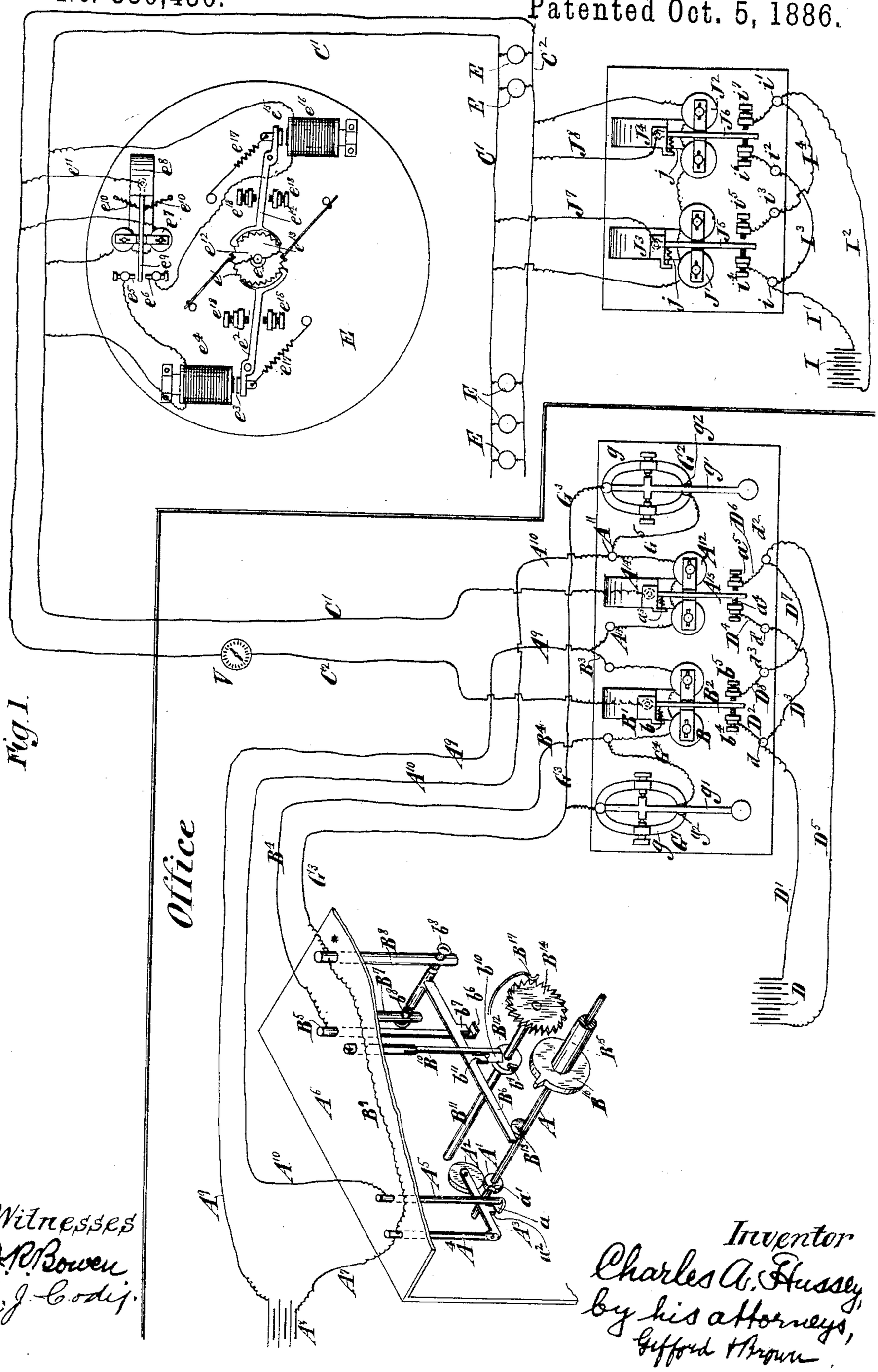
(No Model.)

2 Sheets—Sheet 1.

C. A. HUSSEY.

ELECTRIC TIME INDICATING SYSTEM.

No. 350,430. Patented Oct. 5, 1886.



(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

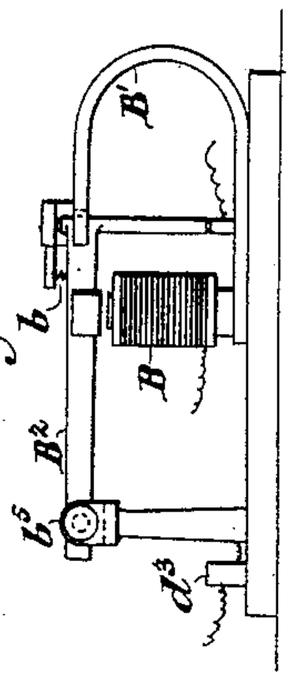


Fig. 3.

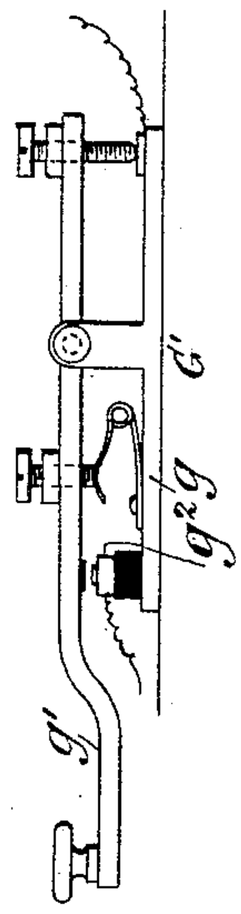
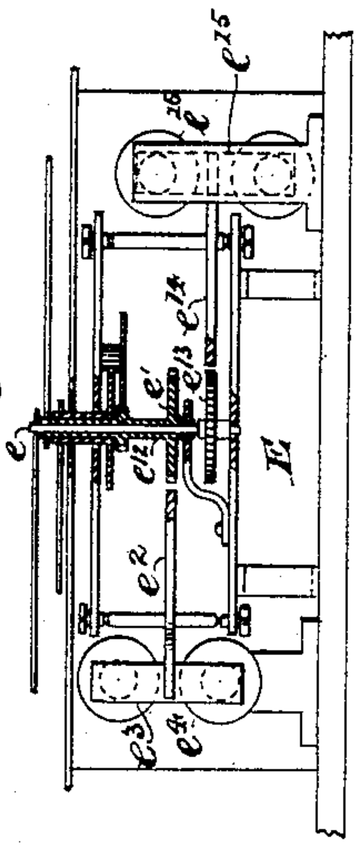


Fig. 4



Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES A. HUSSEY, OF NEW YORK, N. Y.

ELECTRIC TIME-INDICATING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 350,430, dated October 5, 1886.

Application filed May 6, 1886. Serial No. 201,400. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. HUSSEY, of New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Electric Time-Indicating Systems, of which the following is a specification.

I will describe an electric time-indicating system embodying my improvement, and then point out the various features in claims.

In the accompanying drawings, Figure 1 is a diagram illustrating an electric time-indicating system embodying my improvement. All the parts of this system which are located in the office whence the system is controlled I have surrounded by a line, adjacent to which I have marked the word "Office." Fig. 2 of the drawings is a side view of certain parts arranged in the office. Fig. 3 is a side view of certain other parts arranged in the office. Fig. 4 is a side view of certain parts of an electric or secondary clock.

Similar letters of reference designate corresponding parts in all the figures.

A designates the shaft for a sweep second-hand in a primary mechanical clock or regulator. This clock or regulator may be of any suitable kind and operated by a weight. The shaft A, it must be understood, makes one complete rotation during each minute. On the shaft A is affixed a wheel, A′, having a notch, *a*′, in its periphery. Adjacent to the wheel A′ a wheel, A^2, is arranged in the primary clock or regulator. As shown, the wheel A^2 is journaled loosely in a swinging arm, A^3, which is pivotally connected to a rod, A^4, located in the primary clock or regulator. The wheel A^2 rests upon the periphery of the wheel A′. Whenever the notch *a*′ in the periphery of the wheel A′ comes opposite the wheel A^2 the latter drops into it. The arm A^3 of course descends with the wheel A^2 when the latter drops into the notch.

A^5 designates a rod in the primary clock or regulator, which has at the lower end an offset or shoulder, *a*, extending under the swinging arm A^3. As shown, the arm A^3 has a projection, a^2, opposite the offset or shoulder *a* of the rod A^5. When the swinging arm A^3 descends on the dropping of the wheel A^2 into the notch *a*′ of the wheel A′, the projection a^2 makes contact with the offset or shoulder *a* of the rod A^5.

The rods A^4 A^5 and the swinging arm A^3 are to be made of metal. The other parts which I have mentioned may or may not be of metal.

The rods A^4 A^5 are to be insulated from each other. This may be done by supporting them in a frame of insulating material, A^6, or by interposing pieces of insulating material between them and the frame, if the latter is not made of insulating material. The rod A^4 has connected to it a wire, A^7, which extends to one pole of an electric battery, A^8. From the other pole of the battery A^8 a wire, A^9, extends. A wire, A^{10}, extends from the rod A^5. Whenever the swinging arm A^3 descends in the manner which I have explained and its projection a^2 makes contact with offset or shoulder *a* of the rod A^5, the wires A^{10} and A^7 are in electrical communication. This electrical communication will be only momentary, owing to the fact that the notch *a*′ of the wheel A′ is of very slight extent. The notch is preferably so short in the direction of the periphery of the wheel A′ that the contact of the projection a^2 of the swinging arm A^3 with the offset or shoulder *a* of the rod A^5 will exist only for two seconds during each rotation of the sweep second-shaft A. The wire A^{10} is connected to a binding-post, A^{11}, with which one end of the wire of an electro-magnet, A^{12}, is connected. The wire A^9 is connected to a binding-post, A^{13}, with which the other end of the wire of the electro-magnet A^{12} is connected.

It will be understood, in view of the foregoing explanation, that whenever the swinging arm A^3 is allowed to drop, so that its projection a^2 will make contact with the offset or shoulder *a* of the rod A^5, the electro-magnet A^{12} will be momentarily energized from the battery A^8. The electro-magnet A^{12} is mounted upon one pole of a permanent horseshoe-magnet, A^{14}, whose other pole has pivoted to it a swinging armature, A^{15}, for the electro-magnet A^{12}. This armature is of course a polarized armature. The armature A^{15}, as shown, extends above the electro-magnet, and when occupying its normal position extends over the space between the poles. A spring, a^3, tends to pull the armature toward one pole of the electro-magnet. The armature is attracted toward

the other pole of the electro-magnet when the electro-magnet is energized. The armature A^{15} vibrates between two metal contact-pieces, a^4 a^5, (shown as consisting of screws,) so as to be adjustable. Normally, the armature is held against the contact-piece a^4 by the spring a^3. When the electro-magnet is energized it is vibrated over against the contact-piece a^5 momentarily.

B designates an electro-magnet, which is similar to the electro-magnet A^{12}, is, like it, mounted upon one pole of a permanent horse-shoe-magnet, B′, whose other pole has pivoted to it a laterally-vibrating armature, B^2, impelled in one direction by a spring, b, and attracted in the other direction by the electro-magnet B. The armature B^2 vibrates between two metal contact-pieces. (Shown as consisting of adjustable screws b^4 b^5.) Normally, the spring b holds the armature B^2 against the contact-piece b^4. When the electro-magnet B attracts the armature, it swings the latter against the contact-piece b^5. Line-wires C' C^2 extend from the armatures A^{15} B^2 and out of the office to places where electric clocks are located.

D designates a battery for sending currents of electricity along the line-wires C' C^2. A wire, D′, extends from one pole of the battery D to a binding-post, d, which is connected by a wire, D^2, to the contact-piece b^4. The binding-post d is also connected by a wire, D^3, with a binding-post, d', which is connected by a wire, D^4, with the contact-piece a^4. A wire, D^5, extends from the other pole of the battery D to a binding-post, d^2, which is connected by a wire, D^6, with the contact-piece a^5 and by a wire, D^7, with a binding-post, d^3, that is connected by a wire, D^8, with the contact-piece b^5. It will be seen that as the armature A^{15} B^2 are normally in contact with the contact-pieces a^4 b^4, respectively, they are normally in electric communication with one pole of the battery D. When the electro-magnet A^{12} is energized and it vibrates the armature A^{15} against the contact-piece a^5, it shifts the armature into electrical communication with the other pole of the battery D. Thereupon an electric current passes from the battery D along the line-wires C' C^2. If the electro-magnet B is energized, the armature B^2 will be shifted over into communication with the other pole of the battery D, and then, assuming that the armature A^{15} occupies its normal position, an electric current will pass over the line-wires C' C^2. This time the electric current will flow in the reverse direction to that in which it flows when the armature A^{15} is shifted by the electro-magnet A^{12}.

I will remark here, in order to conduce to a clear understanding of my improvement, that the electric current is made to flow from the battery D in one direction over the line-wires C' C^2 by the electro-magnet A and the mechanism operating in conjunction therewith to cause the electric or secondary clocks which I employ to record hours and minutes, and that the electric current is made to flow from this battery in the reverse direction over the line-wires C' C^2 by the electro-magnet B and the mechanism controlling the latter to cause the operation of the calendar mechanism of the electric clocks whereby days of the month are recorded.

I will now describe the mechanism whereby the operation of the electro-magnet B is controlled. A wire, B^3, extends from the wire A^9 to a binding-post, which is connected with one end of the wire of the electro-magnet B. The other end of the wire of the electro-magnet is connected to a binding-post, with which a wire, B^4, is also connected. The wire B^4 is connected to a rod, B^5, in the primary mechanical clock or regulator. This rod B^5 is to be made of metal, and has at the lower end an offset or shoulder, b^6. B^6 is a swinging arm, made of metal and having a projection, b^7, opposite the offset or shoulder b^6 of the rod B^5. The swinging arm B^6 has journals supported by bearings consisting of screws or pins b^8, fitted to metal rods B^7 B^8, arranged in the primary clock or regulator. The rod B^8 is connected by a wire, B^9, with the rod A^4, and hence is in electric communication with the wire A^7, which leads to one pole of the battery A^8. The rods B^5 B^8 are insulated from each other and from the rods A^4 A^5. Whenever the swinging arm B^6 is allowed to descend, so that its projection b^7 will make contact with the offset or shoulder b^6 of the rod B^5, an electric circuit will be completed from the battery A^8 along the wire A^7 to the wire B^9, thence through the rod B^8 to the swinging arm B^6, thence over the latter to the rod B^5, and thence along the wire B^4 to one end of the wire of the electro-magnet B. An electric current will then flow from the battery A^8 to the wire of the electro-magnet B, because the other end of the wire of this electro-magnet is always connected to the battery A^8 through the wire A^9. When the electro-magnet B is thus energized, its armature B^2 will be shifted over to the contact-piece b^5, and an electric circuit will then pass from the battery D over the line-wires C' C^2.

I will now describe the manner in which the swinging arm B^6 is operated. B^{10} is a rod supported in the frame of the primary clock or regulator. Under it is arranged a rotary shaft, B^{11}, on which is affixed a wheel, B^{12}, having a cam-surface, b^9, on one side. The lower end of the rod B^{10} is provided with an offset, b^{10}, that projects into the path of the cam-surface b^9 of the wheel B^{12}, and is adapted to extend under a projection, b^{11}, with which the swinging arm B^6 is provided. The lower portion of the rod B^{10} is resilient. When the cam-surface b^9 of the wheel B^{12} comes opposite the rod B^{10}, the latter will be sprung or moved aside. Its offset b^{10} will then be moved from under the swinging arm B^6, and the latter will descend, so that its projection b^7 will make contact with the offset b^6 of the rod B^5. As soon as the cam-surface b^9 has passed by the rod B^{10}, the latter will be ready to assume its original position and support the

swinging arm B^6 again. It cannot, however, assume its normal position until the swinging arm has been raised to its normal position. The swinging arm B^6 will be raised to its normal position by a cam or eccentric, B^{13}, on the sweep second-shaft A. As the shaft A rotates rapidly, the swinging arm B^6 will only be left in contact with the rod B^5 momentarily. The shaft B^{11} is provided with a wheel, B^{14}, which has twenty-four teeth. On the sweep second shaft A a tubular minute-hand shaft, B^{15}, is arranged. This minute-hand shaft makes a rotation once every hour, and is provided with a wheel, B^{16}, having a single tooth that engages once in each rotation with the wheel B^{14} and moves the latter a short distance. A spring-actuated tooth, B^{17}, which engages with the wheel B^{14}, insures the latter being moved a distance equal to the distance between two adjacent teeth each time the wheel B^{16} engages with it. It also causes the wheel B^{14} to move quickly each time it moves. The wheel B^{16} starts each movement of the wheel B^{14} and the spring-actuated tooth B^{17} completes the movement quickly. This spring-actuated tooth B^{17} also prevents the wheel B^{14} from moving improperly. It will be understood from the description I have given that the wheel B^{14}, the shaft B^{11}, and cam-wheel B^{12} rotate once each twenty-four hours, or, in other words, once a day. The circuit is therefore closed to the electro-magnet B but once a day. As the electro-magnets A^{12} and B have only to vibrate their armatures in one direction, it is not essential that they should have polarized armatures or the permanent magnets combined with them. If not provided with polarized armatures, they would of course have to be turned over into a proper position to move the armatures in the desired direction.

E designates the electric clocks or secondary clocks of the time-telegraph. They are arranged in multiple-arc circuits. Each has a shaft, *e*, which is provided with a wheel, *e'*, having sixty teeth. This wheel *e'* has combined with it a pawl-lever, e^2, that has affixed to it an armature, e^3, for an electro-magnet, e^4. The shaft *e* is a minute-shaft. In other words, it makes a complete rotation once every hour. The minute-hand of the clock is affixed to this shaft. Gearing is combined with this shaft to transmit motion to the hour-hand shaft. The hour-hand shaft I have not shown, as it has nothing to do with my invention. Every time an electric circuit is completed through the electro-magnet A^{12} the latter will shift its armature A^{15} and cause an electric current to flow from the battery D to the electro-magnet e^4. The latter will thus be energized and will vibrate the lever e^2. The pawls of the lever e^2 will then move the wheel *e'* and shaft *e* the distance of one tooth on said wheel. This will occur once every minute. The minute-hand will be moved in this way once every minute for the distance of a minute over the dial of the clock.

I will now describe the manner in which the electric current flows to each electro-magnet e^4. One end of the wire of the electro-magnet e^4 is connected with the line-wire C'. The other end of the wire of this electro-magnet is connected with a metal contact-piece, e^5. This contact-piece is shown as consisting of a screw. Opposite it is a similar contact-piece, e^6. Between the two contact-pieces e^5 e^6 extends the armature e^9 of an electro-magnet, e^7, the ends of whose wires are connected with the line-wires C' C^2. The electro-magnet e^7 is mounted upon one pole of a permanent magnet, e^8. The armature e^9 of the electro-magnet e^7 is pivotally connected to the other pole of the permanent magnet e^8. It is therefore a polarized armature. Springs e^{10} normally hold the armature e^9 midway between the contact-pieces e^5 e^6. The armature e^9 is connected by a wire, e^{11}, with the line-wire C^2. Each time the sweep second-shaft A in its rotation permits of a contact between the swinging arm A^3 and the rod A^5, and the electro-magnet A^{12} is in consequence thereof energized so as to shift its armature against the contact-piece e^5, and an electric current flows from the battery D to the line-wires C' C^2, the electric magnets e^7 of the electric or secondary clocks will be energized. Thereupon the armatures e^9 of such electro-magnets e^7 will be shifted over to the contact-pieces e^5. Electricity will then flow from the line-wires through the wires of the electro-magnets e^7 and the wheels *e'* will be shifted one tooth, and the minute-hands carried thereby move a distance to indicate one minute on the dials. Each electric or secondary clock is provided with a tubular shaft, e^{12}, which fits upon the shaft *e*, and is provided with a wheel, e^{13}, having thirty-one teeth. Combined with this wheel e^{13} is a pawl-lever, e^{14}. On the pawl-lever e^{14} is the armature e^{15} of an electro-magnet, e^{16}. One end of the wire of the electro-magnet e^{16} is connected to contact-piece e^6, the other end of such wire being connected to the line-wire C'. Each time one rotation of the shaft B^{11} of the primary clock or regulator causes a contact of the swinging arm B^6 with the rod B^5, which will be once every day, as before explained, the electro-magnet B will be energized, its armature B^2 will be shifted over against the contact-piece b^5, and an electric current from the battery D will be caused to pass over the line-wires C' C^2 in the reverse direction to that in which it passes when the electro-magnet A^{14} is energized, as before explained. Then the electro-magnets e^7 of the electric or secondary clocks will be energized in such manner as to shift their armature e^9 over against the contact-pieces e^6, whereupon electricity will pass from the line-wires C' C^2 to the electro-magnets e^{16} of the electric or secondary clocks. When these electro-magnets e^{16} are thus energized, which will be once every day, the pawl-levers e^{14} will be vibrated so as to move the wheels e^{13} one tooth. Calendar-hands on the shafts e^{12} will then move a distance to indicate the date of another day upon the dials of the

electric or secondary clocks. Obviously the primary clock or regulator must be so organized that the swinging arm A^3 cannot make contact with the rod A^5 at the same time that the swinging arm B^6 makes contact with the rod B^5. Springs e^{17} retract the pawl-levers e^2 e^{14} of the electric or secondary clocks after they are severally attracted by the electro-magnets e^4 e^{16}. Stops e^{18}, consisting, preferably, of adjustable screws, are employed to limit the movements of the pawl-levers.

I will now describe a means whereby the electric or secondary clocks may be set from the office where the primary clock or regulator is located. G′ G^2 designate keys consisting severally of a metal frame, g, and a metal lever, g', journaled to the frame g and capable of being rocked up and down. The lever g' is provided on its under side with a contact-piece. The frame g is provided beneath the lever with a contact-piece, g^2, which is insulated from the frame. A wire, G^3, extends from the rod B^8 of the primary clock or regulator, and is connected to the levers g' of the keys G′ G^2. A wire, G^4, extends from the binding-post, in which the wire B^4 is secured to the contact-piece g^2 of the key G′, and a wire, G^5, extends from the binding post A^{11}, in which the wire A^{10} is secured to the contact-piece g^2 of the key G^2. By depressing the lever g' of the key G′ a communication with the battery A^8 will be made from one pole along the wire A^7 to the wire B^9, from the latter to the wire G^3; thence to the frame of the key G′; thence to the lever of the key; thence to the contact-piece g^2 of the key and along the wire G^4 to the wire of the electro-magnet B. As the other pole of the battery is always in communication with the wire of the electro-magnet, the circuit is then complete. Each time the key G′ is thus operated the armature B will be shifted over to the contact-piece b^5, whereupon an electric current from the battery D will energize the electro-magnets e^7 of the secondary or electric clocks, so that they will shift their armatures e^9 over against the contact-pieces e^6, and will then energize the electro-magnets e^{16}, so as to cause the latter to shift the pawl-levers e^{14}, and through them the wheels e^{13} and calendar-hands. In this way the calendar-hands of the electric or secondary clocks may be set. By depressing the lever g' of the key G^2 a communication with the battery A^8 will be made from one pole along the wire A^7 to the wire B^9; thence to the wire G^3, to the frame g of the key; thence to the lever g' of the key; thence to the contact-piece g^2 of the key, from the latter along the wire G^5 to one end of the wire of the electro-magnet A^{12}. The other end of the wire of the electro-magnet A^{12} being in communication with the battery A^8 through the wire A^9, the circuit is complete. Whenever the key G^2 is thus operated, the electro-magnet A^{12} will shift its armature A^{15} over against the contact-piece a^5, and a current of electricity will pass from the battery D over the line-wires C′ C^2 to the electro-magnet e^7 of the electric or secondary clocks. The armatures e^9 of these electro-magnets will thereupon be shifted against the contact-pieces e^5, and the electric current will be caused to flow to the wires of the electro-magnets e^4. Then the electro-magnets e^4 will operate the pawl-levers e^2, and cause the latter to shift the wheels e' of the shafts e, carrying the minute-hands. Obviously, a galvanometer, V, may be combined with the line-wires C′ or C^2 in the office to indicate their electrical conditions.

I will now describe means whereby the electro-motive force will be sustained at points distant from the office where the battery D is located. I designates a supplemental battery connected at one pole by a wire, I′, with a binding-post, i, and at the other pole by a wire, I^2, with a binding-post, i. The binding-post i is connected with a binding-post, i^2, by a wire, I^3, and the binding-post i' is connected by a wire, I^4, with a binding-post, i^3. The binding-posts i i' i^2 i^3 are connected with contact-pieces i^4 i^5 i^6 i^7. (Shown as consisting of adjustable screws.) J′ J^2 designate electro-magnets mounted on poles of permanent horseshoe-magnets J^3 J^4, and having armatures J^5 J^6 pivotally connected to other poles of these permanent magnets. These armatures are consequently polarized armatures. They are moved over to the contact-pieces i^4 i^6 by springs j, and are shifted by the electro-magnets over to the contact-pieces i^5 i^7. One end of the wire of the electro-magnet J′ is connected to the wire C′. The other end of the wire of this electro-magnet is connected to one end of the wire of the electro-magnet J^2. The other end of the wire of the electro-magnet J^2 is connected to the line-wire C^2. The armature J^5 of the electro-magnet J′ is connected by a wire, J^7, to the line-wire C′. The armature J^6 of the electro-magnet J^2 is connected to the line-wire C^2 by a wire, J^8. The electro-magnets J′ J^2 and their armatures J^5 J^6 are so constituted that when an electric current flows to the wires of these electro-magnets from the line-wires C′ C^2 in one direction the armature J^5 will be shifted and the armature J^6 will not, and so that when an electric current flows to the wires of the electro-magnets in the other direction the armature J^6 will be shifted and the armature J will not. There may be any desirable number of the batteries and their appurtenances. When the battery D is connected with the line-wires by the shifting of the armature A^{15} through the electro-magnet A^{12} by reason of the contact of the swinging arm A^3 with the rod A^5, each battery I will be connected with the line-wires, so that electricity will flow therefrom in the same direction as from the battery D, owing to the shifting of the proper armatures J^5 or J^6 to connect the batteries I in that manner with the line-wires.

I do not here claim the features of the primary clock or regulator or the features of the electric or secondary clocks shown and de-

scribed in this application, except in combination with other things, as hereinafter particularly specified. I intend to file applications for Letters Patent covering the novel features of my primary clock or regulator and the electric or secondary clocks.

I have filed, on June 18, 1886, an application for patent numbered 205,562, for an improvement in primary clocks for electric time-indicating systems, in which I claim special features of construction in said primary clock. I do not herein lay claim to the special construction of said clocks, as they are claimed in said application.

I have also filed an application for patent numbered 205,849, for an improvement in electric or secondary clocks, June 18, 1886, in which I claim special features of construction of a secondary clock. I do not herein lay claim to the special construction of said clocks, as they are claimed in said application.

I have filed an application for Letters Patent for an improvement in electric line-indicating systems numbered 205,564, June 18, 1886. In this application I show a primary clock or regulator having two circuit-closing mechanisms, line-wires adapted to form two circuits, and electric or secondary clocks having two electro-magnetic mechanisms for operating different parts. In this application I also show electro-magnets having their armatures connected with certain of the line-wires, a main battery for supplying electricity to the line-wires connected at one pole with contact-pieces, against which the said armature will be vibrated when the electro-magnets are energized, and connected at the other pole to one of the line-wires, which is not connected with the armatures, and local circuit-wires connected to the coils or wires of the electro-magnets and extending to circuit-closing mechanism in the primary clock or regulator. In this application I also show a supplemental battery and electro-magnetic mechanism for connecting the supplemental battery with either of the two circuits, as circumstances may require. I do not in this application lay claim, broadly, to the electric time-indicating system therein claimed.

I have also filed an application for Letters Patent for an improvement in electric time-indicating systems numbered 206,464, dated June 18, 1886. In that application I show a regulator or mechanical clock in circuit with secondary or electric clocks, said secondary or electric clocks being each connected with a battery to said circuit. In that application I also show the secondary or electric clocks connected each with a battery in multiple arc to said circuit. In that application I also show a local circuit connected with contact-pieces in the regulator, and a main circuit composed of a number of sections having secondary or electric clocks, batteries in circuit in each of the sections, those sections from which other sections extend having electro-magnetic closers for the said sections, which extend therefrom, and the local circuit which is connected with the contact-pieces in the regulator having electro-magnetic circuit-closing mechanism for the section or sections of the main circuit extending from the place where the regulator is located. I do not in the present application lay claim, broadly, to the electric time-indicating system therein claimed.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an electric time-indicating system, the combination of electric or secondary clocks, line-wires leading thereto, a battery for supplying an electric current to such line-wires, a primary clock or regulator, electro-magnetic mechanism whereby the electric current will be reversed on the line-wires, an electro-magnet in circuit with said line-wires in the secondary clock for operating a certain portion of said clock, and another electro-magnet also in circuit with said line-wires in the secondary clock for operating another portion of the secondary clock, substantially as specified.

2. In an electric time-indicating system, the combination of electric or secondary clocks, line-wires leading thereto, a battery for supplying an electric current to such line-wires, a primary clock or regulator, electro-magnetic mechanism whereby the electric current will be reversed on the line-wires, electro-magnets in the secondary clocks for operating different parts of the clocks, and a circuit-changing device whereby when the current is reversed the electro-magnets in the secondary clocks will be alternately magnetized, substantially as specified.

3. In an electric time-indicating system, the combination of electric or secondary clocks, line-wires leading thereto, a battery for supplying an electric current to such line-wires, a primary clock or regulator whereby the electric current will be reversed on the line-wires, electro-magnets in said secondary clocks for operating different parts of the electric or secondary clocks, and keys and connections whereby provision is afforded for setting the secondary or electric clocks, substantially as specified.

C. A. HUSSEY.

Witnesses:
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