

ELECTRIC LIGHT ADAPTED FOR USE OF NATURALISTS, CHEMISTS, ETC.

In presenting to the Academy the apparatus for electric lighting for the use of naturalists, chemists, micrographers, etc., constructed by Mr. G. Trouve, Mr. De Lacaze-Duthers expressed himself as follows:

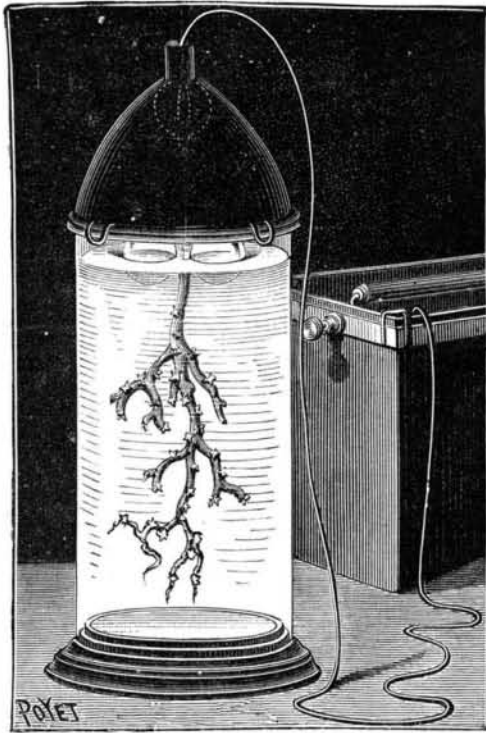


Fig. 1.—ELECTRIC LIGHT ILLUMINATING WATER.

"I have the honor of presenting to the Academy, in the name of Mr. G. Trouve, several apparatus for lighting by electricity, with which I have experimented in my laboratory at Sorbonne, and which rendered me important service in my zoological stations at Roscoff and at Banyuls, for which these instruments were constructed. There is no doubt that these apparatus will

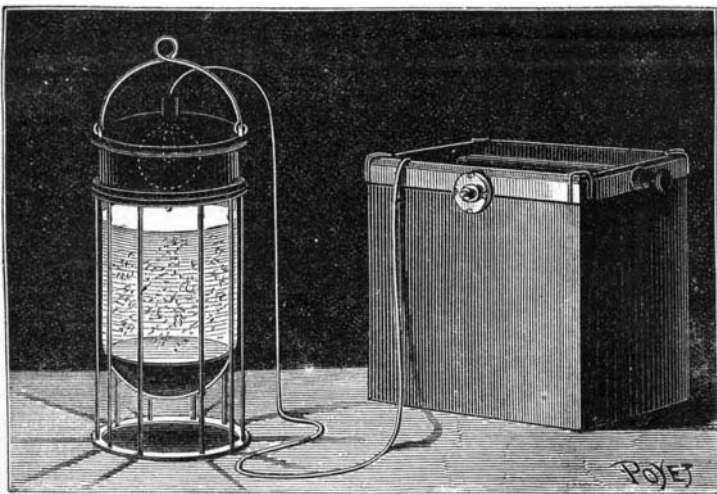


Fig. 2.—APPARATUS FOR STUDY OF FERMENTATION.

be of great assistance to chemists, botanists, and mineralogists, as well as to zoologists.

"This apparatus consists, as shown in Fig. 1, of a cylindrical glass vessel, at the bottom of which there is a

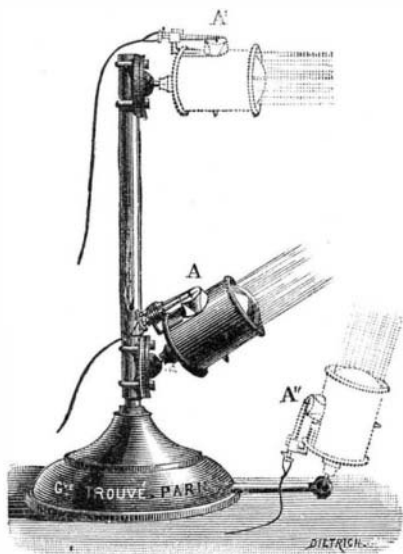


Fig. 3.—THE PHOTOPHORE.

silvered mirror. The vessel is provided with a parabolic cover, which is silver-plated and acts as a reflector, and from the center of which an incandescent lamp is suspended. It is filled with sea water in which are many small living objects, and also a branch of coral. The rays of light are reflected back and forth by the

mirrors in the bottom of the vessel and in the cover in a direction parallel with the vertical walls of the vessel. Light arranged in this manner permits of the study of these delicate creatures in even the most minute details. With the aid of the magnifying glass we obtain truly remarkable results, considering the simplicity of the apparatus used. At Roscoff, as well as at the Arago laboratory, the electric light produced by M. Trouve's simple apparatus was of great assistance to us in our observations of the delicate and transparent animals which float on the surface of the sea.

"For the study of fermentation, the apparatus is slightly modified as shown in Fig. 2; the reflecting cover is screwed on a metallic ring fastened on the upper edge of the glass vessel, so as to keep the preparations from the air. The glass is protected by a metallic cage or frame.

"Fig. 3 represents the reflector (photophore) invented by Messrs. Helat & Trouve, and modified for my use; and with its help the finest dissections can be made. It will be of great assistance in the dark days at Roscoff and Banyuls, when the want of light would interrupt work which had been commenced. This light does not change the color of the animals, which look just the same as in bright daylight. The great advantages of this instrument are its small size and the ease with which it can be arranged to give any desired light, oblique or direct. For example, a glass vessel containing water and living creatures can be kept dark with the exception of part to be examined by the magnifying glass, which can be illuminated by a brilliant ray of light.

"By changing the angle of the light, and using a very powerful glass, I have dissected nerve threads which were so delicate as to be almost invisible by daylight.

"The electric generator used for operating these apparatus which I have just shown is very compact; it weighs scarcely 6 lb., and is very reliable. It is represented in Fig. 4, and was recently presented to the Academy by Mr. Jamin."

Mr. Peligot remarked that, having experimented with these apparatus in the mint, he is convinced that they would be of great assistance in the study of crystallization.

Blood under the Microscope.

According to the *American Bazaar*, the only instance on record when the blood of two persons was compared in a criminal trial was in a murder case in Chicago. The comparison settled the innocence of the woman on trial for her life. A comely woman, with \$20,000, married a man in Chicago, and placed her snug little fortune in his business. In the course of time he commenced to abuse her, and finally she decided to apply for a divorce. The double calamity of losing a woman to beat and the withdrawal of her \$20,000 from his business made the brute furious, and the next morning he was found dead in one corner of his bedchamber, a bullet having gone through his heart. His wife was found wounded in another part of the room. She said that her husband had come home the night before in a rage and began to abuse her while she was in bed, that he hit her on the head with the butt of his revolver while her head was on the pillow, and spattered blood over the linen; that she jumped up, and he shot her, inflicting a slight flesh wound in her side.

She then rushed at him, and, snatching the revolver from him, shot him through the heart. He reeled to the corner where he was found, and died. The prosecution did not believe her story, and set up the theory that she shot him when he was asleep, and dragged him to the corner, and then inflicted the wound upon herself. The carpet where the dead man lay was saturated with blood. According to the theory of the prosecution, the blood on the pillow was his also. Dr. Piper put the section of the pillow with blood upon it under the microscope, and drew on a cardboard the shape of the corpuscles, enlarged about two thousand diameters. He then put the blood on the carpet under the microscope in the same way. The comparison settled the question at once.

The blood corpuscles were as different as day

and night, and sustained the woman's account of the shooting. She was acquitted on that and other evidence.

As between human blood and dog's blood, the microscope enables the expert to determine precisely whether a specimen is from a human being or a dog. But it is

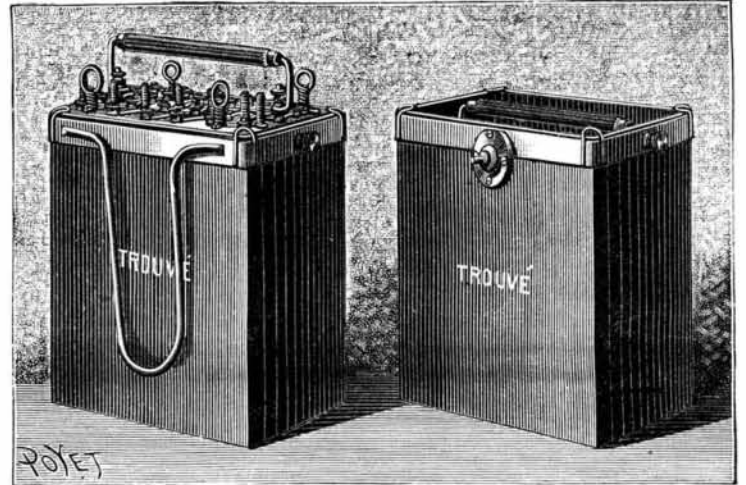


Fig. 4.—THE TROUVE BATTERY.

impossible to determine between human blood and a hog's blood.

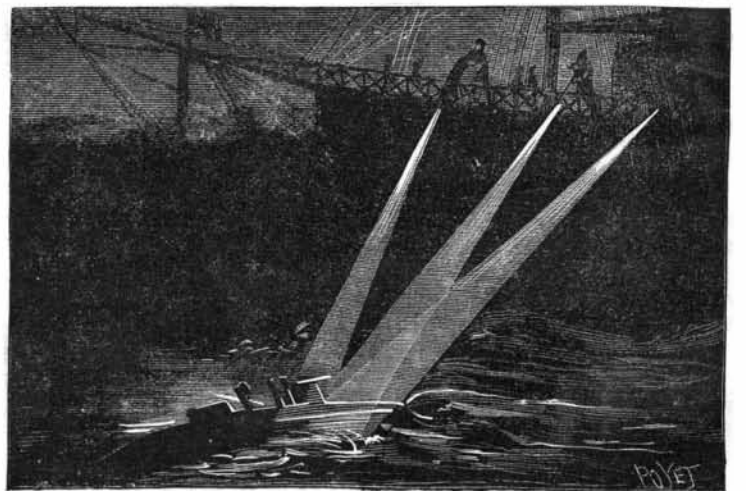
ELECTRIC APPARATUS FOR SUBMARINE LIGHTING.

The accompanying illustrations represent the lighting by electricity of the dredge which was recently sunk in the Suez Canal by an English steamer. It will be remembered that this accident prevented the passage of vessels for some time. Attempts were made to



DIVERS WORKING BY ELECTRIC LIGHT.

blow up the sunken dredge by means of dynamite, but these attempts failed because the divers had not sufficient light for properly placing their cartridges. Being unable to clear the canal immediately, the company proceeded to widen it by 67 feet for a distance of 954 feet. In the mean time the Egyptian Agency telegraphed to Paris for a practical system of lighting.



WRECK ILLUMINATED FROM THE SHIP.

The company, after having addressed several houses, applied to the Minister of the Navy, who advised the use of the Trouve submarine electric lighting system, which he used. Several trials were made on Friday, July 3, and on Sunday, July 5, the necessary apparatus for clearing the canal were shipped.

The Trouve electric lighting system requires no steam engines, no gas motors, and no accumulators. This apparatus is the one in use for the great work at Port de la Reunion, where it is adapted for the divers' bells, and has been in operation day and night for six months. It is also used at Dunkirk, and can be used wherever a reliable light is needed; for instance, in the turrets of war vessels, where no light heretofore would resist the vibrations caused by the firing of the guns, and after each shot all lights were extinguished. Recent experiments at Villeneuve resulted in the acceptance of this new system of lighting, and all ports are to be supplied with it.

ELECTRIC LIGHTING OF THE GREVIN MUSEUM.

Since April last the electric light has been used in the Grevin Museum instead of gas. The plant, which was furnished by the Edison Company, is very complete, and gives an example of all the cases in which this new mode of lighting may be applied.

Upon approaching the Museum, the visitor can judge of the effect produced over a wide space in open air, for two Cance lamps illuminate the boulevard and are seen from afar. These are the only arc lamps employed, all the others being incandescent ones. In the quite long corridor that leads to the entrance of the Museum, there are but three lamps. Here one's eyes have to rest, and prepare themselves to visit the interior. The light is sufficient to allow one to find his way and to distinguish all the better, over the door at the end, a window that is lighted by means of three lamps placed upon a silvered glass reflector. Finally, in the interior, the winter gardens, landscapes, halls, theatrical scenery, the jewels of the dancers, etc., show how the electric light can adapt itself to all exigencies. We have proof, besides, that it can be put in almost anywhere, even in an old building where nothing has been prepared to receive it, and which is situated in the most frequented business locality in Paris.

The machines are placed in the basement, and an aperture has been made in the wall, so as to put the room that contains them in communication with the vaults. These latter already contain a large number of tableaux that are much admired by the visitors, and here is another added that is none the less interesting. The steam generator is not visible, but is in a neighboring hall. To the right of the motor, and against the wall, is seen a Bourdon lubricator. Upon coming from the boiler the steam traverses this, and thus becomes charged with the lubricant necessary to keep the rubbing parts in good working order. In the rear, opposite the visitor, is situated a switch board for the different circuits that start from the dynamo at the left (Fig. 2). We shall now pass rapidly in review the principal elements of the plant.

The boiler, which was constructed by Collet & Co., produces 2,200 pounds of steam per hour. Its heating surface is 65 square yards, and the grate surface is 2 square yards. It occupies a ground area of 5½x7 feet, and does not exceed a yard in height. This type of multitubular generator is of very original construction, by reason of the arrangements adopted for grouping and fixing the vaporizing tubes. The extremity of these is slightly conical in shape, and they are closed by conical plugs, against which they are pressed by a long bolt that traverses them. It thus becomes very easy to remove or replace a tube. The tubes communicate with each other through vertical boxes provided with partitions and internal tubes of thin sheet iron, thus permitting the steam to be freely disengaged without carrying along any water. A special drier placed upon the top of the boiler perfects the drying, and water is thus prevented from entering the engine. The product of this boiler may be estimated at 9 pounds of dry steam per pound of coal burned. The motor was constructed by Messrs. Lecouteux & Garnier. The piston is placed vertically at the top of the frame, and distribution is effected by a circular valve. Its power is that of 50 horses. It is very carefully constructed, and all its parts are so grouped as to occupy as small a space as possible. The total height is 8 feet, and the greatest width 4. As the velocity is 300 revolutions per minute, all the parts subject to friction are of steel, and adjusted by grinding. The regulator is something new, and is of the builder's inventing.

It is not visible upon the engine, since it is mounted

upon the internal part of the fly wheel, which serves at the same time as a driving pulley. It is shown in Fig. 1. It is based upon a displacement of the eccentric, which is mounted, as usual, directly upon the shaft of the fly wheel; and, as may be seen at E, it contains an aperture that allows it to move in a straight line at right angles with the shaft. In this motion it is guided by a slide fixed upon the fly wheel, and is connected by two stiff rods with a weight on the one hand, and, on the other, with a piston filled with oil that has the effect of a hydraulic brake. Finally, the weight is kept in a given position by means of a spring, A. When the engine is running, it is clear that the weight will, through centrifugal force, tend to get so much the

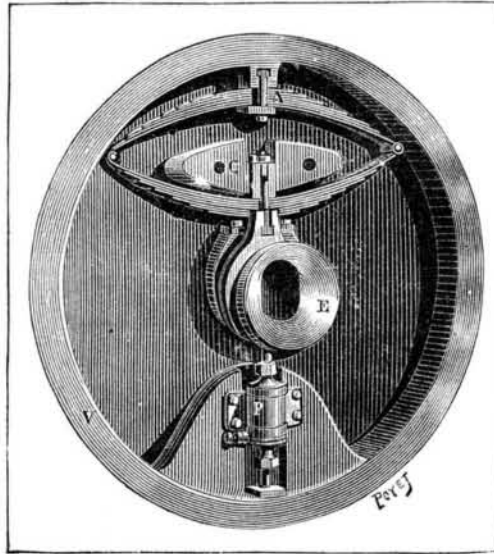


Fig. 1.—THE LECOUTEUX REGULATOR.

farther from its original position in proportion as the velocity is greater. It carries along the Canquel eccentric with which it is connected, and this motion has the effect of modifying the radius of eccentricity, and consequently the operation of the valve, that is to say, the periods of admission, compression, and expansion of the steam. The effect of the spring is to bring back the weight to its normal position as soon as the velocity diminishes; and all abrupt motions are avoided through the effect of the piston brake. This regulator has given good results.

The dynamo machine is of the Edison system, with straight electro-magnets. It is of recent construction, and is the only type of the kind that at present exists in Paris. Its velocity is 900 revolutions per minute, and under such conditions it is capable of supplying 400 16 candle lamps, the constants of which are from 100 to 110 volts and 0.75 a., or ¾ ampere. Its total height is 5 feet, and its greatest width, inclusive of the transmitting pulleys is 7.

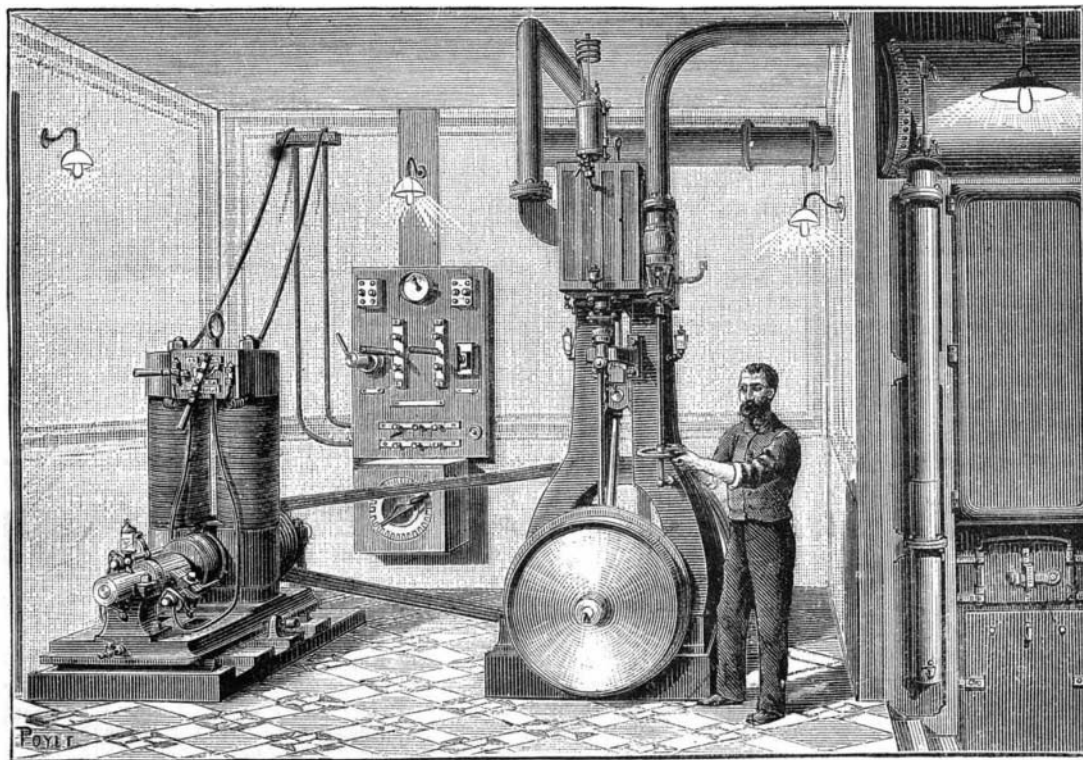


Fig. 2.—ELECTRIC WORKS OF THE GREVIN MUSEUM.

Three circuits start from the dynamo and run to the switch board in the rear of the engine room. One of these serves to supply 54 basement lamps, 28 of which are of 16 candle power and 26 of them 8 candle. These light the "History of a Crime," the "Burial of a Chartreuse," "Mr. Pasteur's Laboratory," the "Ruins of Ischia," etc. The other goes to the upper stories, where are located the offices, the sculpture, modeling, and dressing rooms, etc. Finally, the third goes to the ground floor, where it subdivides into secondary circuits that all start from a tableau near the cloak room. Two of them supply the Cance lamps, and for this rea-

son traverse resistances formed of two German silver wire bobbins, that permit of regulating the current when it starts from the tableau.

Each of the other secondary circuits is especially designed, either for the chandeliers of the halls of the ground floor, or for one or several of the groups placed therein. Each part is thus rendered independent, and, according to the hour of the day and the needs of the service, it is possible to light up at the proper spot by means of a communicator placed at the origin of each circuit. Besides, it is possible to put out any one lamp by unscrewing the plug of the circuit cutter placed alongside of it.

The total number of lamps now in service is 170 of the type A and 204 of the type B, representing in all 4,350 candles. The force of the machine permits of lighting more if necessary, either for the service of the museum, or for lighting up neighboring establishments.

This plant has merited a notice because it shows perfectly the facility with which the electric light adapts itself to lighting of all kinds, and particularly the advantages that can be obtained from it from a decorative point of view.—*La Nature*.

The Recession of Niagara.

Sir Charles Lyell, in 1841 and 1842, estimated the gradual recession of Niagara Falls by the undermining of its brink at the rate of about 1 foot per annum. Recent investigations of the subject by a commission for the establishment of a State reservation at the Falls have, however, shown that this and other estimates are more or less erroneous. A map, based on surveys of the Falls made in 1883 by Mr. Thomas Evershed for the New York State Surveyor, has shown that in the forty-one years ending 1883 the annual rate of maximum recession has been 6½ feet. For the eight years ending 1883 this rate is given as 16½ feet, so that the rate of recession has been higher of late. These results were obtained from the Canadian Fall, while the American Fall was found to have receded at the rate of 10 inches per annum during the forty-one years ending 1883. It has been shown by the surveys that these two falls were once united; and that, supposing the rate of recession to continue, the Niagara gorge will be cut through in some 10,000 years. Lyell's estimate was 35,000 years. Of course these attempts to calculate the cutting of the entire gorge, which terminates at the heights near Lake Ontario, assume that the hardness of the shale and lime rocks, volume of water, and height of the fall, continue much the same as they are now.

An Iron Cement.

Usually, certain proportions of pulverized sal ammoniac in crystals, sulphur, iron filings or drillings, and urine or water has been deemed as quick and adhesive

a cement for two iron surfaces as any that could be made. But this mixture sets slowly and requires days—or weeks—to get in its perfect work. The object of this cement is to oxidize the surfaces of the iron so that close contact will unite the rust, and thus hold the two surfaces as one. Natural specimens of oxidizing of iron as cement are not uncommon. Almost all specimens of bog iron ore show aggregations of iron by rust; sometimes quite large masses being held in one firm embrace by this means; the writer saw in Nova Scotia lumps of bog iron ore aggregated by rust so that there was a conglomerate globe of separate globes of at least thirty inches diameter. In fact, the "rusting" of joints is an old trick with mechanics.

But in place of sal ammoniac let the jointer use chloride of lime, one of the common disinfectants, and the fixity of the joint will surprise him. Two joints of three inch cast iron pipe, with flanges sufficiently

wide to take in ¾-inch bolts, were secured with a mixture (in the usual proportions) of cast iron filings, water, and chloride of lime. The actual proportions were: fine filings, 10 parts; chloride of lime, 3 parts; water, enough to mix to a paste. These joints were bolted together after the mixture was placed between them, and after being left one night, when broken apart the cement scaled off a portion of the solid iron of one of the flanges.

This cement has stood the action of sixty pounds of steam in a pipe connection to a steam boiler where rubber glands and canvas and white lead failed.