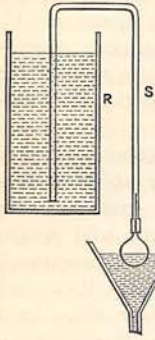


THE GATHERER.

An Automatic Filter.

When a large quantity of water has to be filtered, it is convenient to have a self-acting means of filling the filter. Mr. E. E. Robinson has devised the plan illustrated in the woodcut. To the longer limb, S, of a siphon is attached a short piece of india-rubber tubing, projecting a little beyond the glass tube. The india-rubber tube is closed by the narrow conical stem of a small glass globe, which floats on the liquid in the funnel F. When the liquid in the funnel rises to a certain height, the supply from the reservoir, R, is cut off by the conical stem acting as a stop-valve. This device is likely, we should imagine, to prove useful in other ways.



Barnet's Accumulator.

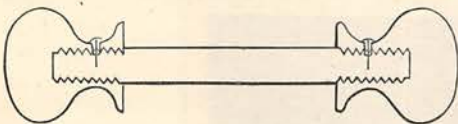
Mr. Barnet has devised a new electric accumulator which, for reasons of patent law, we are not at liberty to describe, but which appears to be an advance on those hitherto invented. The loss of current in ordinary work of electric lighting by its means is stated to be only 10 per cent. This is certainly a better result than other well-known accumulators give. Each battery, as applied to light the trains of the Great Western Railway Company, measures 22 in. by 7 in. by $7\frac{1}{2}$ in. It is provided with foot-plates, which connect the battery to the train system of wires and lamps by simply placing it in position. One such battery keeps a 12-candle Swan lamp going from ten to twenty hours.

A Negative Thermometer.

It is known that ebonite expands more than mercury when heated; and a Russian physicist has constructed a thermometer with an ebonite bulb which causes the mercury to fall in the glass stem when the temperature rises, a contrary effect to that of the usual glass instrument.

A New Door-Handle.

The present method of fastening the handles of doors is troublesome when the little screw-nail holding them on works loose; and Mr. J. Anniss has



devised the simpler plan of screwing the handle on to the bar, as shown in our woodcut. The screw is made to turn so that in opening the door the torsion tends to tighten it.

A Pocket Candlestick.

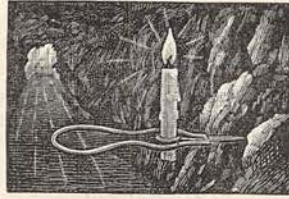


FIG. 1.

ally intended for workmen in dark buildings, or for miners; but it may be serviceable to others. Fig. 1 shows the candlestick, as it is used in mining; Fig. 2 is a representation of it on a somewhat larger scale, as closed for carrying in the pocket.

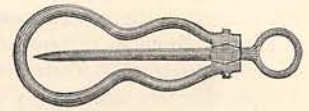


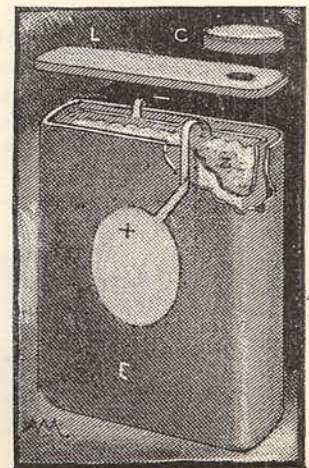
FIG. 2.

Moss-Paper.

Consul Gade, of Christiania, has submitted to the United States Government a report relative to a new material for paper. This is the white moss which grows so largely in Norway and Sweden. The living plant is not used, but the dead moss which accumulates in the woods. The mouldering which the moss has undergone fits it for use in paper-making. A factory is now being built in Sweden, in a district where millions of pounds of the dead moss can be collected. Paper of various thicknesses and cardboard of the white moss have been made; the latter being as much as $\frac{3}{4}$ in. thick. It is as hard as wood, can easily be painted and polished, and it has the advantage of not warping or cracking with drought. It may, therefore, be used for window-frames and so on.

A Pocket Battery.

M. Skrivanov has devised a remarkable little battery, capable of maintaining an electric light of two or three candle power going for an hour without replenishing, although the battery only weighs a few ounces (90 grammes). It consists, as shown, of an ebonite box, E, containing a U-shaped zinc plate, in the hollow of which is placed a silver plate, packed round with chloride of silver and enveloped in parchment-paper. A solution of caustic potash is filled into the cell. The poles



(positive and negative) are formed by silver connections with the zinc and silver plates, but of course copper wires will do. A lid, L, and cap, C, cover up the mouth of the cell. The cell has an electromotive force of 1.45 volts, and gives a current of one ampere for an



AN ELECTRIC DIADEM.

hour, at the end of which time the spent solution has to be replaced. The drawback to its general use is the expense, for after three or four fillings with fresh liquor the chloride of zinc has also to be replaced, and this costs several shillings. For "star" lights it is, however, well adapted; and the above figure shows a diadem worn recently in which the light is fed by two cells, C C, of the Skrivanov battery, carried as part of the buckle of a belt worn round the waist, the current being carried to the lamp by fine silk-covered silver wires. A small "switch," S, beside the buckle allowed the wearer to turn the light off or on at will.

A Chain Coat-Loop.

Considerable inconvenience is frequently caused by the breaking of the loop of tape which is generally found attached to the inside of coat-collars. To obviate this, a new and more durable hanger, consisting of a short length of metal chain, has recently been introduced to this country from Germany. The chain is fastened at each end by a small screw-stud, which admits of the hanger being readily transferred from a disused coat to a new one.

An Ambulance Steamer.

A new paddle-steamer has recently been built for the ambulance service of the Metropolitan Asylums District. The steamer is 105 ft. long, 16 ft. 6 in. in beam, and 6 ft. 6 in. deep. The hull is of iron, the

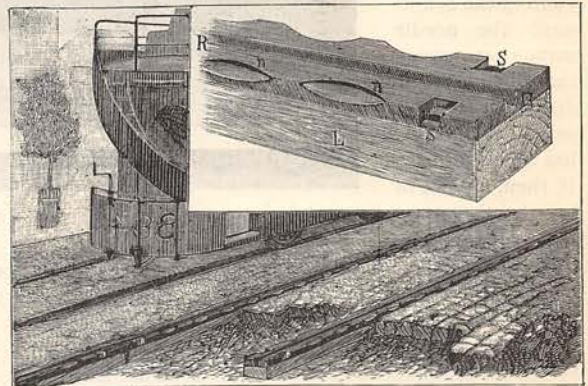
deck of yellow pine, and the fittings of teak. She is divided into six water-tight compartments; forward of the machinery is the hospital, which is partitioned by a bulkhead to separate the male and female patients. The hospitals are fitted with iron beds, heated by hot-water pipes, medicine closets, doctors' and nurses' rooms, &c.; while aft of the machinery is the convalescent hospital. While upon this subject we may mention a very remarkable little steamer, called *Le Stanley*, which has recently been sent out for the use of the African explorer now on the Congo. It can be taken to pieces with ease and transported overland, then built up again. The vessel consists of six galvanised steel pontoons 18 ft. by 8½ ft. wide by 4 ft. deep; these are placed together and a bow and stern piece added to make up the hull, which is over 70 ft. long. These sections can be disunited afloat. The engines and cabins are all removable; and an awning covers the whole deck to ward off the rays of the tropical sun. The steamer burns wood, will float in six inches of water, and being readily portable will prove very useful to the explorer in a new country.

Volcanic Air-Waves

The great shock of the volcanic outburst of Krakatoa was followed by a succession of atmospheric waves, the first of which made itself felt at the Berlin Observatory ten hours after the eruption on August 27 at 7 a.m. This corresponds to a speed of propagation of about 621 miles per hour, or nearly that of sound. About 16 hours later another wave was felt coming round the other side of the globe; and 36 hours after the first, a third wave, but weaker than before, showed that the first wave had completed the circuit of the earth from Berlin. Thirty-four hours after the second, a fourth and weaker wave announced that the second wave had completed the circuit of the earth.

A Skidless Tram-Rail.

When the level of the roadway wears down below the level of the tramway-rail, vehicles are very apt to

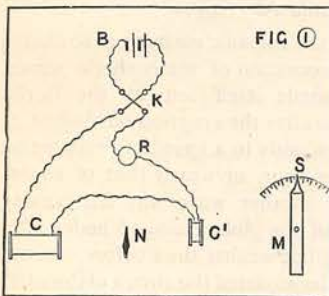


jolt and skid when crossing the line of the rail. The effect in discomfort, wear and tear of carriages and horses, is considerable, besides the great current expense to tramway companies and corporations in

keeping the level of the roadway up to that of the rail. The illustration, however, shows a new rail, which is designed to obviate these drawbacks, and, in addition, permit of rapid laying and relaying. The skidding of vehicles, when the roadway has sunk, is prevented by scolloping or niching the edge of the rail, as shown at *nn*. The track for the tire of the wheels is at *RR*, as in ordinary rails; but the rail is fastened, at the ends of every length, to a longitudinal sleeper, *L*, laid beneath it, by means of screws, *ss*. These screws readily admit of the rail being tightened on its bed by means of a key, or of lifting and renewing the rail when the street has to be repaired or the rail is worn out. This new rail is both ingenious and humane.

A Magnetic Balance.

Professor D. E. Hughes, F.R.S., the well-known inventor of the microphone and other instruments, has recently devised a new apparatus, which is called a magnetic balance. It consists, as shown in Fig. 1, of a magnetic needle, *N*, pivoted at its middle. This



needle is placed between two coils of insulated wire, *C* and *C'*, and a current of electricity from a battery, *B*, flows through them, the strength of the current being moderated by the rheostat *R*, which is a graduated set of coils of wire. The direction of this current can be changed at will by the key *K*. Now the position of the coil *C'* being on the other side of the needle, the electro-magnetic influence of the coil *C* on the needle can be balanced by shifting the coil *C'* until the needle stands at zero—that is to say, the disturbing magnetism of the coils has no effect on it. If, then, a piece of iron, or other magnetic metal, be

placed in the hollow interior of the coil *C*, it will be magnetised by "induction," and the needle will be pulled towards it; but by the aid of a pivoted bar magnet, *M*, on the other side of *C'*, the needle can be brought back again to its zero position. This is done by turning the magnet round its centre in the direction of the needle. The degree to which the magnet has to be turned in order to bring the needle *N* back to zero, as shown on the graduated scale *S*, is taken as a measure of the magnetism in the bar or rod of iron

inserted into the coil *C*. With this apparatus Professor Hughes has investigated the magnetic capacity of over sixty kinds of iron and steel, and arrived at some very valuable conclusions, the chief of which is that the harder a piece of iron or steel the greater its capacity for magnetism. With the help of the magnetic balance, it will be possible to select iron and steel for use as magnets, or as the core of electromagnets. The piece of iron to be tested has only to be put into the coil *C*, and its magnetic capacity tested. Moreover, since magnetic capacity is a measure of the state to which an iron wire is tempered (or annealed), by running the wire through the coil a test of its temper will be obtainable. The balance as actually made is shown in Fig. 2, where the same letters indicate the same parts as in Fig. 1.

A Manganese-Bronze Engine.

Two pumping engines have recently been constructed in which the chief working parts are of manganese-bronze. They are intended for salvage purposes in raising sunken ships. Such engines have frequently to remain under water for days together, and iron engines deteriorate greatly by rust, especially in the working parts, which when made of manganese-bronze are unaffected. A hard alloy is used, having a strength about equal to mild steel, so that in point of strength the new material is equal to the old.

An Oil-Bearing Shell.

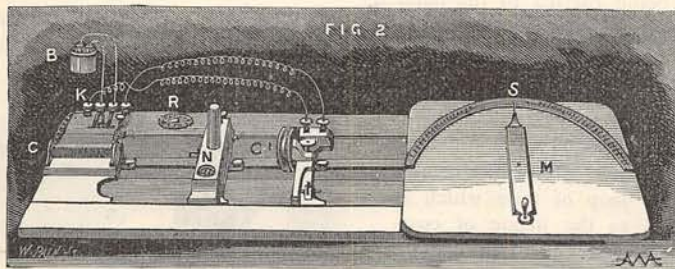
The practice of pouring oil on troubled sea-water has led Mr. Gordon, of Dundee, to design a shell which can be fired from a mortar, and which in bursting spreads the oil it carries over the sea. The shell is fitted with two fuses, which are set alight by the explosion in the gun, and burn although the shell is under water. On the bursting of the shell the oil

spreads over the surface, producing smooth water. The device was recently tried with success; the object being to still the sea between two ships in order to let a boat pass from one to the other. The shell fired from the ship carrying it (and

every ship might carry a few) burst between the vessels and calmed the waves with the oil.

A Natural Barometer.

The natives of the Chiloe Islands make use of a curious natural barometer to tell when bad weather is coming. It was noticed recently by the captain of an Italian corvette, who named it the "Barometro Arancano." As described to the Linnean Society of New



A MAGNETIC BALANCE.

South Wales, it is the shell of a crab belonging to the *anomura* species, and probably of the genus *lithodes*. The shell is nearly white in dry weather, but exhibits small red spots on the approach of moisture. In the rainy season it becomes completely red. While upon this subject we may mention that Mr. C. V. Boys has recently drawn attention to the human ear as a barometer. He, and doubtless many others, find

a sense of pressure on the ear when a train enters a tunnel, or on rapidly descending a mine. Mr. Boys has observed that his ear is sensible in this way to $\frac{1}{150}$ inch of pressure compared with the barometer; but, of course, the change must be a sudden one to be felt.

An Automatic Lathe.

An automatic lathe for cutting out a particular design in the legs of chairs and tables has been devised by M. F. Arbey, of Paris. It works well on wood even of a twisted grain, and produces some very artistic designs. The details of the mechanism are too complicated to give here; but the illustration will show how the machine operates.

A New Mode of Generating Electricity.

Interesting, in a scientific sense, is the discovery of Mr. J. A. Kendall, F.C.S., that electricity can be generated in a cell consisting of two platinum vessels, the outer one a crucible, having the space between filled with vitreous material, such as glass, or porcelain, and certain salts of the earths, in a fused state. It is necessary, however, that hydrogen gas should be occluded in one of the platinum plates. The hydrogen is supplied to the inner plate, and after passing through the salt and outer crucible is oxidised by the air. The effects are relatively feeble, and not likely at present to have any practical application.

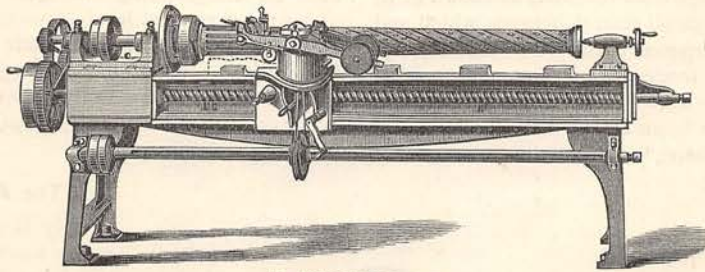
A Morning Glow.

A curious atmospheric phenomenon was witnessed by Professor Guy, of St. Louis, Perpignan, in France, at four in the morning, on January 8th. On getting out of bed in the dark, a flash of lightning illuminated the room, and on rushing to his window he saw a peculiar white glow extending over the southern sky from a bank of clouds along the horizon to the zenith. Flashes of lightning played about the upper part of the cloud-bank; but the general glow lasted till a quarter to five a.m. The lightning shows that electricity was rife in the air; and the glow may have been caused by an electric discharge in the higher and rarer atmosphere.

Electricity and Tanning.

Hides in tanning undergo certain chemical changes. For instance, the gelatine is decomposed, and its nitrogen combines with hydrogen to form ammonia.

This process is checked by putting the hide in the tan liquor, but by sending a current of electricity through the liquor, so as to liberate hydrogen, it still goes on, and the curing of the hide is facilitated. By reversing the current after the above reaction is complete, and the tan liquor changed, oxygen is evolved among the hides from the decomposition of the water, and serves to oxidise the tannin and fix it in the tissues of the leather.



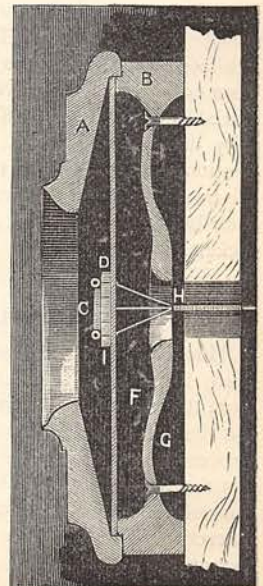
AN AUTOMATIC LATHE.

A Crystal Chair.

A Birmingham firm have recently completed a beautiful chair of cut crystal, to serve as a throne for an Indian potentate. It is composed of crystal columns and pieces with polished facets, and is covered by a crystal dome or canopy, which is lighted beneath by three electric incandescent lamps. The effect is said to be very fine, and the work artistic.

A Mechanical Telephone.

The telephone illustrated will transmit speech to a considerable distance along a wire without the aid of electricity. It consists of a mouthpiece, A, which has an aperture allowing the sound-waves to pass to the diaphragm, C, which is secured round the edges to the mouthpiece. The diaphragm is about seven inches in diameter, and is made of spruce pine-wood, which is both sonorous and strong. The mouthpiece and diaphragm are carried by a bed-piece, B, which is fixed to the wall. The bed-piece is recessed at both sides, F G, and centrally apertured for the passage of threads connecting the line-wire to the diaphragm. The front recess, F, affords a space between the diaphragm and the centre of the bed-piece for free action of the diaphragm, giving clear-



ness of articulation ; and the after recess, G, allows of the telephone being in contact with the wall by a narrow space only, and thus prevents external vibration. The line-wire is connected to the diaphragm by silk cords which diverge from the wire, as shown at H, and are secured to a metal ring, C, between which and the diaphragm is interposed a rubber or leather stop, D. The line-wire is made of copper strands twisted together and coated with varnish. The invention is an improved "string telephone," and hails from New York.

A New Life-Preserver at Sea.

One of the chief elements of danger to a good swimmer in a rough sea, lies in the suffocating and stupefying effects of the waves breaking over his head. Even when the body is suspended by a life-belt, drowning frequently results from the force of the sea ; and to provide against this, Mr. William Wilkins has invented a new life-preserver consisting of an atmospheric helmet and belt. The helmet is provided with ample arrangements for sight, speech, and respiration, and both it and the belt are divided into two compartments, the buoyant power of either of the four compartments alone being sufficient to prevent the wearer from sinking. Indeed it has been calculated that the weight of a man in the sea, when fully dressed, is only six pounds, while the belt will sustain forty pounds, and the helmet twenty pounds. Both helmet and belt can be inflated and put on in about three minutes. This new life-preserver was exhibited at the Fisheries Exhibition, but has recently been considerably improved in many minor points. In a trial in a rough sea off Brighton its efficiency was fully demonstrated, and it seems likely that the invention will be found particularly useful to members of life-boat crews, who at present are often washed out of their boats and drowned, although provided with cork jackets.

The Luxotype.

This is a new process for making picture-blocks ready for printing from in a book or newspaper, direct from the painting, photograph, or natural object, without the aid of either draughtsman or engraver. The process is not made public yet, as it is being patented, but the appearance of the pictures shows that some gauze-like material is inserted before the block to intercept the light in some way. Judging from prints extant, the results are very fine and compare with the best wood-engravings.

A Wire-Fence Telegraph.

On the Milwaukee and St. Paul Railway in America, experiments were recently made to see whether a barbed wire-fence on either side of the line could be used for telegraphing through. The wire was run under the surface at level crossings to make the line continuous, and trials were made which showed that telegraphing could be done through the fence ; but in wet weather we should imagine the insulation would be very bad.

The Ammoniophone.

Italy is a favoured land in many ways, and especially in its beautiful climate and the musical instincts of its people. Italians are remarkable for their good voices, and various reasons have been given for this, the latest being that of Dr. Carter Moffat, brother of the well-known missionary. Dr. Moffat has found that the air and dew of Italy are more largely impregnated with free ammonia and peroxide of hydrogen than is the case elsewhere ; and he has constructed an apparatus, called an "ammoniophone," containing absorbent material saturated with peroxide of hydrogen and condensed ammonia, which is used as a respi-

lator in order to imitate the Italian atmosphere. On several occasions, as we are informed, the value of the inhaler for improving the range and quality of the voice has been publicly demonstrated by singers.

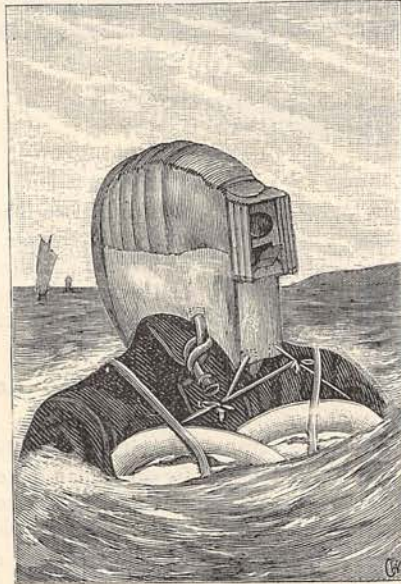
1883 SONG COMPETITION AWARD.

The number of MSS. received in response to the Editor's invitation has been unusually large; no less than 112 compositions having been sent in. To carefully consider and weigh the merits of so large a number of musical compositions has, of course, been no light task; but the Editor is happy in being able to announce that the judges have awarded the PRIZE OF FIVE POUNDS, offered for the best musical setting of the Earl of Carlisle's words, "Who has not felt 'mid azure skies," to

W. R. COLBECK, 296, Thomas Street, Georgetown, British Guiana.

*Honourable Mention is awarded to the following, in order of merit:—*AMY COMPTON, Weybridge ; ARTHUR C. FAULL, Plymouth ; W. CLAXTON, Tenbury ; D. F. WILSON, Ayr, N.B.

The Editor hopes to publish the Prize Song in an early number of the Magazine. The regulations governing the Competition, and under which this Award is made, will be found in the June (1883) Part.



NEW LIFE-PRESERVER AT SEA.