No. 703,033. Patented June 24, 1902.

E. H. WRIGHT.

ELECTRIC TIME SWITCH.

(Application filed Apr. 11, 1898.)

(No Model.) 3 Sheets—Sheet 1.

FIG 1.

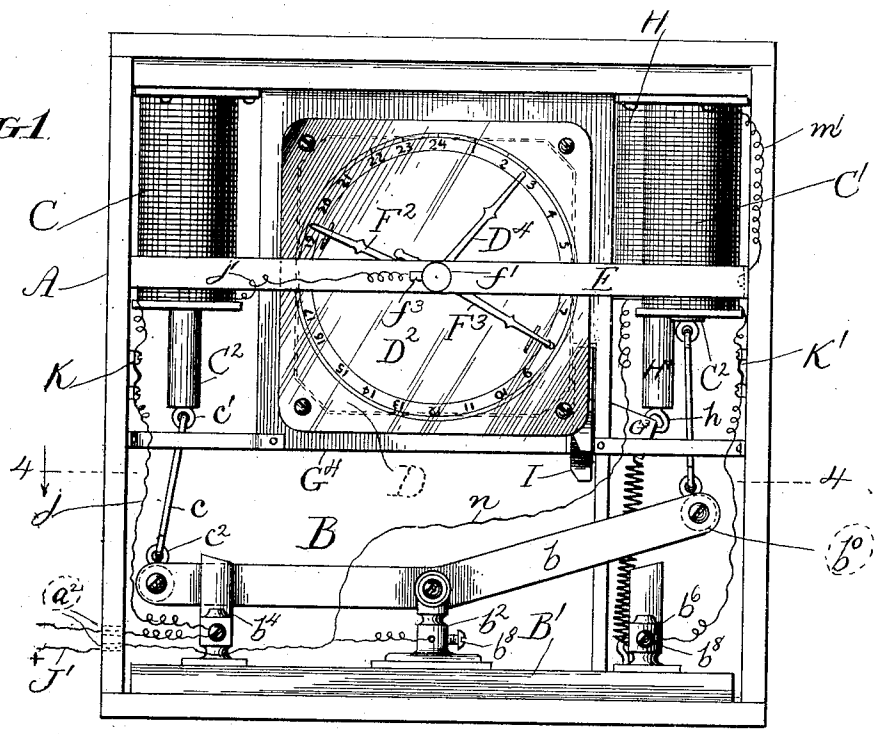
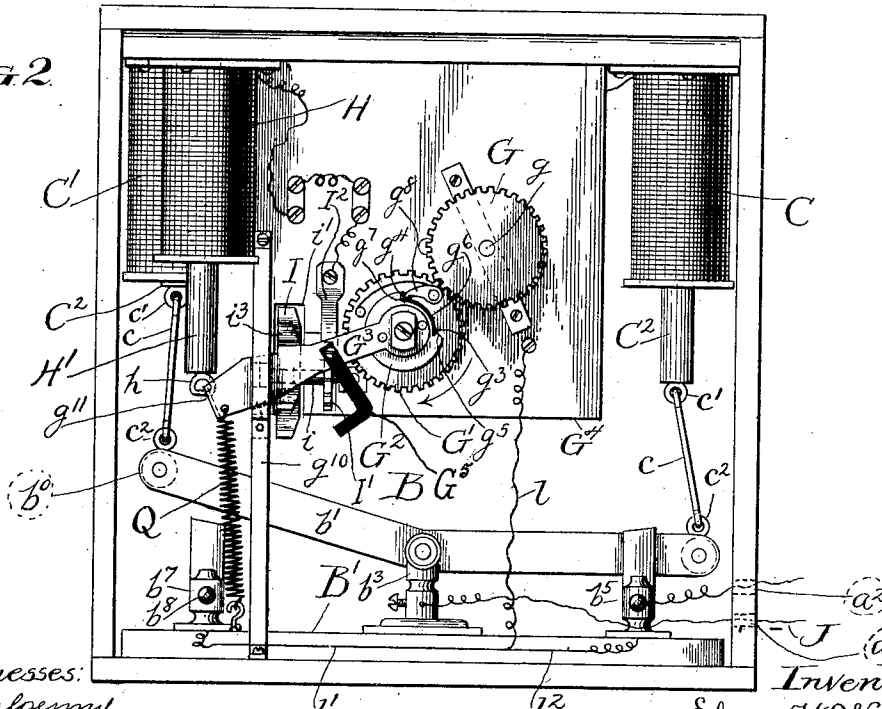


FIG 2.



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(No Model.) 3 Sheets—Sheet 2.

FIG. 3

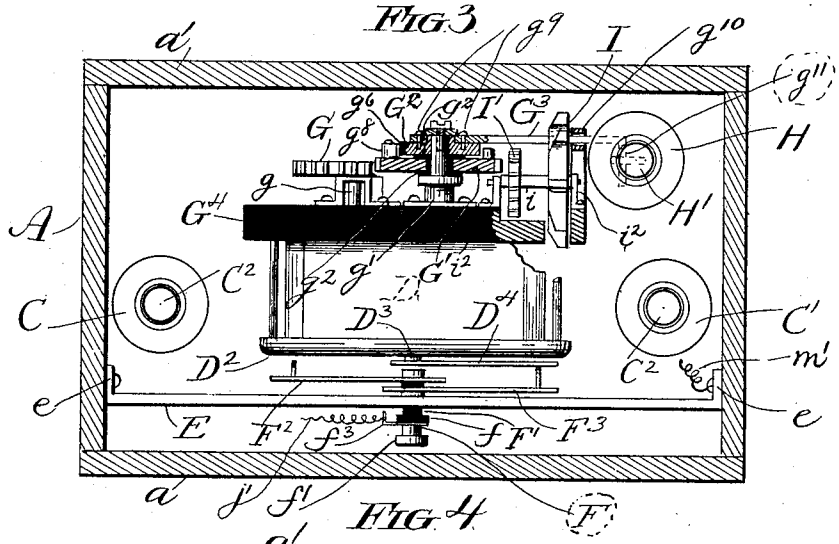

FIG. 4

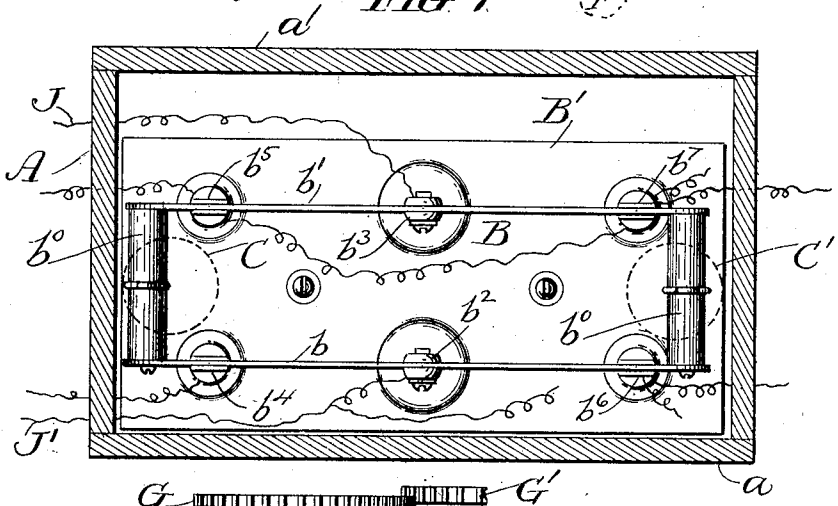

FIG. 5

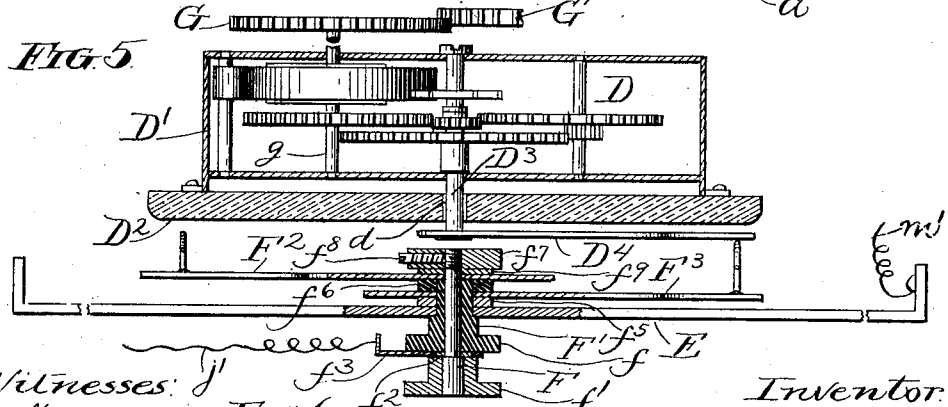

FIG. 6

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(No Model.) 3 Sheets—Sheet 3.

Fig. 7.

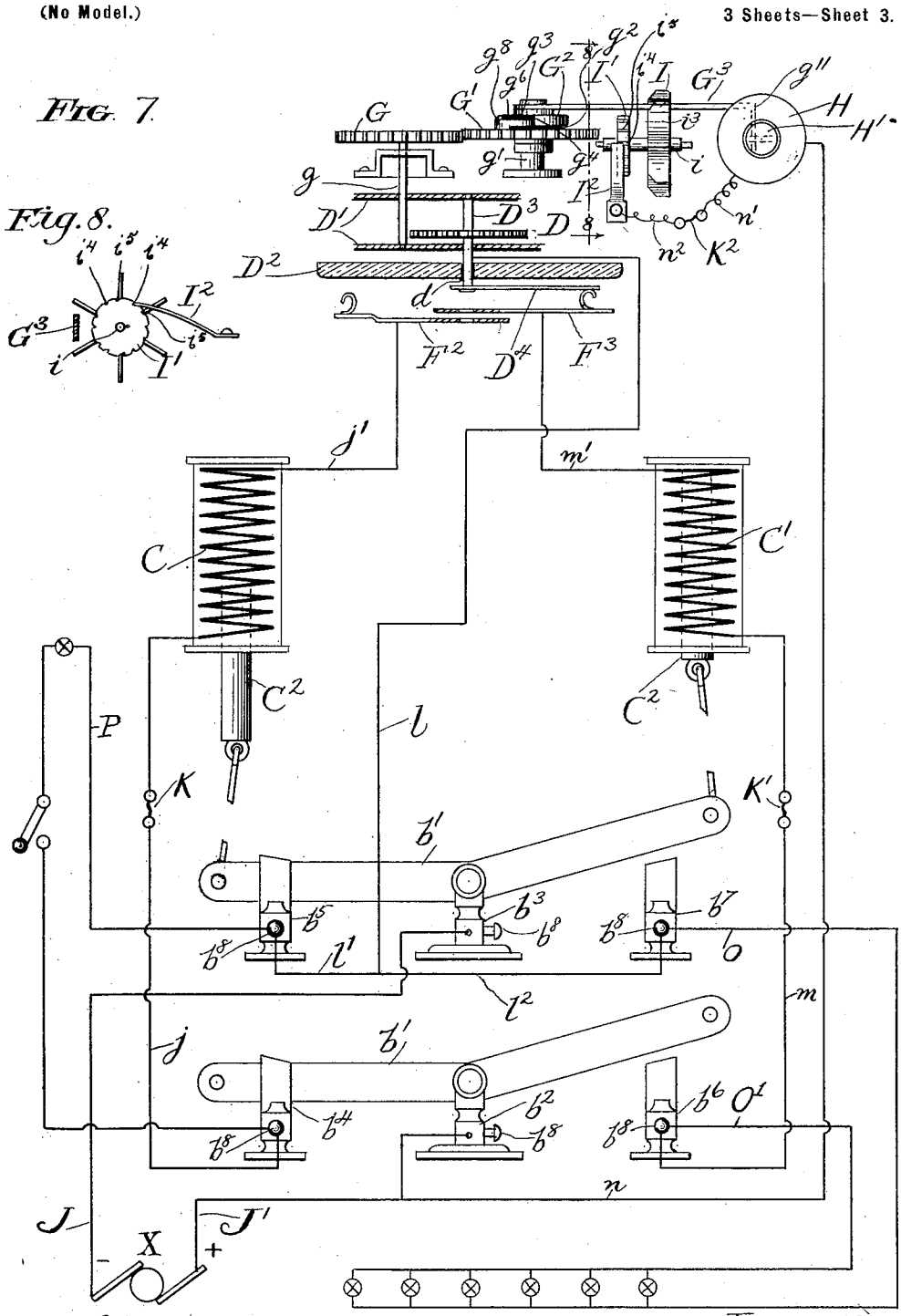

Fig. 8.

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UNITED STATES PATENT OFFICE.

ELMER H. WRIGHT, OF CHICAGO, ILLINOIS.

ELECTRIC TIME-SWITCH.

SPECIFICATION forming part of Letters Patent No. 703,033, dated June 24, 1902.

Application filed April 11, 1898. Serial No. 677,208. (No model.)

To all whom it may concern:

Be it known that I, ELMER H. WRIGHT, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Automatic Electric Switches, of which the following is a specification.

This invention relates to improvements in automatic electric switches, and refers more specifically to a clock-controlled switch mechanism whereby one or more working circuits may be turned off or on or shunted successively at predetermined intervals.

Among the objects of the invention are to provide a simple and practical apparatus embracing a clock or time-measuring device, mechanism controlled by said clock for operating the switch or switches, and automatic winding mechanism for rewinding the clock at regular intervals; to provide such a construction and arrangement that all of the power necessary for operating the several parts of the mechanism shall be derived directly from the working circuit; to so construct and arrange the parts as to minimize the sparking incident to the opening of the circuits; to provide an improved form of contact device which while effecting a certain and reliable closing of the circuit is at the same time sufficiently delicate or easy of operation to avoid interfering with the time-keeping qualities of the clock, and to improve generally the arrangement and construction of the apparatus.

The invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims, and will be readily understood, reference being had to the accompanying drawings, in which—

Figure 1 is a front elevation of a preferred embodiment of my invention with the front of the casing removed. Fig. 2 is a similar view from the rear. Fig. 3 is a top plan view with top casing removed, parts being broken away to expose other mechanism beneath. Fig. 4 is a horizontal sectional view taken on line 4 4 of Fig. 1 and looking downwardly. Fig. 5 is a detail view with parts shown in horizontal section, taken axially through the hand-spindle of the clock and with parts in plan view. Fig. 6 is a perspective view of one of the contact-hands of the clock. Fig. 7 is a diagrammatic view showing the electrical connections and circuits. Fig. 8 is a detail view of the ratchet-wheel which controls the position of the contact-wheel.

Referring to the drawings, A designates as a whole a box or casing which may be of any suitable construction, that shown consisting of a rectangular box provided with front and rear walls a a', respectively, made to open, so as to permit access to both sides of the contained mechanism. Within the case is mounted a switch B, consisting in the present instance of an oscillatory switch mounted upon a suitable insulating-base B' upon the bottom of the casing, the blades b b' being alike and rigidly connected, by means of cross-bars b^0, so as to move together, and being pivoted at their centers upon standards b^2 b^3, so as to oscillate upon a transverse horizontal axis. Separate pairs of contact-blades b^4 b^5 and b^6 b^7 are provided to receive each end of each switch-blade, the latter being bent between their ends, so that when the switch-blades are engaged with one pair of contacts their opposite ends will be held free from the opposite pair of contacts, and vice versa. Each of the pivot-standards and of the contacts is conveniently provided with a binding-screw, as b^8, for attaching conducting-wires.

In order to operate the switch-blades, a pair of solenoids C C' is employed, arranged vertically one above each end of the pair of blades and conveniently mounted upon the top casing, so as to depend downwardly therefrom. The core or movable member C^2 of each solenoid is flexibly connected with the corresponding cross-bar, desirably by means of links c, engaged with eyes c' c^2 upon the lower ends of the cores and upon said cross-bars, respectively, the length of throw of each solenoid-core being equal to the distance of movement necessary to shift the switch from a closed to an open position.

Next describing the clock mechanism, whereby the circuits through the solenoids and consequent positions of the switch are controlled, D designates as a whole a clock-movement which, so far as its general features are concerned, may be of any suitable or preferred form of the twenty-four-hour type—*i. e.*, a clock having its dial divided

into twenty-four spaces and so constructed that the hour-hand performs a complete revolution once in twenty-four hours. That shown herein is in its general features an ordinary spring-clock, with the exception that the usual minute-hand spindle and minute-hand are omitted, and need not, therefore, be described in detail. Said clock is secured in the upper part of the casing between the two solenoids, conveniently by having its frame D′ (see Fig. 5) attached to the top wall of the casing, so that the clock depends therefrom.

D^2 designates the dial, which is of insulating material—such as glass, hard rubber, or the like—and D^3 the hour-hand spindle, suitably mounted in the metal frame D′ and arranged to project at its forward end through a suitable aperture *d* in the dial.

D^4 designates a metallic hour-hand mounted upon the end of the spindle D^3 and arranged to sweep over the dial.

E designates a support shown as conveniently consisting of a bar arranged to extend horizontally across the dial at a short distance from the latter and opposite the spindle D^3, the ends of said bar being secured to the side walls of the casing, as indicated at *e e*.

F designates a short spindle rotatably mounted in the support E and having its axis arranged in alinement with the axis of the hour-hand spindle. Said spindle F is of metal and extends through an insulating-bushing F′, preferably of hard rubber, seated in the bar and having the form of a thumb-nut, the head of which, *f*, is outside of the bar and by means of which it may be rotated. The spindle F is also provided at its outer end with a thumb-nut or head *f*′, and between the shoulder formed at the juncture of the head and spindle and the head *f* is interposed a small washer f^2 and a metal contact-strip f^3, having an aperture adapted to receive the washer, so that the said parts may occupy the same plane, as indicated clearly in Fig. 5. The washer is, however, slightly thicker than the contact-strip, so that the latter will not be carried around with the thumb-nut when it is rotated; but at the same time the difference in thickness is not so great as to prevent a good electrical contact being maintained between the shoulder f^2 and a contact-strip.

F^2 F^3 designate a pair of contact-hands mounted upon the spindle F, one of said hands F^2 being rotatably mounted thereon and in direct electrical contact therewith and the other being mounted upon the bushing F′ and being held rigid with the latter by having its aperture f^4, through which the bushing extends, made angular and engaged with a correspondingly-shaped part of the bushing. The hand F^3 is separated from the bar E and from the hand F^2 by means of washers f^5 f^6, respectively, the washer f^5 being of metal, so as to place the hand F^3 in electrical connection with the bar, and the washer f^6 being of insulating material, so as to electrically separate the hands. The several parts constructed and assembled as described are held in position by means of a clamping-nut f^7, threaded upon the inner end of the spindle F and held from movement after it has been properly adjusted by means of a set-screw f^8. In order to insure a more certain movement of the hand F^2 with the spindle, a washer f^9 is interposed between said hand and the nut f^7. Each of the contact-hands is provided near its outer end with a curved spring-metal contact device so secured to the hand as to stand inwardly in a plane at right angles to the plane of movement of the hand and so shaped that its curved side toward the dial will brush lightly against the hour-hand and form electrical contact therewith when the hour-hand is rotated past either one of said contact-hands.

With the mechanism thus far described properly connected with a working circuit by means of suitable conductors, as will be hereinafter fully described, the circuits will be controlled by the clock and the switch operated by the closing of the circuits through the solenoids alternately as long as the clock is kept wound up. In order, however, to dispense with manual winding up of the clock, I have provided additional mechanism whereby the winding is made automatic and is effected by power derived from the working circuit.

Referring to Figs. 2, 3, 5, and 6, G designates a gear-wheel mounted upon the winding-shaft *g* of the clock-movement, it being understood that said shaft is provided with the usual holding ratchet mechanism. G′ designates a second gear-wheel mounted upon a fixed stub-shaft *g*′ upon an insulating-plate G^4, secured upon the rear side of the clock-frame in position to intermesh with the gear G. G^2 is a smaller disk mounted loosely upon the shaft *g*′ adjacent to the gear G′, but completely insulated from the latter and from the shaft upon which it is mounted by means of an insulating-washer g^2 and an insulating-bushing encircling the shaft. In the periphery of the wheel or disk G^2 is formed a segmental-shaped recess g^3, terminating at its ends in shoulders g^4 g^5, and that portion of the periphery of the disk forming the bottom of the recess is covered by a strip g^6, of insulating material, held in position by having its ends inserted in undercuts g^7 at the ends of the recess. g^8 designates a metal pawl mounted upon the gear G′ and having its acting end arranged to rest within the recess upon the insulating-strip. The forward end of the pawl is adapted to engage and form electrical contact with the shoulder g^4 at the end of the recess when carried back into this position by the running down of the clock, it being understood that the gear G′ will be rotated in the direction opposite that indicated by the arrow while the clock is running down. G^3 designates a lever rigidly connected with the disk G^2 at one end,

conveniently by means of screws or studs g^9, said lever being in electrical contact with the disk, but insulated from the gear G', as hereinbefore described. The lever is arranged to extend through a vertical guide g^{10}, vertically slotted to permit oscillation of the lever, and is provided at its free end with a hook or loop g^{11}, (see Fig. 3,) which is engaged with an eye h upon the lower end of the core H' of a solenoid H, mounted to depend vertically from the top casing. The solenoid H is sufficiently powerful when energized by the working circuit to pull up the lever by means of its core, and thus through the medium of the disk acting on the pawl g^8 and gears G' and G turn the winding-shaft a part of a revolution. I designates a contact-wheel mounted in an opening i' of the clock-frame upon a shaft i, having bearing in brackets i^2, mounted upon the insulating-plate G^4. The contact-wheel is provided with a series of radially-projecting plate-spring arms i^3, and the wheel is located at one side of and adjacent to the lever G^3, so that the outer ends of said arms will project into the path of the movement of the lever. I' designates a ratchet-wheel mounted rigidly upon the shaft i and engaged by a detent I^2, which is of metal, so as to form a conductor, and is also mounted upon plate G^4. The ratchet-wheel (see Fig. 8) has a notch i^4 for each of the spring arms or blades of the contact-wheel and also an intermediate notch i^5 between each two of the notches i^4, the arrangement of the parts being such that when the lever is in its lowermost position or that indicated in the drawings it will rest between and in contact with a pair of said spring-arms. As the lever is lifted the contact-wheel will be held from rotation by the detent I^2, and the lever will flex and slide past the end of the uppermost arm of the pair until the latter slips out of engagement (thus opening the circuit, as hereinafter explained) and springs back straight, the rebound of the spring-blade serving to carry the wheel forward sufficiently to permit the detent to drop into the succeeding intermediate notch i^5, and thus insuring a certain breaking of the circuit. Upon the return downward movement of the lever the latter will engage the upper side of the arm, and the contact-wheel being free to turn forwardly will rotate the latter a step. In order that the rebound of the spring-arms when they slip out of engagement with the lever may not carry the wheel too far forward, a bent hook-shaped arm G^5, of insulating material or other material insulated from the lever, is secured rigidly to the latter in such position as to be carried between a pair of the arms of the wheel when the lever is uplifted and prevent forward rotation of the latter.

The arrangement of the circuits and electrical connections may be as follows:

J J' designates two main conductors of opposite polarity connected with any suitable source of electricity and led in through suitable apertures a^2 in the casing and connected with the front and rear central standards, respectively, of the switch B. From one of the contacts b^4 a conductor j leads to the solenoid C, a fuse K being conveniently interposed in this conductor to protect the solenoid. From the solenoid C a conductor j' leads to the contact-strip f^3, (see Fig. 1,) thus placing the contact-hand F^2 in electrical circuit with the solenoid. The principal parts of the clock, and hence the hour-hand D^4, are placed in electrical connection with the two contacts b^5 b^7 by means of a conductor l, which I shall designate as the "common-return conductor," said conductor having two branches l' l^2, which lead to the respective contacts b^5 b^7, so that whichever position the switch B occupies the hour-hand will be in circuit. Similarly, a conductor m leads from the contact b^6 through fuse K' to the solenoid C' and thence through conductor m' to bar E, thus placing the contact-hand F^3 in circuit, (see detail Fig. 5,) the return-circuit being by way of the "common return," as before.

The circuit which operates the winding mechanism is formed by a conductor n, which leads from main conductor J' (or standard b^2) to solenoid H, thence through conductor n', (see Figs. 2 and 7,) fuse K^2, and conductor n^2 to the detent I^2. The detent resting on the ratchet-wheel I' places the contact-wheel I and lever G^3, engaged therewith, in circuit, the circuit being normally interrupted between the disk G^2 and pawl g^8 by the insulating-strip g^6. Upon the closing of the circuit the return will be, as in the case of the other solenoids, through the common return.

The working circuit, which is controlled by the switch and which may obviously be a lighting-circuit, as indicated in the diagram, or any other working circuit, is simply connected at its opposite ends, as O O', with the pair of contacts at one end of the switch, as b^6 b^7, so that when that end of the switch is closed the circuit will be direct from the source of electricity—as, for instance, a dynamo X—through one blade of the switch, out through the work-circuit, back by the opposite blade, and back to the other pole of the generator.

In the case of using a working circuit for lighting purposes it is usually desirable to have one or more night-lamps burning after the principal lights have been turned off. I have therefore indicated in the diagram a night-lamp circuit, as P, connected with the pair of contacts b^4 b^5, which will obviously be closed when the main light-circuit is opened. A hand-switch P' is provided, by means of which the night light-circuit may be opened during the day-time.

The operation of the apparatus is obvious, but may be briefly described as follows: The proper electrical connections having been made and the clock initially wound up and set to the correct time of day, the operator

adjusts the contact-hand F^2 to point to that time of day when he wishes the circuit closed and the lamps lighted, effecting this adjustment by means of the thumb-nut f'. He next adjusts the hand F^3 to the time of day when the circuit is to be thrown off by means of the thumb-nut f, and the apparatus will thereafter require no further attention unless it be desired to change lighting hours. The clock in running down—say at the end of half an hour—will carry the contact-pawl into contact with the shoulder g^4, whereupon the circuit will be closed, the solenoid energized, the lever pulled up thereby, and the clock rewound as much as it has run down. This rewinding will obviously be automatically repeated at the end of definite periods of time. The manner in which the circuit will be opened by the contact-wheel at the end of the upward movement has been already described. As soon as the circuit is thus broken the weight of the lever and solenoid-core, assisted by a spring Q, if found desirable, will carry the lever back to its normal lower position; but the pawl g^8, mounted upon the gear G′ in mesh with gear G, which is held immovable by the ratchet of the winding-shaft, will remain stationary, thus opening the circuit between the said pawl and the disk as the lever starts back, and prevent the reëstablishment of the circuit when it makes contact with the contact-wheel. By referring to the diagram of the circuits it will be seen that when the hour-hand reaches either one of the contact-hands that one of the solenoids C or C′ in circuit therewith will be energized, and it will be further obvious that each solenoid serves, through the medium of the main switch, to cut itself out of circuit.

It will be seen from the foregoing that each of the solenoids is only momentarily energized, thus precluding any danger from heating, and that each of the three circuits concerned in the operation of the apparatus is broken positively and almost instantly after it has been established, thus precluding arcing and reducing the sparking to a minimum.

While I have herein described a preferred embodiment of my invention, yet it is to be understood that the details thereof may be varied to some extent without departing from the invention.

I claim as my invention—

1. In an electrically-wound clock, the combination with the winding-shaft, of a lever arranged to act upon said shaft to turn it forward, a movable contact device carried by a movable part of the clock mechanism, arranged and moving in or parallel with the plane of movement of said lever and electrically connected with one pole of a source of electricity, a normally stationary contact device arranged in the path of movement of said movable contact device, mounted to move with the lever and electrically connected with the other pole of said source of electricity, a solenoid included in said circuit and arranged to act upon the lever when energized by the bringing together of said parts, whereby the movable contact, together with the winding-shaft, is thrust back to its initial position by a single movement of said lever and means for opening the circuit at a point other than between the said circuit-closing contacts at the end of the movement of the lever, substantially as described.

2. In an electrically-wound clock the combination with the winding-shaft, of a lever arranged to act upon the shaft to turn it forward, a contact device carried by a movable part of the clock mechanism and electrically connected with one pole of a source of electricity, a contact device operatively connected with the lever and electrically connected with the other pole of said source of electricity, a solenoid included in said circuit and arranged to act upon the lever when energized by the bringing together of said contacts, the movement of said lever being such as to retain contact during the effective movement of the lever, and means for opening the circuit at the end of the movement of the lever embracing a contact-wheel included in the circuit and consisting of a plurality of spring-contact blades adapted to be successively brought into bearing with the lever, and a ratchet mechanism arranged to coöperate with the lever to hold the contact-wheel from backward movement and permit it to turn forward a step upon each reciprocation of the lever.

3. In an electrically-wound clock the combination with the winding-shaft of a lever arranged to act upon the shaft to turn it forward, a contact device carried by a movable part of the clock mechanism and electrically connected with one pole of a source of electricity, a contact device operatively connected with the lever and electrically connected with the other pole of said source of electricity, a solenoid included in said circuit and arranged to act upon the lever when energized by the bringing together of said contacts, the movement of said lever being such as to retain contact during the effective movement of the lever, and means for opening the circuit at the end of the movement of the lever embracing a contact-wheel included in the circuit and consisting of a plurality of spring-contact blades adapted to be successively brought into bearing with the lever, a ratchet mechanism arranged to coöperate with the lever to hold the contact-wheel from backward movement and permit it to turn forward a step upon each reciprocation of the lever and an escapement-arm arranged to prevent the contact-wheel from rotating more than a step at a time.

4. In an electrical-winding clock, the combination with the winding-shaft, of a lever arranged to act upon said winding-shaft, a disk

or segment mounted concentrically with the pivotal axis of said lever and provided with a peripheral portion of insulating material and an electrical contact device mounted upon a part operatively connected with the clock-movement and arranged to travel upon said insulating portion and to form electrical connection with the disk when carried beyond the edge of the insulating-strip.

5. In an electrically-wound clock, the combination with the winding-shaft, of a gear arranged to act upon said winding-shaft, a disk or segment mounted concentrically with, and adjacent to the gear and provided with a peripheral portion of insulating material, and an electrical contact device mounted upon said gear and arranged to travel upon said insulating portion and adapted to form electrical connection with the disk when carried beyond the end of the insulating-strip.

6. An electrical connection comprising a spindle provided with an annular shoulder, a rotatable bearing within which said spindle is rotatably mounted, a washer clamped between the annular shoulder and a part of the bearing and a second washer apertured to receive and fit around the first washer so as to lie in the same plane with the latter; one of said clamping parts being slightly yielding and said inner washer being of such thickness as to receive the greater part but not all of the clamping pressure, whereby the bearing member may be rotated with the spindle while the outer washer is held from movement and electrical contact is maintained between both washers and one of the clamping members.

7. The combination with an electric circuit, of a clock provided with a time-indicating hand connected with, and forming one terminal of, said circuit, the metal support E extending across the dial, the spindle F mounted in said support, the contact-hand F^2 mounted upon said spindle in electrical connection with the latter, the bushing F', the contact-hand F^3 mounted upon the bushing, the check-nut f^7, the contact-strip f^3 and washer f^2 interposed between the heads of the spindle and bushing, and the conductors j', l and m' electrically connecting the several parts, substantially as described.

8. In an electrical contact device, the combination with a movable part and a rotatable contact-wheel adapted to make and break contact with said movable part and comprising a plurality of spring-blades each adapted to impart rotation to the wheel by its rebound when breaking contact with the movable part, of a ratchet adapted to coöperate with the contact-wheel to hold the latter from backward rotation.

In testimony that I claim the foregoing as my invention I affix my signature hereto, in the presence of two subscribing witnesses, this 5th day of April, 1898.

ELMER H. WRIGHT.

Witnesses:
ALBERT H. GRAVES,
EMMA D. MARSH.