

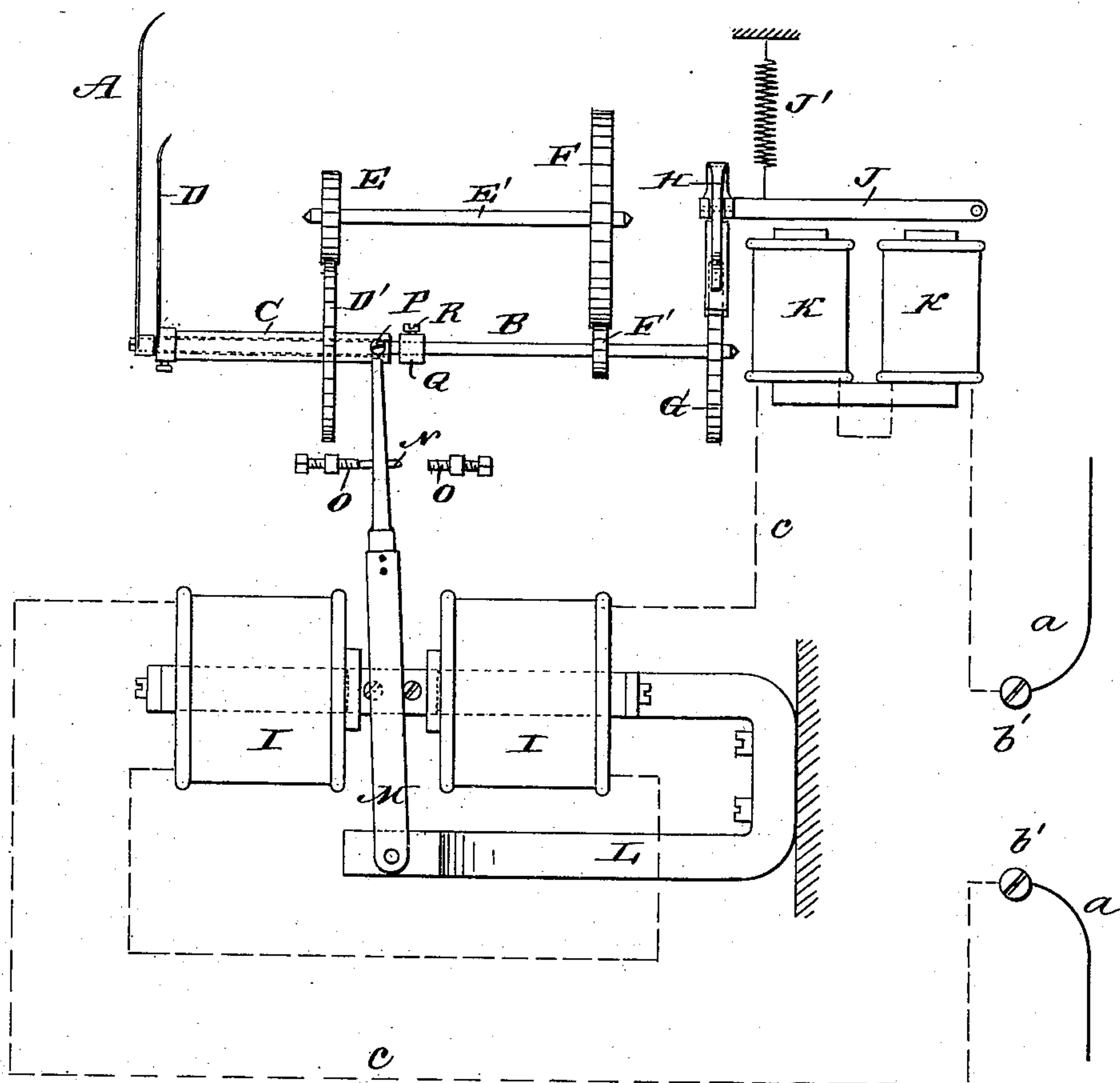
(Model.)

W. B. HARVEY.

SECONDARY ELECTRIC CLOCK.

No. 377,895.

Patented Feb. 14, 1888.



WITNESSES:

*Probyer*  
*C. Sedgwick*

INVENTOR:

*W. B. Harvey*

BY

*Munn & Co*

ATTORNEYS.

# UNITED STATES PATENT OFFICE.

WIRT B. HARVEY, OF MEMPHIS, TENNESSEE.

## SECONDARY ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 377,895, dated February 14, 1888.

Application filed August 25, 1885. Serial No. 175,300. (Model.)

*To all whom it may concern:*

Be it known that I, WIRT B. HARVEY, a citizen of the United States, residing at Memphis, in Shelby county, State of Tennessee, have invented certain new and useful Improvements in Secondary Electric Clocks, of which the following is a full, clear, and exact description.

The object of this my present invention is to improve the construction, simplify the action, and increase the efficiency and certainty of operating, correcting, and synchronizing the hands of secondary electric clocks upon and by means of the same line wire or circuit over which the signals that are to operate the hands once per minute or oftener are transmitted; and to these ends it consists in certain details of construction, combinations of elements, and peculiarities of arrangement and operation, that will be specified more particularly in the claims at the end of this specification.

My invention consists of a secondary electric clock containing, in addition to the usual electro-magnet, armature, gears, &c., used for propelling the hands forward, a polarized armature, two pins, screws, or catches so placed in relation to each other and the arbors carrying the hands that the polarized armature will at all times be in a position to arrest either of said pins, screws, or catches, thereby arresting the hands at certain points on the face of their dials during each revolution for the purpose of correcting or synchronizing.

My invention is more especially designed to operate in a circuit where a regulator or master-clock causes the said circuit to be closed for a short space of time during each minute, preferably the last second of each minute.

Reference is had to the accompanying drawings, forming a part of this specification, in which a diagrammatic side view of my improved secondary electric clock is shown.

The minute-hand A is mounted on the end of a spindle, B, surrounded by a sleeve, C, carrying the hour-hand D and provided with a cog-wheel, D', engaging with a pinion, E, on the shaft E', carrying a cog-wheel, F, engaging with a pinion, F', on the spindle B, which carries on its other end a ratchet-wheel, G, on the edge of which plays a pawl, H, pivoted on an armature-lever, J, which is pivoted near the ends of the cores of an electro-mag-

net, K, said armature being pulled away from the said cores by a spiral or other spring, J', when no current is flowing through the coils of the electro-magnet, all so mounted in relation to each other as to operate the hands of a secondary electric clock in the usual manner by means of an electric current.

A permanent magnet, L, is secured to the clock-case, on one pole of which is secured an electro-magnet, I, and on the other pole the armature M is pivoted in such a manner as to swing freely between the ends of the cores of the electro-magnet I. The armature M is thus polarized and not affected by the opening or closing of the circuit, but only by the reversals. This principle is well understood by electricians or others versed in the art. A pin, N, is placed transversely through the polarized armature M and projects from opposite sides between two check-screws, O O. A screw, pin, or catch, P, is carried by the sleeve C, and another, R, by the collar Q on the spindle B. The polarized armature M is located in relation to these pins so that it lies either in the one or the other path at all times, as they revolve around with the spindles, sleeves, and hands, and will at a certain point of a revolution of either hand prevent its passage until it is removed by being placed in the path of the other. The line wires or circuit connecting the secondary electric clock with the master-clock are connected to the posts *b b'*, which are in connection electrically with the electro-magnet I and electro-magnet K by the wire *c*.

It will readily be understood that when the polarized armature M engages either pin P or R both hands will be locked and cannot proceed until released, although signals may continue to flow through the circuit.

When secondary electric clocks are placed at a distance and out of sight of the master-clock, as is usually done, and a number of them included in a circuit, there is no way to tell where the hands point to on the face of the dials, and if a certain one accidentally fell behind, which from various causes often occurs, it continues that much out of time or behind the others until an inspector or some one corrects it by hand. There is also no means whereby one at the central station can know whether or not the secondary clocks are correct at any time. My invention meets these



requirements and allows the secondary electric clocks to be corrected, synchronized, and to cause all the hands to point to the same time or point on the faces of their several dials.

5 It will easily be seen that if two or more secondary electric clocks are placed in the same circuit, whose pins are arranged at exactly the same point—that is, arranged to be engaged when their hands reach a certain time or point  
10 on their dials—while one or more may be faster or slower than others, if a sufficient number of signals are transmitted to them, each one will respond to every such signal until that time or point is reached, and then  
15 stop responding, although the one that is slower will continue responding. A time therefore must come when all secondary electric clocks have ceased following the signals, when the hands will all point to the same time or point  
20 on the faces of their several dials.

For various reasons I prefer to select XII as the time to synchronize the hour-hands, and the thirty-minute mark of an hour the minute-hand. I also prefer that a synchronizing take place once every twelve hours. If this  
25 time is selected, it allows one pin to revolve out of the way, so that when the other is engaged by the polarized armature M nothing will be in the way to prevent said armature  
30 being removed from out of the path of the engaged pin. I also prefer that the current from the main battery be of such a direction or polarity as to incline the polarized armature M in the path of the pin carried by the  
35 sleeve carrying the hour-hand as its normal position, and let it remain that way for twelve hours or reversed only long enough to effect a correction. This will prevent having to shift it back and forth to enable the pin on the minute-hand arbor to continue its rotation, as it  
40 is evident that when a pin is engaged by the said polarized armature, if not shifted out of its path, then the hands must stop. By working the battery in this position the attention  
45 required is greatly lessened, as the current has only to be reversed once in twelve hours to enable the secondary hands to continue rotating, wherein if it was worked in the opposite direction or position it would have to be reversed once per hour.

To correct or synchronize a circuit comprising one or more secondary electric clocks whose pins or catches have been previously so placed in relation to each other as to prevent the hands  
55 passing a certain point on the face of their dials, said point being the same, the operation is as follows:

As an illustration, say the correct time is ten minutes before twelve and that some of the  
60 secondary electric clocks were faster, some slower, and some correct as to that time. The first thing to be done is to disconnect the master-clock and apparatus responding to its impulses or signals, and insert in circuit a convenient hand-key or circuit-closer and a pole-changer or current-reverser, placing the latter  
65 in such a position as to cause the current to

incline polarized armature M in the path of pin P. Then with the circuit-closer close the circuit once per second, or oftener, for several  
70 minutes. The correct secondary clocks will be thrown out of time for the first few signals; but this will not make much difference, as they will not remain so for any length of time. The fast clocks, if over a few minutes fast, may,  
75 as far as the operation is concerned, be considered as slow, and will respond to signals until a sufficient number has been made by the circuit-breaker to bring their hands up to XII mark on their several dials. Now, if you  
80 have been quick with the synchronizing, it will be necessary to allow the master-clock to “catch up,” as the expression goes. After the master-clock hands point to the time of XII, and before it has reached XII and one minute,  
85 replace the master-clock and apparatus in circuit, allowing the pole-changer to remain in also. Reverse the current from its normal direction or polarity, and leave it so until 12.30 o'clock is reached by the master-clock, when,  
90 with the pole-changers till in that position, operate the circuit-closer as before for, say, half a minute, then reverse the current, and when the master-clock closes the circuit for the thirty-first minute of the hour the polarized armature  
95 will be removed from the path of pin R, in addition to the hands responding to the signal, which they do as soon as they are released by said polarized armature M. I prefer the pole-changer being in the circuit at all times, and the  
100 master-clock transmitter-points and those of the circuit-closer being so arranged as to each other that either one will close the circuit when operated—a principle well understood by those versed in the art.  
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Owing to the fact that when a secondary clock is not very carefully constructed, there being a sufficient amount of lost motion, as it were, between the gearings of the two hands, I find that in synchronizing by means of engaging-pin P the minute-hand may go a minute or two beyond the XII mark of the dials; but this deviation cannot occur when pin R is engaged by the polarized armature M.  
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A synchronizing of the secondary clocks  
115 may be had at any time during the day or night; but by selecting some particular time to do so, and arranging the pins in each one to that time, the interference with clocks that are already correct may be avoided.  
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Experience shows that a secondary electric clock seldom needs or requires correcting for more than a few minutes, although sometimes it becomes necessary to correct one several hours. Any correction of less than sixty minutes may be had once per hour by any one at the central office.  
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Having now fully shown and described my invention, what I desire to claim, and secure by Letters Patent, is—  
130

1. A secondary electric clock provided with an electro-magnet arrangement for operating the hands and a polarizing electro-magnet and polarized armature for arresting one or



both hands, the said electro-magnet coils being in the same electric circuit, substantially as herein shown and described.

5 2. The combination, with an electric clock having a projection on the spindle of the hour-hand and an electro-magnet for operating the hands of the clock, of a polarized electro-magnet and polarized armature, the coils of the said polarized electro-magnet being in the  
10 circuit with the coils of the hand-operating electro-magnet and the armature adapted to engage the projection on the spindle of the hour-hand, substantially as herein shown and described.

15 3. The combination, with an electric clock having projections on the spindles of the hour and minute hands and an electro-magnet for operating the hands of the clock, of a polarized electro-magnet, and polarized armature  
20 the coils of the said polarized electro-magnet being in the circuit with the hand-operating electro-magnet and the polarized armature

adapted to engage either of the said projections, substantially as herein shown and described.

25 4. In a secondary electric clock, the combination, with a spindle carrying the minute-hand, a sleeve surrounding the spindle and carrying the hour-hand, and an electro-magnet and intermediate mechanism for operating the  
30 hands from said electro-magnet, of projections on the spindle and sleeve, a polarizing electro-magnet and polarized armature, the said polarizing electro-magnet coil or coils being in the same electric circuit with the hand-oper-  
35 ating electro-magnet coil or coils, and the polarized armature adapted to engage the said projections for the purpose of synchronizing the hands, substantially as herein shown and described.

W. B. HARVEY.

Witnesses:

J. S. GALLOWAY,  
C. T. SMITH.