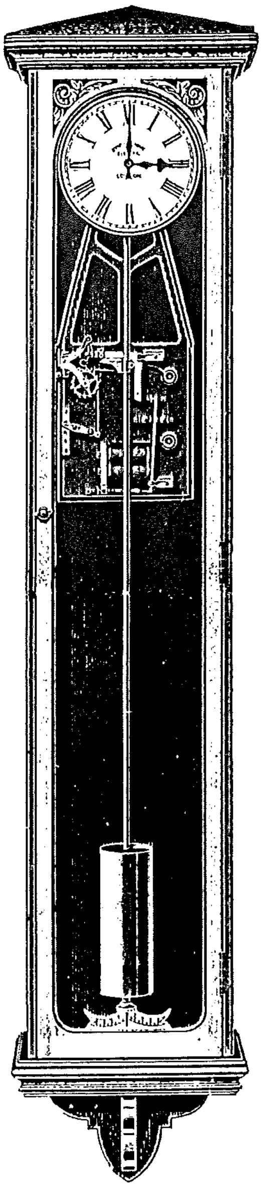
"Synchronome" Electric Clocks.



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"SYNCHRONOME" ELECTRIC CLOCKS.

THE advantage of all clock dials in a building or works registering the same time can hardly be over estimated. But the system by which they are operated must be an absolutely reliable one or it would be worse than useless. In the past several systems have been tried and discarded.

The "Synchronome" system, however, is one which has won for itself a great reputation, and is now being largely installed on British and foreign railways. Such clock dials are particularly useful in large blocks of offices and hotels, and is essential in works in which men register the time spent on each job.

The "Synchronome" system was invented by Mr. F. Hope-Jones, and in ten years broke down the prejudice which had been aroused by the many failures of other systems. The advantages claimed for it are :—

Its complete automatic action, as not even the master clock requires to be wound up. Absolute synchronism of any number of dials. Small consumption of current which may be taken from any source of supply. Automatic battery warning which may be audible if desired. Impossibility of stopping in closed contact. Great accuracy of time keeping, which is unaffected by variation of battery. Facility for automatic synchronization by official time signals.

One of the largest and most recent (1912) installations put up by the Synchronome Co., Ltd. (32, Clerkenwell Road, London) is that at the Adelphi Hotel (Midland R.), Liverpool, having 200 dials. There are seven installations on the L. and North Western R., including one at Euston of 36 dials, one at Broad Street of 100 dials, ten of which are turret clocks, and one of 16 dials at New Street, Birmingham.

On the L. and South Western R. there are four, including the general offices (50 dials), and the Eastleigh Locomotive works and offices (14 dials and 2 turrets). It is interesting to note that the 5ft. turret dial at Waterloo South Station was supplied and erected at four days' notice at half the cost of an ordinary key-wound clock. The installation of 40 clocks at Nottingham (Midland R.) has been working since 1903; according to Mr. J. Sayers they are "as near perfection as anything ever will be in this world."

There are also large installations on the Caledonian R., Glasgow and South Western R., the North British R., the Midland R. (Tilbury section), the Belgian State Railways, and the South Manchurian R., on which there are five installations, including the Mukden station and hotel (13 dials and 4ft. 6in. turret), and the loco-works and model village with 29 dials and 3ft. turret.

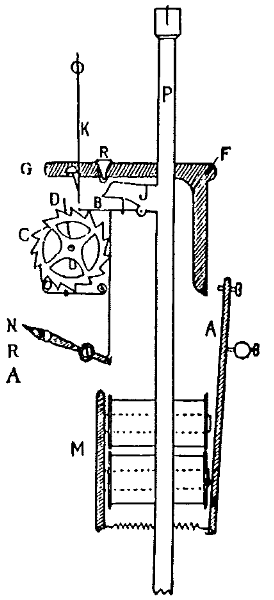
The Burmah State R. and the Buenos Ayres and Gt. Southern R. have also adopted the system.

Fig. 1 illustrates the self-wound controlling pendulum "Time transmitter," or master clock.

The switch consists of two moving parts; (1) the right angled lever G centred at F and normally supported on spring catch K. Once every half-minute the lever is let down, in the act of giving an impulse to the pendulum P, upon (2) the armature A. Current from any available source then passes through the series circuit of dials and the magnet M, which attracts the armature A and throws up the lever G on to its catch again.

If the current be insufficient the pendulum assists the magnet M to replace the gravity lever G, thereby giving visible (or audible) warning of impending failure of battery.

The pendulum releases the switch by means of the fifteen-toothed wheel C, which carries a vane D engaging with the catch K at each revolution. The hook B pivoted upon the pendulum P turns this wheel once every thirty seconds. At the moment of its release the little roller R on the gravity arm G is just above the curved end of the pallet J, down which it runs, giving an impulse to the pendulum at the moment when it passes through its zero or central position. Thus the pendulum is free at all times except in the middle of its swing; not only is the escapement detached, but it operates at zero, thus realizing the ideal which horologists have been aiming at for centuries.



The shape of the impulse surface of the pallet J is mathematically produced to yield an impulse, beginning with extreme gentleness, increasing to a maximum at zero, and diminishing in identical ratio.

The dials can be readily set to time by merely moving the lever from normal to retard or accelerate.

The electrical contact, occurring at each half-minute precisely, is the only contact in the system, and it is a very perfect one; the whole of the energy required to keep the pendulum swinging being transmitted through the contact surfaces.

Dial movements of ideal simplicity can be used with confidence that they will keep in step. The motion is here illustrated, fig. 2, and it will be understood that the electro-magnet B receives an impulse every half-

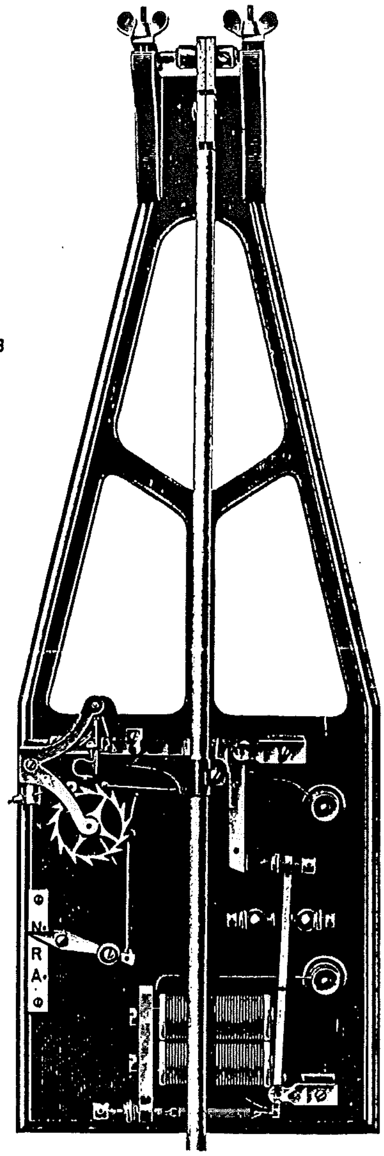


Fig 1.
Controlling Pendulum,
Time Transmitter, or Master Clock.

minute which attracts the armature C and by means of the lever D enables the click E to engage another tooth of the wheel A. The spring F then propels the wheel A and the minute hand attached to it one half-minute. The stops H and I are so arranged that the wheel is locked at every point in the cycle of operations, yet capable of being freed at any moment by merely lifting the backstop lever G.

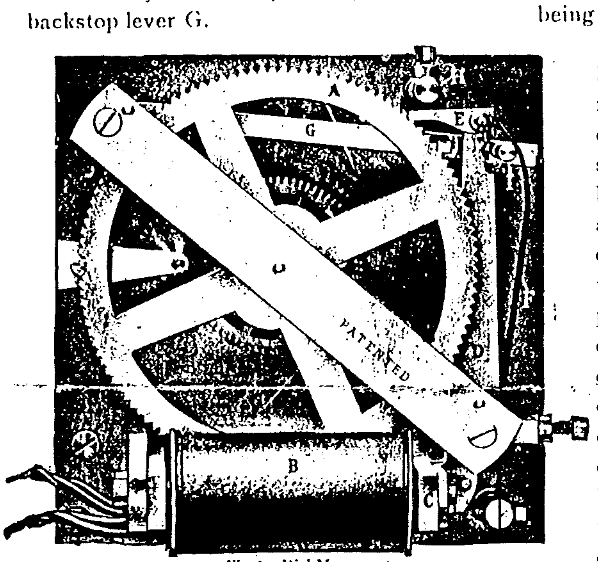


Fig 2. Dial Movement.

The great virtue of the pendulum switch is that it transmits to all dials in the time-circuit sufficient current to propel them. By an entirely novel application of the phenomenon of self-induction it becomes impossible for the switch to operate without doing so. This was perfectly demonstrated by Mr. Hope-Jones in his 1910 Paper before the Institution of Electrical Engineers by means of a series of oscillographs, one of which, fig. 3, is here reproduced.

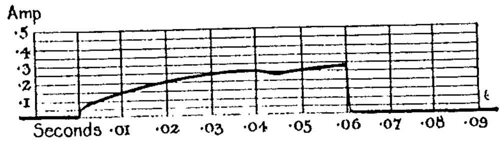


Fig. 3.

It may be described as a photograph of the electric impulse which passes through the "Synchronome" time-circuit every half-minute. The verticle divisions represent hundredth parts of a second, and the horizontal lines are twentieth parts of an ampére. The installation on which this observation was taken consisted of a controlling pendulum and fourteen dials, on a primary battery of 23 volts, the total resistance of the circuit being 61.8 ohms. The current rate would have risen to ·37 ampéres if the clocks had required it and had therefore asked for it. The small depression in the curve between ·04 and ·05 sec. represents the operation of the dials. It will be observed that the current never attains its full value, and that the dials operate at ·25 amperes with an impulse whose duration is less than a twentieth part of a second. The total duration of the impulse is ·60, or one-seventeenth of a second. The area enclosed by the curve represents the consumption of current, which, in this case, is ·012 coulombs per impulse = 3·5 ampere hours per annum, or an average of 5 watt hours per annum per dial, many of which were large ones.

The voltage might decline to 16 (a drop of 30 per cent.), or 26 ohms resistance might be include.l in the circuit (an addition of 42 per cent) before the electro-magnet would call upon the pendulum to assist it to raise the gravity arm, and even then the circuit would continue to work perfectly.

The above compensatory effect is of the greatest practical value, and is not, we understand, to be found in any other system.

The Oscillograph test, which is the severest known to electrical science, reveals the slightest intermittency or "raggedness" of impulse. It demonstrates the perfect cleanliness and precision of the make and break—the cardinal virtues of the "Synchronome" switch.