

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

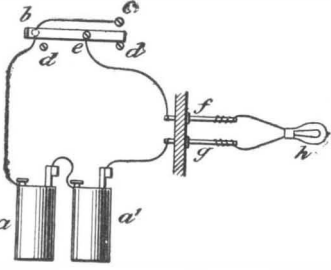
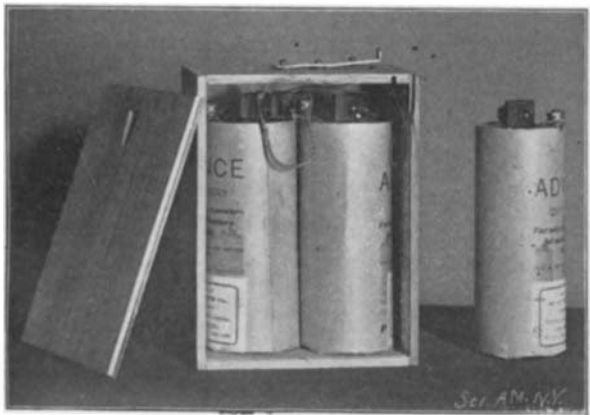
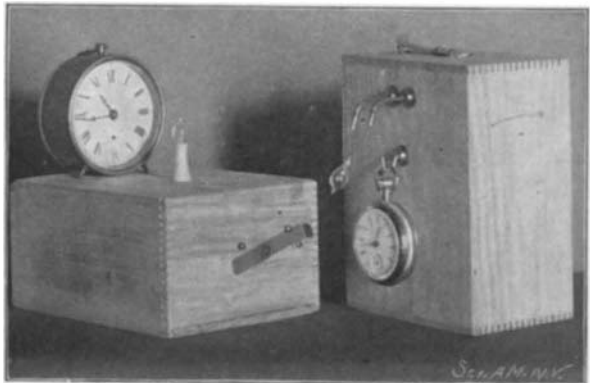


DIAGRAM OF CIRCUIT.

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



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 $\frac{1}{2}$ 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.

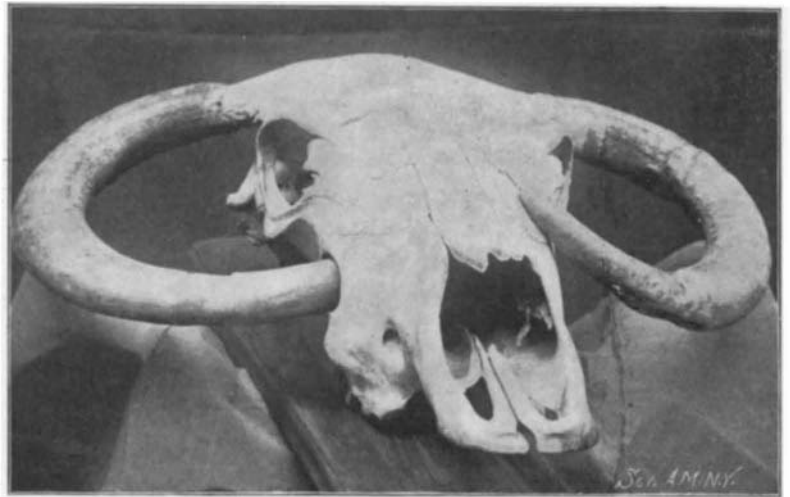
Two cells of dry battery will light the lamp occasionally, for a long time, if used only an instant each time; but if the lamp is used continuously, it runs the battery down, so that it will require frequent renewal.

Methods for Producing Low Temperatures.

At a recent meeting of the Académie 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 cy-



CURIOUS HORN GROWTH OF A NEW ZEALAND BUFFALO.

indrical 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.

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 $4\frac{1}{2}$ inches into the head through a hole $2\frac{1}{4}$ 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, Wavynui, 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



PORTABLE COAL-LOADING MACHINE.

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.

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