.

Blasting Iron with Dynamite.

An interesting application of dynamite to the breaking up of castings too massive for the hammer was recently made at Chicago. A mass of iron weighing about twenty tons was placed in a ditch, and a charge of dynamite lodged in a hole pierced into the metal. Several pieces of iron weighing a few tons were afterwards laid over the ditch so as to prevent the projection of fragments. The charge was fired by an electric battery some forty yards from the ditch. The explosion blew the casting into pieces.



A Mimicking Caterpillar.

A curious instance of animal mimicry comes to us from Assam, where Mr. S. E. Peal has discovered a caterpillar which when surprised assumes the attitude of a shrew, as will be seen from the accompanying sketch. Mr. Peal was passing through a dense forest when he saw it fronting him on a stout creeper and mistook it for a shrew. When moving quietly along it is prone as in Fig. 1, but when disturbed suddenly takes the pose shown in the upper part of the sketch. Fig. 2 is a plan of the head. The usual colour is neutral to brownish-grey with greenish-yellow spots. Instances are common enough in which

insects mimic each other and different kinds of seeds, leaves, flowers, stones, &c.: the eye and nose of a crocodile are like lumps of dirty foam on the water; the tiger has a hunting call very similar to the cry of the Samber deer; but this of the caterpillar is perhaps the most singular and amusing instance of mimicry on record.

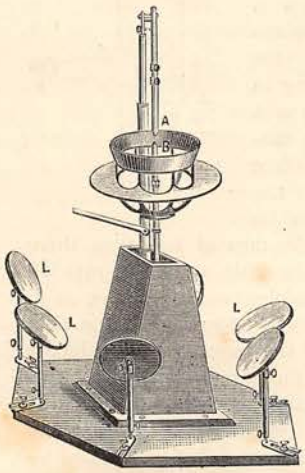


FIG. 1.

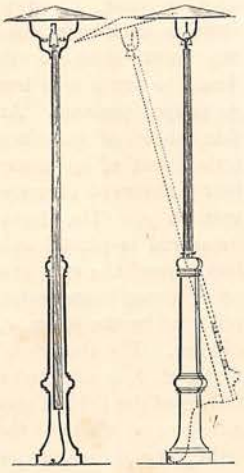


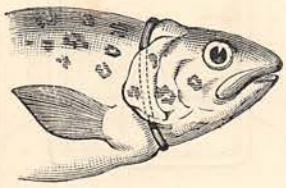
FIG. 2.

Diffusing the Electric Light.

MM. Jaspar and Dumont, two French electricians, have devised a useful mode of diffusing the electric light and fitting it for small rooms. Fig. 1 represents one of their electric lamps, in which A B are the two glowing carbon points, and L L L are a system of lenses or mirrors so placed and mounted that they can direct beams of light in different directions, so as to light up dark corners or recesses opening from the room. The same inventors have also designed the lamp-post or candelabra, shown in Fig. 2, for use in public places. As will be seen from the woodcut, it is capable of being bent down so as to enable the attendant to trim the lamp and add fresh carbons.

A Muzzled Fish.

An india-rubber band round the gills of a fish would seem to be enough to strangle it. Nevertheless Mr. Charles Clarke, of Plymouth, recently caught a trout in the Plym which had a round india-rubber band slipped over its head as shown in the sketch. The band had compressed the gills, and deeply indented the horny part of the lower jaw. How the band got there is a mystery; whether it had been by the wanton mischief of some person or the efforts of the trout to take a bait, we may never know; but that the creature continued to live is very remarkable.

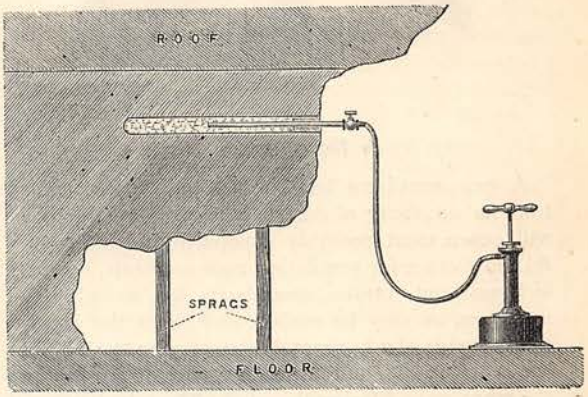


Boring the Channel Tunnel.

The perforator designed by Colonel Beaumont to pierce the grey chalk under the English Channel and tunnel between England and France is a novel piece of mechanism. It consists of a strong horizontal shaft directed to the rock, and carrying a cross-head studded with chisels or cutters, which, when the cross-head revolves with the shaft, breaks down the rock, that is caught in little buckets forming an endless train, which delivers the fragments into a waggon behind the perforator. Thus at a single revolution of the shaft a circular hole six feet in diameter and about half an inch deep is carved out of the rock. The regular advance is at the rate of a yard per hour, and the power being derived from compressed air, the healthy nature of the operation is assured.

Water from Wood.

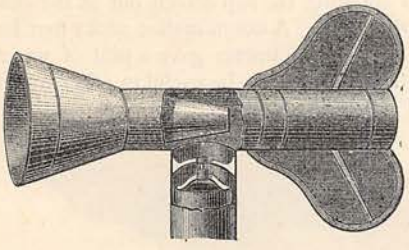
An Australian explorer recently saved himself from dying of thirst in a waterless desert by thrusting the ends of green scrub-wood—"mallec scrub"—into the fire and catching the sap driven out at the other end in a bark trough. A dozen mallec sticks four feet long by two inches in diameter gave a pint of water in an hour. This device may be useful to other travellers in an arid region.



Blasting with Quicklime.

An important discovery has just been made with respect to the use of quicklime as a substitute for blasting-powder in coal-mines, which, speaking from the satisfactory results arising from a series of recent experiments, will, if introduced, tend in all probability to lessen to a great extent many of the dangers arising from the present system. The lime, which must be freshly burnt, is ground to a powder, and then consolidated by pressure into rods 2½ inches in diameter, and with a groove running along each side. These are packed in air-tight boxes to preserve their caustic character. In blasting, the shot-holes are drilled in the block of coal, and an iron tube half an inch in diameter, and having a small external channel or groove on the upper side, and provided also with perforations, is

inserted along its whole length. The tube is enclosed in a bag of calico which covers the perforations, and its distal end, while the other end is furnished with a tap. The lime cartridges are next inserted and lightly rammed so as to insure their fitting the bore-hole. After the cartridges have been enclosed, and by tamping in the same way as with gunpowder, a small force-pump is connected with the tap at the end of the tube by means of a short flexible pipe, and water is then forced in. The water being driven to the far end of the shot-hole through the tube, escapes along the groove and through the perforations and the calico, reaches the lime, and completely saturates the whole charge, driving out the air before it at the same time. The tap is then closed, preventing escape of steam, and the flexible tubing attached to the pipe is disconnected. The action of course is twofold; first the steam, and then the expansive force of the wetted quicklime tends to rupture the block of coal, and in ten or fifteen minutes, when the sprags are removed, the coal falls clean from the roof in large masses remarkably free from dust, and in sizes ready for loading.

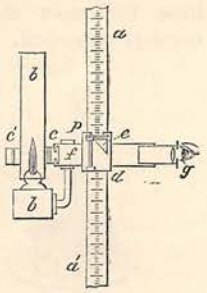


A New Ventilator.

A new ventilator has lately been invented, which from its simplicity of design, efficiency, and durability will prove most probably a popular and highly useful contrivance for ventilating compartments, not only in houses, but in trains, steamboats, &c., as well. The invention, as may be readily seen from the illustration, consists of a horizontal tube carrying two wings or vanes at one end, and having a funnel projecting into the other, or end facing the wind. The tube is pivoted to, and freely revolves on, a vertical pipe, the upper end of which opens into the chamber of the tube immediately below the enclosed tapering end of the funnel. When the wind blows, a partial vacuum is formed of course at the end of the perpendicular pipe, thus producing a good upward draught, but the end being also provided with a valve, the possibility of a downward draught is entirely prevented.

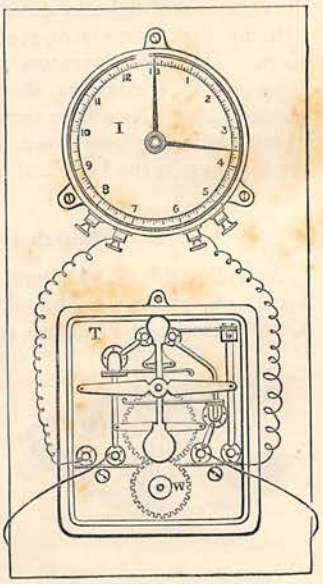
A New Light-Meter.

The photometer recently invented by Mr. R. Sabine, C.E., is based on the principle of quenching the light by passing it through translucent materials. It consists, as shown in the figure, of a square brass box, *d*, on one side of which is a draw-tube and eye-piece with lens, *g*; and on the other side a tube, *f*, carrying a collar by which the paraffine lamp, *b b*, is supported and may be kept in a vertical position at whatever angle the scale is directed. The chimney of the lamp is of copper, and opposite to the bright part of the flame it is provided with a tube, *c*, in which are a thin pane of glass and two diaphragms, and at the back another tube, *c'*, in which is fitted a dark glass for observing from time to time the flame, to see if it is burning in its proper position. At *p* is a thin sheet of translucent material, part of its inner surface being observed directly by the eye at *g*. The light to be measured is placed at a distance of less than three feet beyond the end, *a*, of the scale, so that its rays fall on *p*, whose inner surface is observed by the eye at *g*, reflected by the prism, *e*, which occupies half the field of view. The thickness of the interposed translucent material, *p*, is adjusted till the illuminations of the two halves of the field of view are as nearly equal as this adjustment allows; then the distance between the light to be measured and the face of *p* is adjusted by causing the photometer, which is mounted on rollers, to travel on the scale until the two halves of the field are equally illuminated.



A Water-Level Indicator.

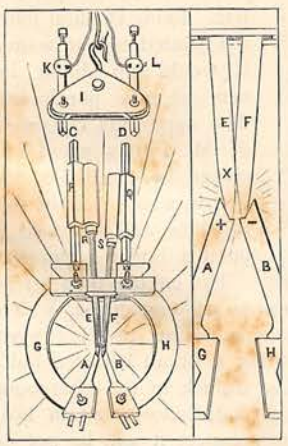
The figure illustrates an electrical apparatus of a new kind, devised by Mr. H. R. Kempe, for indicating the level of water in a reservoir, boiler, or river, at a distant place by means of the electric current. This current is only sent in momentary pulses to work the indicator, because if a continuous current were sent the battery would soon become exhausted. The apparatus consists of a transmitter, T, seen in the lower part of the figure, and a receiver or indicating dial, I, seen in the upper part. The bottom toothed wheel, W, of the transmitter is fixed on the spindle of a drum, around which are wound two metallic cords, one being attached to a float buoyed on the surface of the water, and the other to a counterweight. The movement of the toothed wheel causes a lever unequally weighted at its two ends to turn round until its



heavier end passes just beyond the vertical position, when it topples over, and in so doing makes a momentary contact. The right or left hand movement of the toothed wheel causes this momentary current to be in one direction or the other according to the direction in which the wheel turns, or in other words, according as the float rises or sinks with the water-level. The indicator has its hand fixed to a toothed wheel, which can be actuated in one direction or the other by two ratchets. One of the ratchets is worked when pulses of positive current are sent to the line, and the other when pulses of negative current are sent. They are worked by two electro-magnets having a polarised tongue or armature between the poles, which is free to move to right or left according to the direction of the current through the coils of the magnet. The ratchets working the toothed wheel move the hand of the indicator to right or left round the dial, thus marking the level of the water in feet and inches. The second hand on the dial shows the reading of the instrument at any particular time, so that the rise or fall of water which has taken place since that time can be seen at a glance. At Nottingham the entire water service is fitted with these instruments, one indicator dial being seven miles from the transmitter. Besides the dials at the pumping station there is a row of them in the office of the engineer in town.

Another New Electric Light.

Between the powerful electric arc lamp and the small and comparatively feeble "incandescent" lamp, in which a filament of carbon is kept glowing inside a vacuous glass bulb, there is an intermediate type of electric lamp which has been termed the "semi-incandescent." In this type a pointed pencil of carbon rests on a metal butt, and the electric current, traversing the carbon point to the metal, heats up the point to a brilliant whiteness. The power of such a light is intermediate between the arc and incandescent lamps, while the light is as steady as that of the glowing filament *in vacuo*. Taking advantage of this principle of a heated joint of carbon, M. Emile Reynier, who is a pioneer in this direction, has constructed an incandescent lamp in which the carbon filament glowing in a vacuum is replaced by a pile of carbon buttons contained between two metal pieces, above and below. The current passing through the series of buttons, enclosed in a vacuum, heats them up white-hot. M. Reynier has also constructed a semi-incandescent lamp with multiple points, in which there are three carbon pencils touching one another side by side, and comprised between two metal butts, or electrodes. The current, passing between the metal pieces, traverses the joints between the carbon pencils, and heats their points up to whiteness. Still another, and at present a more practical lamp, has been invented by the same electrician. This is illustrated in the figure, where E and F are carbon pencils resting on copper butts, A B, which are carried by arcs of bronze, G H. The carbons are held by tubes, R S, affixed to weights, P Q, which glide upon two metal guides, C and D. These weights press the carbon downwards, in proportion as they are burnt away at the points resting on the butts. This portion of the lamp is connected to the portion I above, which carries the terminal screws, K L, by which the current enters the system. M. Reynier's lamp is a very good one of its kind, but it is believed by many electricians that the half-and-half semi-incandescent lamps will disappear before the pure arc and incandescent lamps.

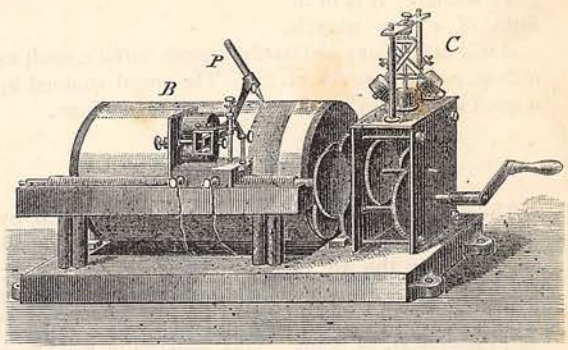


A Lawn-Edge Cutter.

A useful little hand-machine for cutting the edges of lawns and grass-plots has been brought out by Mr. Alfred Ridgway, of Macclesfield. It consists of a circular saw or cutting edge, each tooth of which operates as a knife, cutting down into the turf as the box or roller carrying the shaft and gearing of the cutter is drawn along the edge of the plot.

Plumbago as a Lubricator.

A recent trial with a heavy fly-wheel shaft demonstrates that ordinary black-lead mixed with tallow is an excellent lubricator. Various oils, tallow mixed with sulphur, and gunpowder were tried with poor success, and the engine could only be run for a very short time with these before undue heating of the axle began. But with the plumbago and grease it could be run all day long. The plumbago should, however, be pure.



A Pen-and-Ink Chronograph.

Our illustration is taken from the excellent chronograph now used in the Washburn Observatory, Wisconsin Co., U.S. The barrel, B, is covered with

paper and rotated at a uniform rate by the clockwork, C. The pen, P, is carried by an electro-magnetic arrangement which, when an indicating current is sent at a particular moment, brings the pen-point down on the paper and makes a dot. The ink used in the pen is worthy of note as it does not freeze in winter. It consists of water, four fluid ounces; alcohol, two fluid ounces; concentrated glycerine, one fluid drachm; crystallised aniline blue, forty grains. This mixture is slowly filtered and then stored for use. Such an ink would be very suitable for a pocket stylographic pen.

Painting on Silk.

Some years ago an artist of Florence painted silk in such a way that the surface could be folded up without damaging the picture. Ordinary wear and crumpling did not efface the colours, thanks to the peculiar medium which he employed. The secret of this medium is still guarded, but it is now made and sold to amateurs. A specimen of white satin painted with a cluster of flowers by this Adolfi process has been subjected to hard rubbing without injury to the painting. We may also add that several Italian artists have tried the medium for oil-painting on canvas.

A Tricycle Skate.

The accompanying figure illustrates a novel skate invented by Mr. J. F. Walter. It is in the form of a tiny tricycle, and will act on any ordinarily smooth surface, such as a floor, asphalte street, or ice. The speed attained by a good skater may reach to twenty miles an hour.

A TRICYCLE SKATE.

How to Detect Earth-Tremors.

The sensibility of the earth to vibrations caused by a passing vehicle or other pressure has been brought out of late by the use of the microphone in watching for earthquake disturbances. Another method of investigating the phenomenon has been introduced by Professor H. M. Paul. This consists in sinking a stout post some four and a half feet into the ground, and supporting upon it a dish containing an amalgam of mercury and tin. The brilliant surface of the mercury acts as a reflector, and an image of a suitable object is mirrored in it. When the ground is quite still the image is clear and well defined, but the least tremor of the earth blurs the reflection. In this way an express train passing at a distance of one-third of a mile disturbs the mercury for two or three minutes, and a one-horse vehicle passing 500 feet away affected the mercury each time a wheel mounted over a stone.

The Sun as a Printer.

Apollo was anciently esteemed the god of light, and the words take a new meaning when we find the solar rays actuating a printing press, and furnishing printed copies of a Parisian newspaper. From time to time we have chronicled in the GATHERER the interesting experiments of M. Mouchot in turning the solar heat to mechanical work and pumping water, cooking, and distilling with it. The Mouchot apparatus has recently been improved by M. Abel Pifre, a French engineer, and at the recent fête of *L'Union Française de la Jeunesse*, held in the garden of the Tuileries, his arrangement was employed to print copies of the *Soleil Journal*, an organ of the fête. Being the first journal printed by sunbeams, it would no doubt be very eagerly purchased. The apparatus consisted of M. Pifre's great receiver, a parabolic reflector, which caught the sunshine and focussed it upon a boiler connected with a small steam-engine. The engine thus set in motion actuated a Marinoni printing press, which was attended by one person. The printing went on, we are informed, without a break between half-past one and half-past five o'clock in the afternoon, and the experiment was so satisfactory that in hot, cloudless countries we may expect it will be put in regular use.

Silk-Felt.

The waste silk from wild cocoons gathered in the forests of China, Japan, and Australia is now manufactured into a felt which is made into hats. The inventor of the process is M. Villedieu, and the silk is sometimes mixed with hair, wool, or cotton. The hats are light and soft and present the lustrous appearance of silk.