HOME-MADE ELECTRIC NIGHT LAMP.

BY GEORGE M. HOPKINS.

A very simple device, which will produce a temporary light of one-half of one candle power, is shown in the illustration. It will be found convenient for observing the time at night, or for momentarily lighting a closet or an area where the light of a candle or an oil lamp would be objectionable.

The miniature electric lamp, and the dry batteries used for lighting it, can be purchased almost anywhere, and the labor of putting these things together, with a switch and suitable connections, is very slight indeed. A one-half candle lamp requiring 1.58 amperes at 2.5 volts is the first requisite; then two cells of dry battery, giving a current with a pressure of about 3 volts will be needed, and last of all a small packing box, that will just receive the batteries, should be selected. If a lamp of higher voltage is chosen, more cells of battery will be needed. A 4-volt lamp will require three cells of battery. A little more light will be secured with this combination, but it is not desirable to increase the number of cells beyond this, as the apparatus becomes at once too bulky and too expensive. The best combination is the one-half candle lamp with two cells of battery. After the lamp

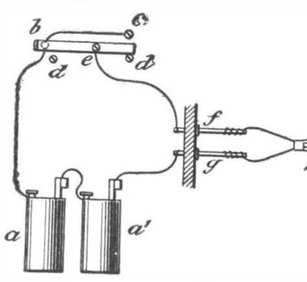
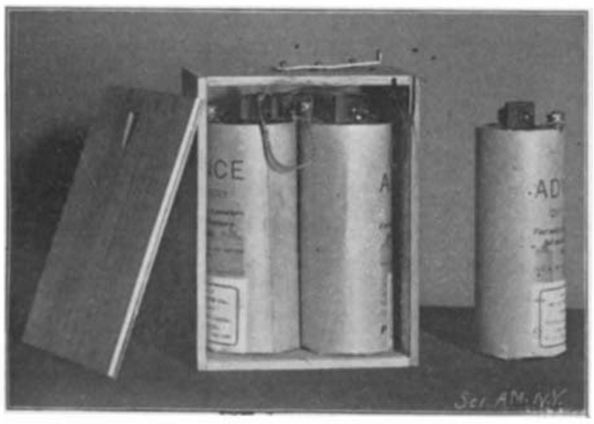
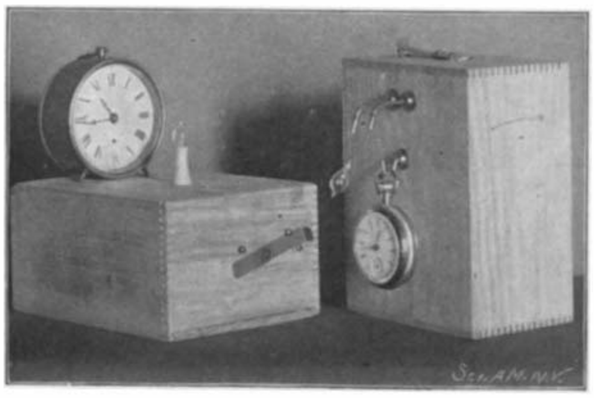


DIAGRAM OF CIRCUIT.



BATTERY-BOX, COVER REMOVED.



TEMPORARY LIGHT.

is procured it should be tested momentarily by means of two cells of dry battery, connected in series. If the lamp is properly lighted, a packing box which receives the batteries easily is selected, and two small brass hooks, *f g*, are straightened and screwed into the box near the top. Small copper wires are placed in electric contact with the hooks, *f g*, as shown in the diagram. At the top of the box is placed a switch, consisting of a piece of spring brass 3 inches long and ½ inch wide, held in place by a pivotal screw, *e*, passing through a central hole in the spring into the box. The wire from the brass hook, *f*, is placed in electrical contact with this screw, *e*, and two brass screws, *b c*, are inserted in the top of the box, to serve as contact points for the switch. These screws are connected together and with the zinc pole of the cell, *a'*, by a wire. The carbon pole of the cell is connected electrically with the hook, *g*. The hooks are curved downwardly and the terminals of the lamp, *n*, are wound three or four times around the ends of the hooks, *f g*, respectively, so as to support the lamp above and in front of the face of the watch, hanging upon the hook, projecting from the front of the box.

The longer arm of the switch is turned up to form a thumb piece, and is held normally out of contact with the screw, *b*. By pressing the end of the switch down into contact with the screw, *b*, an electrical contact is formed which lights the lamp. By turning the switch on its pivotal screw, *e*, it is brought into contact with the screw, *c*, thus forming an electrical contact, which is prolonged until the switch is returned to its original position. The movement of the switch is limited by the screws, *d d*.

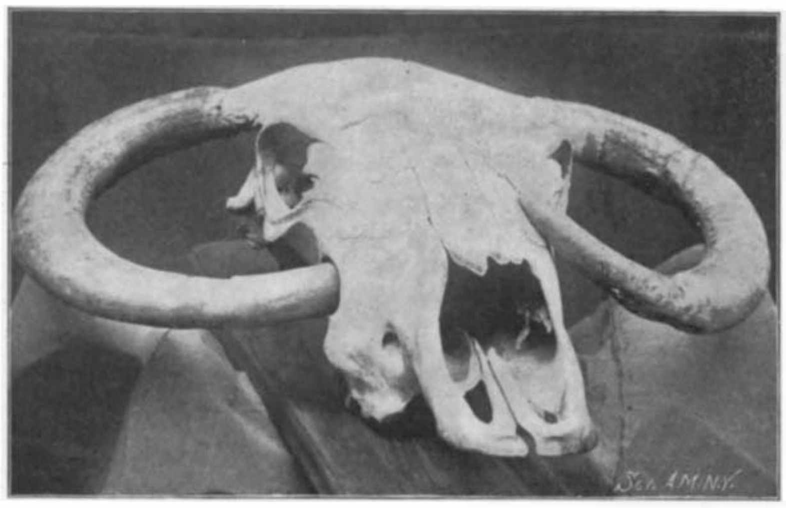
In one of the views the lamp is represented as being supported by a hollow wooden column in front of a clock. In this case one of the lamp wires is incased in a very small rubber tube, to insure insulation; otherwise the construction is similar to that described.

Two cells of dry battery will light the lamp occasionally, for a long time, if used only an instant each time; but if the lamp is used continuously, it runs the battery down, so that it will require frequent renewal.

Methods for Producing Low Temperatures.

At a recent meeting of the Academie des Sciences, M. d'Arsonval read a paper on the production of low temperatures, with special reference to methods of cooling which may be utilized in the laboratory or elsewhere, with the simple means at the operator's disposal. For instance, to descend to —60 deg. C., chloride of methyl is found convenient. It should be placed in a porous vase, such as that of a battery, to allow a spontaneous evaporation. To descend to —112 and even —115 deg., liquid carbonic acid or acetylene may be used. Both of these take the snowy state at the ordinary temperature. To dissolve this snow, acetone is the best, and is the solvent used by the author. Acetylene, as has been shown by Messrs. Claude and Hess, dissolves in large quantities in acetone. This solubility increases as the temperature is lowered, so that at —80 deg. C., for instance, the acetone will dissolve more than 2,500 times its volume of acetylene. The snow of carbonic acid acts in the same way, but is less soluble. By using the latter, dissolved in acetone, one can easily descend to —115 deg., provided the acetone has been previously cooled. This mixture constitutes a veritable freezing mixture, and the solution of the carbonic acid snow in the acetone (both having been previously cooled to the same point) takes place with an absorption of heat which lowers by 20 deg. the initial temperature of the mixture. The acetylene snow is as easily manipulated as the former and evaporates more slowly and at a lower temperature. This is due to its great latent heat of fusion (which is at least 55 calories per kilogramme) in passing from the solid to the liquid state. Acetylene, like carbonic acid, does not take the liquid state at atmospheric pressure, but it requires a supplementary pressure of about a third of an atmosphere. If acetylene snow is placed in a glass tube and the latter corked, the snow is seen to melt very slowly and the pressure is maintained in the interior of the tube equal to 24 centimeters of mercury throughout the duration of the fusion. M. Claude has utilized this property as a simple means of transporting acetylene.

To descend below —115 deg. C. it is necessary to use liquid air, and with this one has the advantage of obtaining very low temperatures and also of maintaining these constant. M. d'Arsonval then describes his method for proceeding with liquid air. In the first place, it is necessary to have a vessel as impermeable as possible to heat and to place it in a bath which remains unfrozen at the lowest temperatures. The author uses the silverized glass vessels with double walls which he first described in 1898 and which are now well known. As to the liquid bath, one of the most incongealable is the ordinary gasoline of commerce, and with very volatile samples one may descend to —160 deg. without freezing. They may, in fact, be used for thermometers, as Kohlrausch has shown, and M. Demichel has made a number of these lately. By successive rectifications it is possible to obtain gasolines which do not congeal even as low as —194 deg., which is the boiling point of liquid air at normal pressure. To cool the gasoline to the desired point it suffices to place at its upper part a small annular metallic vessel into which the liquid air is let fall drop by drop. For this purpose the author uses a silvered flask containing the liquid air, which is otherwise arranged like an ordinary washing-bottle, with one glass tube passing through the cork into the liquid and another short tube with a piece of rubber tubing at the exterior. When the rubber tube is compressed the evaporation of the liquid air creates a pressure which forces out a violent stream, but by opening the rubber tube more or less the flow can be regulated at will, and in consequence the temperature of the gasoline bath. The substance to be acted upon is placed, as above stated, in the double-walled vessel, and the latter in the gasoline bath, which is kept at the desired temperature by the dropping of the liquid air. M. d'Arsonval estimates that with a cylindrical silvered vessel of a liter capacity the loss may be reduced to 20 grammes of liquid air per hour, when working at —194 deg., which makes the use of liquid air quite practicable.



CURIOUS HORN GROWTH OF A NEW ZEALAND BUFFALO.

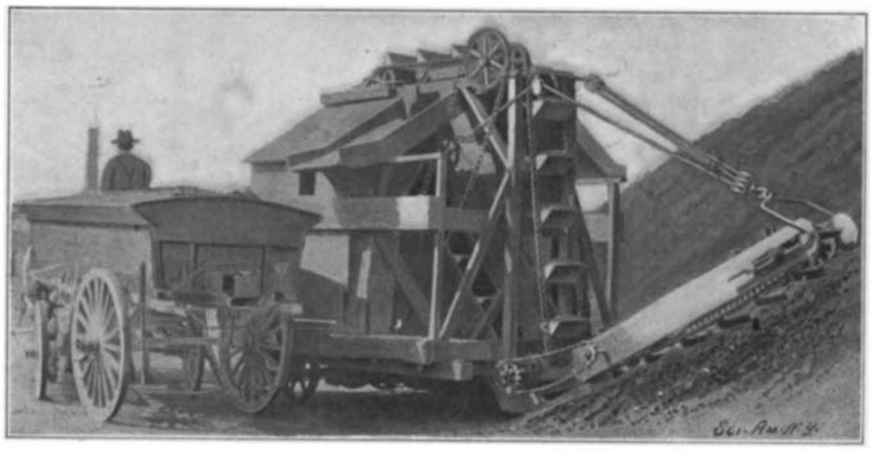
CURIOUS HORN GROWTH.

Our engraving represents a bullock's head with an ingrowing horn. The animal was originally one of a working team, the property of some Maoris (New Zealand natives), but escaped about twelve years ago and joined some wild cattle in the ranges. The left horn penetrates 4½ inches into the head through a hole 2¼ inches diameter. The other horn had also pierced the skin, causing an indentation in the skull. The animal was found by a party of surveyors in such a poor condition that it could hardly move, so it was shot. The head is in the possession of Mr. A. K. Blundell, Wavyanui, New Zealand, and the photograph was kindly sent to us by Mr. Johnson, of Danewirke, New Zealand.

PORTABLE COAL-LOADING MACHINE.

In a large retail coal yard in Philadelphia there is in daily operation a machine for loading the delivery wagons of the firm, the first apparatus of the kind which has ever been successfully operated. It is known as the Seitz loader, and is shown in active service in the accompanying illustration, made from a photograph. The machine is entirely self-contained, moving around the yard from pile to pile under its own power and loading the wagons entirely without any human assistance other than that which directs the running of the engine.

The loader is run to the vicinity of the coal pile, and an endless-belt raking device dropped thereon. The engine is started, and the coal is by this means brought to the elevator buckets, which dump it onto screens at the top of the machine, and after passing through these it is conveyed by spouts to the cart which stands at the side of the loader. The raking device and elevator are both operated by the same engine located in the interior. The machine shown in the cut has a capacity of one ton a minute, and takes the place of six laborers who were heretofore employed in shoveling and screening. This capacity can be increased, and with a trifling change the loader may be made to fill two wagons at one time. While it is primarily designed for coal, it can be used for lime, sand, gravel and other similar materials.



PORTABLE COAL-LOADING MACHINE.

The total amount that John D. Rockefeller has given to the University of Chicago is $10,251,000.

Engineering Notes.

The buildings of the Pan-American Exposition have been sold for $130,000 to a Chicago wrecking company.

The West Virginia University has recently received a gift of a passenger locomotive from the Baltimore & Ohio Railroad for experimental use in its new engineering building.

In one day 39,200 tons of iron were recently shipped from Ashtabula to the Pittsburg furnaces; fifty-five trains were handled in twenty-four hours, sixty-five locomotives being used; thirty-five locomotives and fifteen crews were borrowed from the main line for the occasion.

The Fire Department surgeons in New York city now attend second-alarm fires in order to attend to the injured firemen. On many occasions there has been a disgraceful conflict of authority between ambulance surgeons and firemen, in which the ambulance surgeons refused to carry out the orders of the firemen. Each Fire Department surgeon will take with him various dressings and articles for such emergencies. If the injured fireman requires to be treated in the hospital, he will be sent there in an ambulance.

Owing to the success which has attended the construction of the turbine passenger steamer "King Edward" upon the Clyde, another similar vessel is to be constructed. She is to be an improvement on the "King Edward" in every respect. She will exceed the dimensions of the latter vessel by 20 feet in length, 2 feet in breadth and 1 foot in draught. Her speed will be 22 knots—25 miles. She will be placed upon the Clyde for traffic between Campbelltown via Fairlie and Glasgow, and is to be completed in time for the pleasure traffic season of next year. Messrs. Denny Brothers, of Dumbarton, who built the "King Edward," will also construct the new turbine steamer.

Acetylene gas is now utilized for a variety of illuminating purposes in Sweden, owing to its low cost in comparison with other processes of lighting. Attempts are now being made to introduce it into factories, and it is anticipated that its employment will signify a very considerable saving. It has been calculated that a factory using fifty lamps of 16 candle power, each burning 720 hours per year, would find its lighting bill worked out as follows: With coal gas in common burners, $290; with electric incandescent lamps, $235; with petroleum, $150; with acetylene gas, $125. By this it will be recognized that acetylene is more than one-half as cheap as coal gas.

The British Naval Department contemplates introducing the German water-tube boiler into the English navy. Orders have recently been placed for experimental sets of the Duesseldorf-Ratingen water-tube types for trial in some of the cruisers, including the third-class cruiser "Medusa," used as a drillship at North Shields. Trials are also being made in other vessels of the "Medea" class, and it is to be fitted on the second-class cruiser "Encounter," a vessel of the improved "Highflyer" class, and at present equipped with Belleville economizers. The displacement of the latter by the German water-tube boiler will be watched with interest. The new boilers are said to give excellent results, but English naval engineers refrain from venturing an opinion regarding them until they have been submitted to severe trials.

The Parisian municipal authorities are paving several streets with glass. About twelve months ago the inventors of this process were accorded permission to lay down their glass pavement in certain thoroughfares on condition that, should the new material not be found to answer at the expiration of a specified time, the streets thus experimented upon were to be repaved in the old style at the inventors' expense. The paving has evidently given satisfaction, since the Municipal Council is laying down the glass in several of the busiest thoroughfares of the city. The vitreous paving-stones are made of powdered glass, which is baked until it becomes almost fluid, then compressed by hydraulic machines, and cut into cubes to facilitate the laying process. The chief objection against the glass pavement is that its surface offers no grip to horses' hoofs, which would render it dangerously slippery in wet weather, but results have proved that no greater danger is to be feared with this material than with the ordinary asphalt paving.

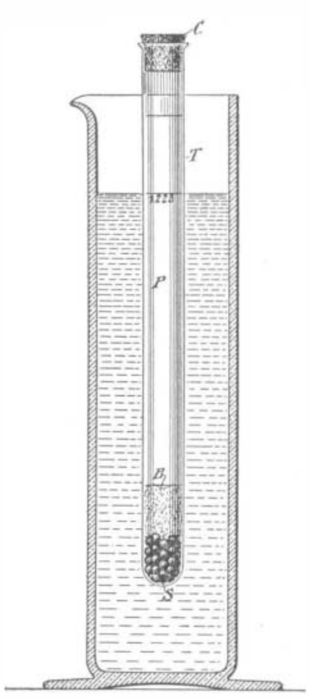
The work of constructing the great Simplon tunnel, which when finished will be 12½ miles long, and which will considerably facilitate railroad traveling in Italy, has been seriously interrupted by the striking of a copious vein of water which has flooded the whole of one section of the works. For several weeks boring to the south has had to be suspended. In the left gallery work is still going on, but all has to be done by hand, and the advance is little more than three feet a day. Here there is water also, but the pressure is less. However, when the streams of the two galleries unite, about 1,000,000 hogsheads of water will pass through every twenty-four hours. At first it was supposed that this enormous quantity of water came from Lake Avino, near which the tunnel passes, but such is not the case. Later investigations show that it probably emanates from the Cairasca torrent, which having its origin at the foot of Mont Leone, extends almost parallel with the tunnel. It is intended to prove this by the experiment of throwing a large quantity of strong coloring matter into the torrent, so that if it appears in the tunnel there will be proof that the water there comes from the Cairasca. In that case it will be necessary to open a new gallery to go round the inundation. Such an alternative will mean a great expense and occupy considerable time.

HOW TO MAKE A CHEAP HYDROMETER.

BY PARKER S. SIMONSEN.

There are many amateurs who have at one time or other tried to make a storage battery, but have given up in disgust on finding that their plates have sulphated, thus ruining their battery. This is often caused by not having the electrolyte of the proper density, but this fault can be corrected by the use of a hydrometer. Readings should be taken regularly with the hydrometer, and this will also form a valuable guide as to the amount of the charge in the battery; that is, the density of the electrolyte after charging will be found to be slightly greater than the limit of discharge. A simple and cheap hydrometer can be made as follows, which will more than repay the maker for his slight trouble:

Procure from a druggist or chemical house a test-tube (Fig. 1, *T*) 6 inches long and 7-16 of an inch in outside diameter. The test-tube should be free from flaws and very thin—about 1-32 of an inch in thickness. Now place some buckshot, *S*, in the bottom of the tube so as to form a column about a half-inch in height, or until it will float upright in water, the tube projecting about an inch above the surface of the water. A small wad of cotton, *B*, should be placed over the shot so as to hold them in place, and also a small strip of paper, *P*, should be placed inside of the tube on which to mark the necessary graduations. Now procure a bottle as long as the tube and large enough to allow the tube to pass into it. Fill this bottle full of dilute sulphuric acid having a specific gravity of 1.225 when cold. A druggist will put this up for a small sum, but if you wish to put this up yourself you can carefully add one ounce of good commercial sulphuric acid to four ounces of distilled water, and when this is cold place the tube in it. But before doing this place a small waxed cork in the mouth of the tube to prevent the liquid from accidentally flowing into it. Now mark the point to which the tube sinks into the dilute sulphuric acid, 1.225 specific gravity. If you desire any other graduations you can proceed as above, but you will then have to compare your hydrometer with a standard one. Most makers of storage batteries recommend the use of an electrolyte having a specific gravity of 1.225, so that is the only necessary mark. A small drop of glue on the strip of paper will hold it in place, completing your hydrometer.



HOME-MADE HYDROMETER.

Elastic Composition for the Preservation of Iron Ships Needed.

The life of iron and steel ships depends, other things being equal, greatly upon the prevention of corrosion in parts that are inaccessible and out of sight, such as the frames, reverse frames, shell plating directly above the cement in waterways, under the deck in the wake of stringer plates, and similar localities. The usual treatment of these parts to preserve them from rusting is to apply red-lead paint, but this is not a preventive, for the straining of the ship and wash of more or less bilge water soon cracks the thin coating so that the plates are attacked. An elastic coating that can be applied cold to the surfaces of iron and steel vessels would be of great value, but it should be comparatively cheap, contain no ingredients liable to spontaneous combustion in hot climates, and dry rapidly after application. These requirements are essential to the general adoption of such a cement or protective coating, and while they may be difficult to discover, will amply repay research in the direction indicated.

Electrical Notes.

A Michigan firm has just received an order to ship fifteen hundred telephone poles to the Telephone Company of Egypt, which is making extensive increases in its business and the area covered by its lines.

The capitol at Hartford, Conn., is being wired for electric lighting. Incandescent, arc and Nernst lamps are to be used. At the top of the interior of the dome a large Nernst lamp will be located, and under the railing at the top there will be a circle of thirty-six Nernst lamps.

According to a foreign contemporary, three electrical furnaces, of 500 horse power each, have been erected at Camonica, in the north of Italy, where the manufacture of pig iron by the Stassano patent will be engaged in. The ore and other material are ground together and formed into bricks, a composition of coal tar being the binder used. It is thus fed into the furnace and subjected to the current. The electrodes are at the bottom of the boshes.

The Society for the Study of Electric Railways of Germany has been carrying out a remarkable series of speed trials upon a new electric railway. The speed attained varied from 100 to 105 miles an hour. While running at the latter speed the pressure was found to be equal to a wind force of 12 feet per second, a force which has only been registered once on the German coast, in the hurricane of February, 1894. The engineers of the railway are confident that even a much greater speed can be attained.

A curious accident was caused recently by a cat climbing a pole of the Buffalo and Lockport Electric Railway. While attempting to walk along the feed wires her tail touched one of the 22,000-volt Niagara transmission lines. The cat was instantly killed, but a short circuit was caused by the body falling across the wires; this resulted in shutting off the power at Niagara for two hours. Several electric railways and lighting systems in western New York were without power. The next day another cat in Utica, N. Y., prowling around the power house in Utica, also caused a short circuit, which resulted in blowing out several fuses, and the cars were stalled for some time. The cat, however, was not injured and still lives.

The engineers of the Brooklyn Rapid Transit Company have drawn plans to reduce the congestion on the Brooklyn Elevated Road. A considerable section of the Myrtle Avenue division is very much overcrowded, owing to the fact that the Long Island, Fifth Avenue, Bay Ridge, Borough Park and other trains which reach the suburban districts have had to cross Fulton Street and use the Myrtle Avenue and Adams Street line as the only means of reaching the bridge, while the traffic on the Fulton Street line is not very heavy. The plan proposed is to connect the Fulton Street and Fifth Avenue lines at Flatbush Avenue. The difference in the grade of the two roads will be adjusted by an incline. The closing of a number of stations on the Fulton Street line is also contemplated, with a view to reducing the number of stops and making the service to the bridge of an express nature for long-distance travelers. Naturally this has aroused considerable antagonism.

Some interesting experiments for the artificial production of rain by means of electricity have been carried out in Japan. The probability of greater success being obtained by this means, in lieu of the system of detonating explosives in the upper air strata, has often been advocated by scientists. This attempt by the Japanese, however, is the first practical effort to prove the truth of this theory, and it was attended with conspicuous success. The trials were made in the Fukushima prefecture. Operations were commenced at eleven in the evening, but there was no sign of atmospheric change until nine o'clock next morning, when a cluster of clouds was observed over the hill on which the experiment was held. At length rain began to fall, followed by a second fall at eleven A. M., and afterward a third, fourth, and fifth—the last being about 9:30 in the evening. The area upon which the rain fell extended over many miles. As a single experiment of this description is scarcely conclusive, the scientists who carried out these particular trials propose to repeat them, with a view to establishing the feasibility of the idea. It will be recollected that we recently published in the SCIENTIFIC AMERICAN an article describing the influence of electricity in connection with the weather.

The Current Supplement.

The current SUPPLEMENT, No. 1363, contains many articles of unusual interest. "Animal Haunts and Trapdoors" is an admirably illustrated article on natural history. "Recent Science" is a paper by Prince Kropotkin. "Scenes from Kilima Njaro" is an attractive article on exploration, and is accompanied by a number of engravings. "The Dignity of Chemistry" is by Dr. H. W. Wiley, Chief Chemist of the United States Department of Agriculture.