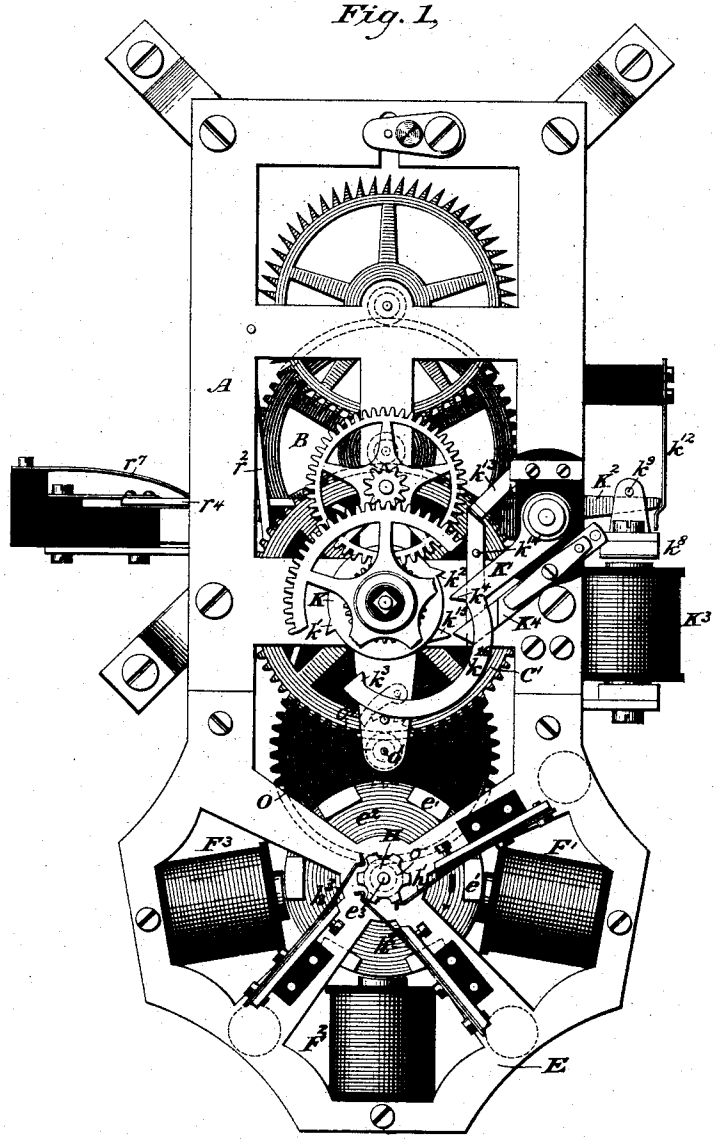
(No Model.) 3 Sheets—Sheet 1.

C. H. POND.

SYNCHRONIZING DEVICE FOR CLOCKS.

No. 339,688. Patented Apr. 13, 1886.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

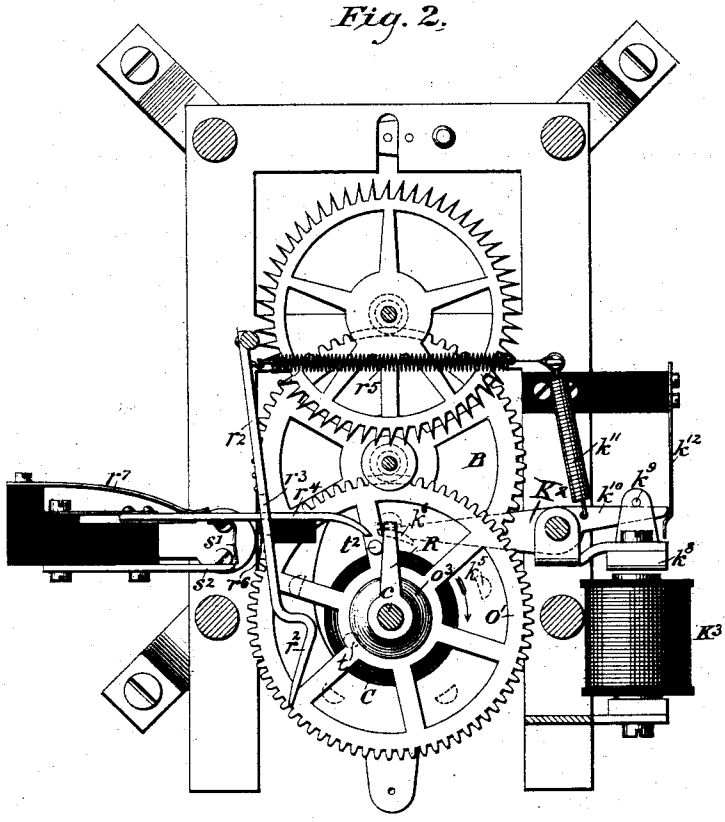

Fig. 3.

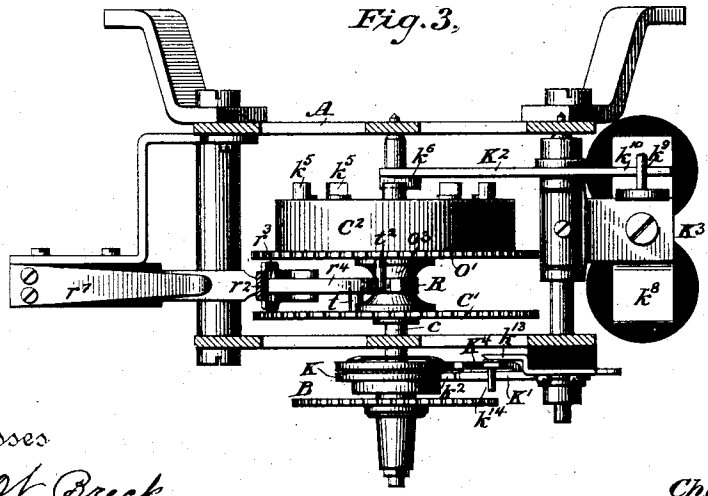

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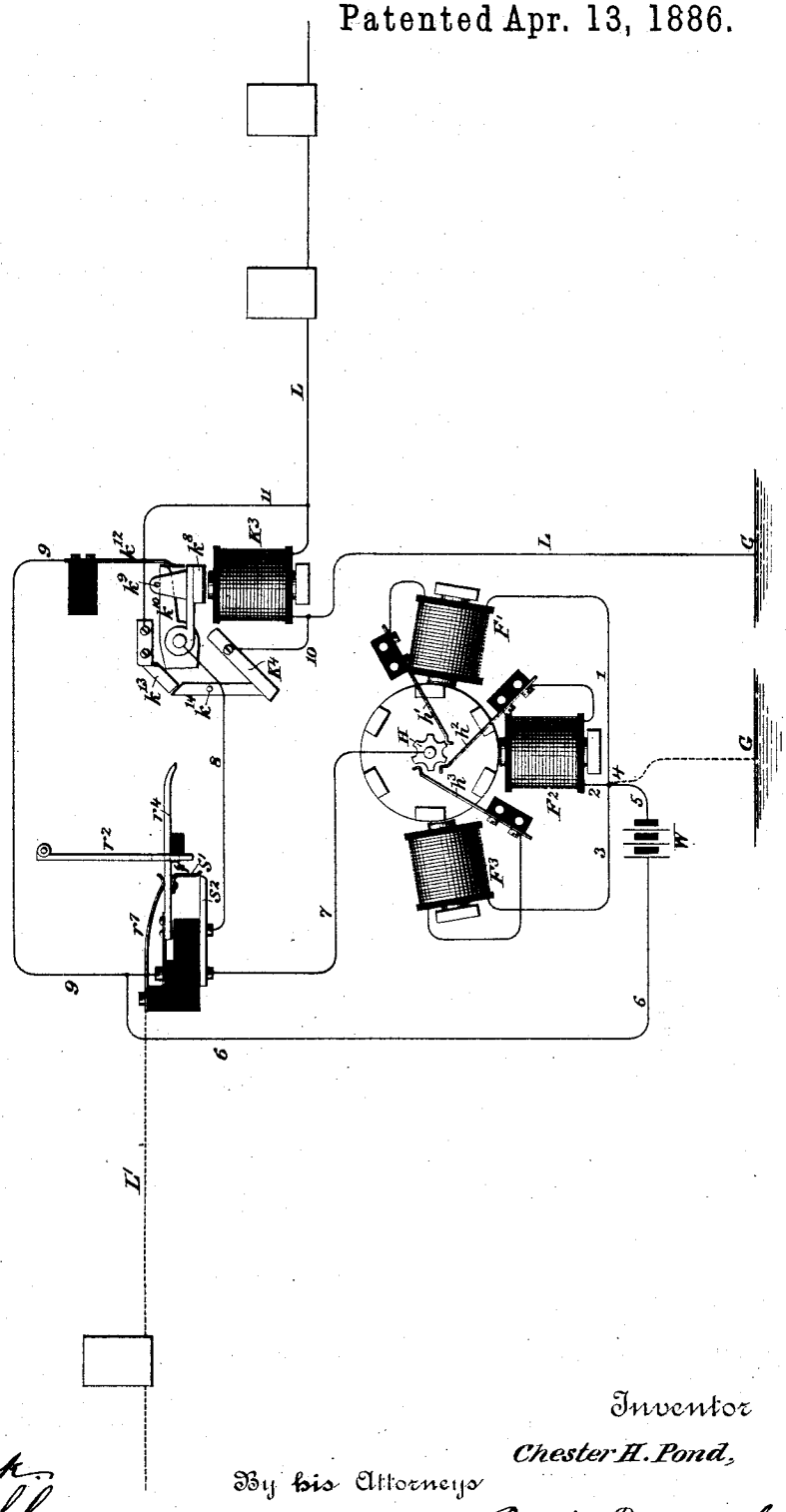
Fig. 4.



Witnesses
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UNITED STATES PATENT OFFICE.

CHESTER H. POND, OF BROOKLYN, NEW YORK.

SYNCHRONIZING DEVICE FOR CLOCKS.

SPECIFICATION forming part of Letters Patent No. 339,688, dated April 13, 1886.

Application filed June 6, 1885. Serial No. 167,855. (No model.)

To all whom it may concern:

Be it known that I, CHESTER H. POND, a citizen of the United States, residing in Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Synchronizing Devices for Clocks, of which the following is a specification.

My invention relates to the organization of apparatus employed for periodically synchronizing the hands of clocks or time-pieces, and it especially pertains to the class of clocks which are automatically wound at predetermined intervals by means of electric motors.

In a patent issued to me November 25, 1884, No. 308,521, there is shown and described a peculiar form of electric winding device for clocks. This invention is especially designed to afford means for synchronizing the hands of a clock equipped with such a winding device. The invention described in the patent referred to involves the employment of a rotary electric motor, the circuit of which is completed at predetermined intervals by the movement of the clock mechanism. The present invention involves the addition to such an organization of a controlling device operated to complete a circuit through the winding-motor and at the same time places a lever operating the synchronizing device in a position to be actuated by the mechanism which is moved by the motor. As soon as the operation of the motor has placed the hands in position to indicate the correct time, a shunt-circuit is formed around the electro-magnet, and thereby the parts are restored to the original condition. The form of circuit-controlling device which it is preferred to employ consists of a lever having two bearing-points, which are designed to strike against cams or projections secured to the minute-hand arbor of the clock. By striking against these, the hand is set backward or forward, as may be necessary at the particular moment.

In the accompanying drawings, Figure 1 is a front elevation, Fig. 2 a vertical section, and Fig. 3 is a plan view, of a clock mechanism embodying the features of this invention. Fig. 4 is a diagram illustrating the organization of circuits.

Referring to the drawings, A represents the frame of the clock, and B the train of wheels commonly employed for actuating the hour, minute, and second hands. The train B is normally impelled by means of a spring, C, acting through a center wheel, C′, carried upon the arbor *c*. The spring is preferably of such length that it is capable of actuating the clock several hours. An escapement-anchor (not shown) controls the movements of the train. The spring is designed to be wound once each hour, or at some other predetermined interval, by means of an electric motor, E. This motor is designed to be set in operation and to wind the spring quickly to a predetermined tension by the operation of the clock mechanism itself. The armature of the motor consists, preferably, of a series of armature-bars, *e′*, carried upon suitable non-magnetic disks or rings, e^2 e^2. The rings are supported from an axis, e^3. Three electro-magnets, F′, F², and F³, are shown as employed for propelling the armature in the direction indicated by the arrow. These electro-magnets are placed in circuit with a battery, W, Fig. 4, in recurrent succession by means of a commutator, H, and its three brushes *h′*, *h²*, and *h³*. The battery W has one pole connected at a point, 4, with conductors 1, 2, and 3 leading to the magnets, by a conductor, 5. Its other pole is connected with the conducting-segments of the commutator through a circuit-controlling device, which will be hereinafter described, by conductors 6 and 7. The brushes are respectively connected with one terminal of the coils of the corresponding electro-magnets. The remaining terminals of these coils are connected with each other at the point 4. The conductors 6 and 7 are normally not connected with each other, but are connected through suitable contact-points, *s′* and *s²*, when the clock is to be wound. Upon the shaft c^3 of the armature there is carried a pinion, *o*, which engages the teeth of the wheel O. The shaft *o′* of the wheel O carries a pinion, o^2, and this pinion engages the teeth of a gear-wheel, O′. The collet or sleeve o^3 of the wheel O′ loosely surrounds the arbor *c* of the center wheel, C′, of the train. The spring C has one end attached to the arbor *c*, and the other end is secured to the wheel O′. When the motor is set in operation, the wheel O′ is driven in the direction of the arrow, and the spring is wound from its outer end. The spring is constantly

being unwound from the inner end by the action of the clock.

The method of setting the motor in operation will now be described. Upon the arbor c there is loosely mounted an arm, R, which is designed to operate a circuit closing and opening device once each hour. The arm R is designed to be brought against a pendent arm, r^2, when the clock is to be wound. In the pendent arm r^2 there is formed an opening, r^3, through which there extends a circuit-closing arm, r^4. A shoulder or projection, r^6, upon the arm r^4 normally rests upon the bottom of this opening. The pendent arm is normally held in a position to engage the circuit-closing arm by means of a spring, r^5. When, however, the arm R strikes against the pendent arm and forces the latter backward against the tension of the spring, the arm r^4 is released. The circuit-closing arm is then pressed downward by the action of its supporting-spring, and a contact-point, s', is brought against an insulated contact-point, s^2, supported from the frame of the clock. The two points are respectively connected with conductors 6 and 7, already referred to, and the circuit of the motor will thus be completed as soon as the arm R has caused the arm r^4 to be released from one pole of the battery W, through the conductor 5, thence through the motor-conductors 1, 2, and 3 to the conductor 7, thence through the points s^2 and s' to the conductor 6, and thus to the remaining pole of the battery. The motor being thus set in operation the spring is wound.

The arm R is operated by means of a pin, t, projecting laterally from the face of the center wheel, C'. This wheel revolves once an hour, and the pin engages the arm and carries it against the pendent arm r^2 once each hour. The circuit will be completed thus at a predetermined moment.

For the purpose of interrupting the circuit when the spring is wound, a second pin, t^2, carried upon the wheel O', projects laterally toward the arm R. When the motor is winding the spring, the wheel is revolved in the direction of the arrow. The pin t^2 will thus be caused to overtake the arm R and advance it rapidly from the pin t' and the arm r^2 into engagement with the circuit-closing arm r^4. The latter is thus lifted and the contacts are separated. The bottom of the opening r^3 again engages the circuit-closing arm r^4 and holds the contact-points apart. The arm R then remains at rest until the pin t' again overtakes it and advances it to repeat the operation.

The essential features thus far described have been described and claimed in the patent before referred to. A description will now be given of the synchronizing attachment. Upon the minute-hand arbor of the clock there is carried a disk, K, having two cam-like projections, k' and k^2, upon opposite sides. A pivoted arm, K', is designed to be forced toward the disk and by suitable projections, k^3 and k^4, which engage the projections k' and k^2, to set the disk in a predetermined position. In this manner it will also set the hand of the clock to a predetermined position—say at XII. The arm K' is carried upon an arbor supporting an arm, K^2, which projects toward the barrel C^2 of the spring. This barrel carries pins k^5, which project outward, as shown. A cam-like projection, k^6, upon the end of the arm K^2, is normally in such position that the pins pass outside the same when the barrel is revolved in the winding of the clock; but if the arm K^2 be raised slightly, then the projection k^6 will be in the path of the pins and will ride above them instead of passing beneath. The arm K^2 will thus be raised farther and will force the setting-arm K' toward the disk. If the minute-hand be in such position that it indicates within two or three or perhaps five minutes of the correct time, the projections k' and k^2 will be engaged, and the hand will be turned to the proper position. For the purpose of thus placing the arm K^2 in the position to be acted upon, and for the further purpose of completing the circuit of the motor and setting it in operation, an electro-magnet, K^3, is employed. This magnet is included in the circuit of an independent line, L, and when the magnet is vitalized its armature k^8 is drawn downward. The line L leads from a central station through a similar magnet applied to each clock in the system, and it is provided with means for transmitting an impulse whenever it is desired to bring the setting devices into operation. Upon the armature there is carried a pin, k^9, projecting above the short arm or heel k^{10} of the lever K^2. A spring, k^{11}, normally holds the arm in its forward position; but the attraction of the magnet is sufficient to overcome the tension of this spring. The armature is supported from, but is movable independently of, the arbor of the levers K' and K^2.

For the purpose of placing the motor in circuit by the downward movement of the armature-lever, and thus causing the barrel carrying the pins k^5 to revolve and to operate the setting device, it is necessary to close a shunt-circuit around the circuit-closing points s' and s^2. This is accomplished by means of the heel k^{10} and an insulated contact-spring, k^{12}, supported from the frame of the clock. The heel is connected by a conductor, 8, with the contact-pin s^2, while the insulated spring is connected by a conductor, 9, with the conductor 6. The downward movement of the armature-lever causes the connections to be completed, and thus a connection of the battery W through the motor to be established. It is evident, however, that as soon as the setting is accomplished this circuit should be interrupted, otherwise the motor would continue to revolve, and each pin k^5 that passed the projection of the lever k^2 would again actuate the setting-lever K'. This is accomplished by means of a shunting-device for the magnet, which consists of a pivoted angle-arm, K^4,

which is connected by a conductor, 10, with one side of the electro-magnet, and of a contact-point, k^{13}, which is connected by a conductor, 11, with the other side of the electro-magnet. A pin, k^{14}, projects from the lever K^4 into the path of the arm K′, and when the latter is forced upward it turns the lever K^4 upon its pivot and places it in contact with the point k^{13}, establishing the circuit-connections between the conductors 10 and 11, and the magnet is thus shunted, so that any accidental current upon the line would not vitalize the magnet. It is necessary that this circuit be interrupted, so that the clock may be again set at the recurrence of the proper time. For this purpose a cam, k^{15}, is carried upon the disk K. The revolution of the hands carries this cam against a projection, k^{16}, upon the arm K^4, pressing it downward. The cam k^{15} is preferably placed in such position that it will engage the arm K^4 a few minutes only before the minute-hand reaches the point at which it is to be set by the operation of the lever K′. The closing of the shunt-circuit also insures the release of the arm K′ after the setting of the hands, even though the current which was employed for starting the setting device may have been somewhat prolonged. The devices are thus again in their normal position, and the winding and setting may be repeated at the proper periods. It is designed that the line L shall lead through a synchronizing-magnet of each clock, and preferably the battery for winding the clocks are local batteries, one being employed for each clock.

Any suitable means are employed for transmitting the current at the proper moment for setting or synchronizing the clocks.

If it is desired, a single battery may be employed for winding the different clocks, either in the manner described or in a manner described in an application filed by me January 14, 1885. This latter method is preferable, and it is accomplished as follows: One pole of the battery W, and likewise the point 4 are connected with the earth, as shown in dotted lines. The connections of the conductor 6 will then be completed normally from the arm r^4 through a contact-arm, r^7, with which a line, L′, leading to the succeeding station, is united. When the apparatus is at rest, the arm r^4 is against the arm r^7, and the circuit of the battery is thus completed through the line L′ to the earth at a distant station. When, however, the arm r^4 is dropped, and the points s' and s^2 are connected, the circuit of the battery will be complete through the corresponding clock, and the succeeding stations cut out of circuit, and these will remain so cut out until the winding of the clock has replaced the arm r^4 to its normal position, thus completing the connections from the battery with the line L′. The next succeeding clock will be then wound to the exclusion of those beyond, and so on throughout the series, one clock being wound at a time. When the setting or synchronizing devices are to be operated, it will be understood, however, that the motors are all set in operation at once, for their circuits are simultaneous, without separating the arms r^4 from their contact-springs r^7, and the motors are thus connected in multiple arc, and therefore tend to revolve.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, with a clock and an electric motor for winding the same, of a synchronizing or setting device, an electro-magnet for completing the circuit of said motor, and mechanism for operating said setting device by the movement of said motor.

2. The combination, substantially as hereinbefore set forth, with a clock mechanism and an electric motor for winding the same, of a hand-setting device operated by said motor, an electro-magnet for completing the circuit-connections of said motor, and a shunt-circuit around said electro-magnet, the connections of which are completed by the operation of said hand-setting device.

3. The combination, substantially as hereinbefore set forth, with a clock mechanism, of an electric motor, a synchronizing device operated by said motor, means, substantially such as described, for completing the circuit-connections of said motor by the operation of said clock mechanism at predetermined intervals, and means for completing the connections of the same independently of said clock mechanism.

4. The combination, substantially as hereinbefore set forth, of a series of clocks, an electric motor for winding each of said clocks, means, substantially such as described, for placing said motors in circuit by the action of their respective clock mechanisms, one at a time, and means, substantially such as described, for placing all of said motors in circuit simultaneously.

5. The combination, substantially as hereinbefore set forth, with a series of clocks and devices for automatically winding the springs of the same at predetermined intervals, of a synchronizing device for each of said clocks, means for actuating the same by the instrumentality used to wind said clocks, and an electro-magnet applied to each of said clocks for setting in operation the winding devices of all of said clocks simultaneously.

6. The combination, substantially as hereinbefore set forth, with a clock mechanism and a hand-setting device, of an electro-magnet, a revolving wheel having one or more pins projecting therefrom, a lever normally out of the path of said pins, means for moving said lever into the path of said pins by the action of said electro-magnet, and means for causing said wheel to revolve when said lever has been thus moved, and to thereby actuate said synchronizing device.

7. The combination, substantially as hereinbefore set forth, with a clock mechanism, of an electro-magnet, K^3, its armature, the lever K^2, the contact-spring, the arbor carrying said

lever, the synchronizing-arm K′, carried upon said arbor, one or more pins, k^5, and means, operated by said electro-magnet, for placing the arm K^2 in the path of said pins.

8. The combination, substantially as hereinbefore set forth, with the electro-magnet K^3 and its armature, of the arm K^2, pins k^5, the wheel or drum C^2, the projection upon the end of said arm, and the synchronizing-arm, all operated substantially as described.

In testimony whereof I have hereunto subscribed my name this 27th day of May, A. D. 1885.

CHESTER H. POND.

Witnesses:
DANL. W. EDGECOMB,
CHARLES A. TERRY.