Electro-Galvanizing.

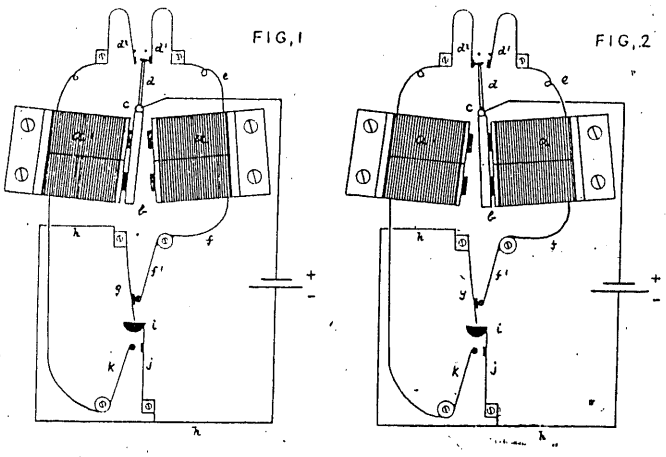
Burgess and Hambuechen, in the *Electrical World*, xl, 411, sum up the advantages and disadvantages of the electrical process. They recommend the addition of aluminium salts to the zinc sulphate bath, believing that the improved deposit of zinc so obtained is due to the separation of Al ions at the kathode and the deposition of Zn as the result of secondary chemical action. No aluminium remains in the coating.

Influence of the Hydrogen Iron in Peptic Digestion.

The fact that the digestive power of pepsin requires the presence of acid implies the dependence of the enzyme on hydrogen ions for its activity. W. Gies (*Amer. Journ. Physiol.*, viii) supports this view by experiments with various acids. He is examining the effect of equi-dissociated solutions to ascertain the influence of the anions.

THE LOWNE SYSTEM OF ELECTRIC CLOCKS.

Most systems of electric clocks which have been placed on the market have come to grief sooner or later because their inventors failed to appreciate that in order to run clocks successfully for very long periods without attention the current used to operate them must be husbanded with the greatest care. Most makes of electrically-controlled or operated clocks will work satisfactorily for a limited time, but in many cases, sooner or later, and generally sooner, their action will become erratic and they will ultimately stop altogether. Although the amount of electrical energy necessary to move the hands of a clock once every minute or half-minute is very small, yet that amount of energy must always be there, ready to do its work, or the clock will fail. The longer, therefore, the battery which supplies that current can be induced to last the longer time will the clock work satisfactorily. It is obvious, of course, that the shorter the time during which electrical contact between the battery and the clock is maintained the less will be the amount of energy consumed and the longer will the battery last. The expenditure of current every minute or half-minute may be infinitesimal, but a very small excess taking place regularly sixty or a hundred-and-twenty times every hour soon mounts up and shortens the useful life of the battery to an extent which would hardly be credited by anyone who has not compared the various systems of electric clocks in actual use. A carefully thought-out system has, after tests extending over many years, recently been put on the market by Messrs. R. M. Lowne & Sons, of Bromley Road, Catford, S.E., its special object being to save current, and so to lengthen the time over which clocks will run without attention. Clocks on the Lowne system have been running in private for the last seven years continuously without more attention than filling up with water, once or twice a year, the Leclanché cells which are used to drive them. Once they have been

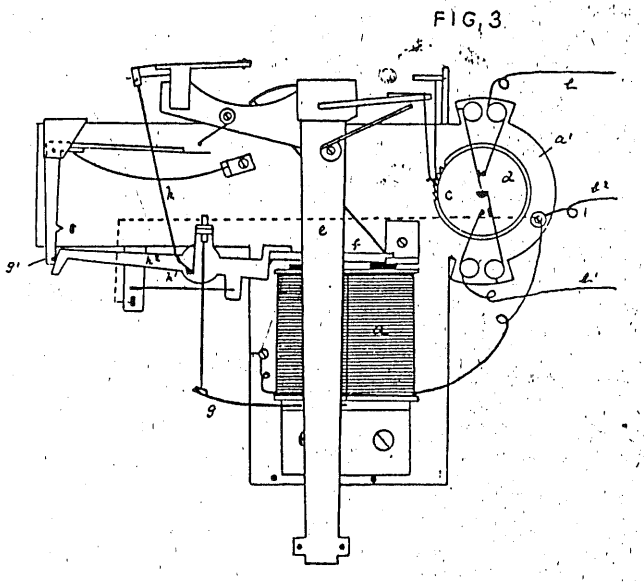


Diagrams showing Circuits in Lowne Electric Clock.

regulated they appear to keep time to within fifteen seconds a month, such accurate time-keeping being possible owing to the apparent impossibility of the apparatus ever missing an impulse. We were recently afforded an opportunity of looking closely into the Lowne system, and the accompanying diagrams will make the principle of its action clearly understood. Fig. 1 shows the arrangement employed in the clocks whereby the exact amount of current needed to energise the magnets sufficiently to do the work required of moving the hands, is automatically secured without any waste of power.

In this diagram (a and a^1) are electro-magnets having an armature (b) movable at a centre (c) with metallic conductor (d) in electrical contact with one pole of a battery (+) and with contact spring (d^1) through conductor (e), magnet (a), conductor (f), insulated contact piece (f^1), contact spring (g), conductor (h), to pole of battery (−).

Under these conditions the magnet (a) will be energised and the armature will move on its centre towards the poles of the magnet, at



Mechanism for actuating Pendulum, showing Transmitter Wheel.

the same time the *electrical* contact will be broken at (d^1) and *metallic* contact will be made at (d^2) as shown in Fig. 2, but *electrical* contact will not again be made until the contact spring (j, Fig. 1) falls upon the insulated contact piece (k). When this occurs the magnet (a^1) will be energised, and similar conditions to those described above will again take place, the armature moving back to its original position, and so on.

The contact springs and pieces (f, g, j, k) form the electrical transmitter, and are operated by the half cylinder (i) which is caused to revolve by the swinging of a pendulum, and alternately makes electrical, and brakes metallic contact, whilst the electro-magnets (a, a^1), armature (b) and contact breaker (d, d^1, d^2) form the indicator or clock. This part of the apparatus automatically breaks electrical, and makes metallic contact immediately the work of moving the hands of the clock or other apparatus is performed, and the battery can never remain in circuit, or contacts of undue length be made.

Fig. 3 shows the mechanism for giving the impulse to the pendulum. An electro-magnet (a) is actuated by means of a transmitter (a^1) which makes electrical contact with one or other of two insulated conductors (b, b^1) at regular intervals of time by means of a toothed wheel (c) which carries a half cylinder (d) and is caused to revolve by the vibrations of the pendulum fork (e). When the magnet is energised its armature (f) is drawn close to the poles and winds up a spring (g) which is held at a tension by the stop (g^1) after the current has ceased to pass through the coils of the magnet. An escapement rod (h) attached to the pendulum fork now comes in contact at (h^1) with a lever (h^2) attached to the armature and gives an impulse to the pendulum. The escapement rod automatically releases itself from the lever and does not come in contact with it afresh until the electro-magnet is again actuated.

One pendulum can, of course, be employed to drive any number of large or small dials arranged say in the various rooms of a house, hotel or office building, the time recorded by them all being identical.

A recent improvement in the Lowne clocks is the addition of an electric striking device, which can be connected to any existing clock without alteration. Its action is purely electrical and quite automatic, the time being struck on a gong or bell by a clapper with unfailing regularity when the hands of the clocks reach the hour or half-hour, A modification of the same system is now being applied to operate at certain intervals for any predetermined duration, steam sirens and hooters for use in large factories and works.