No. 677,819. Patented July 2, 1901.

D. W. THOMPSON.

ELECTRIC SELF WINDING CLOCK.

(Application filed Feb. 3, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

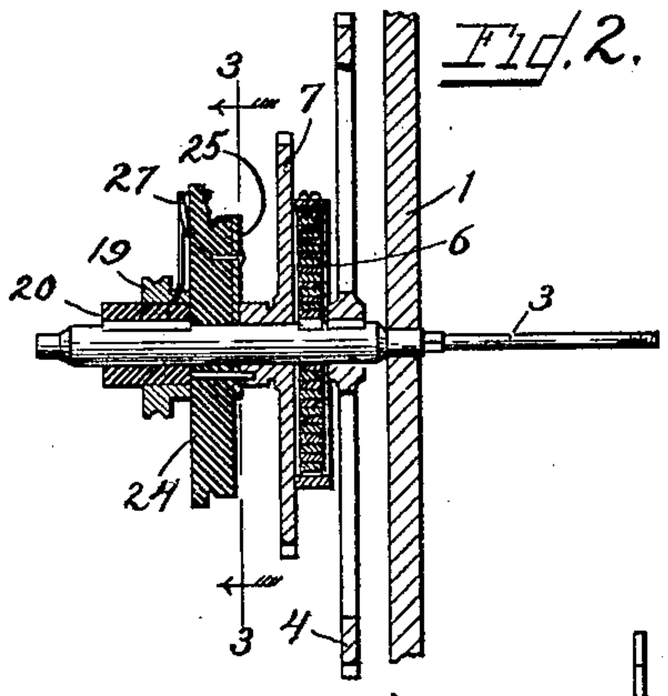


Fig. 3.

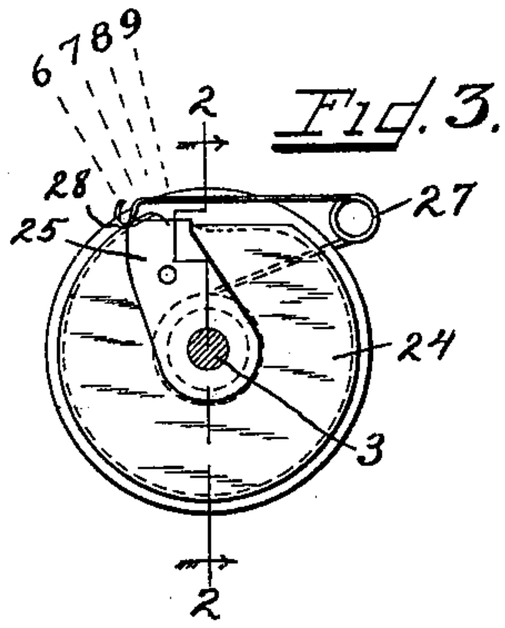


Fig. 4.

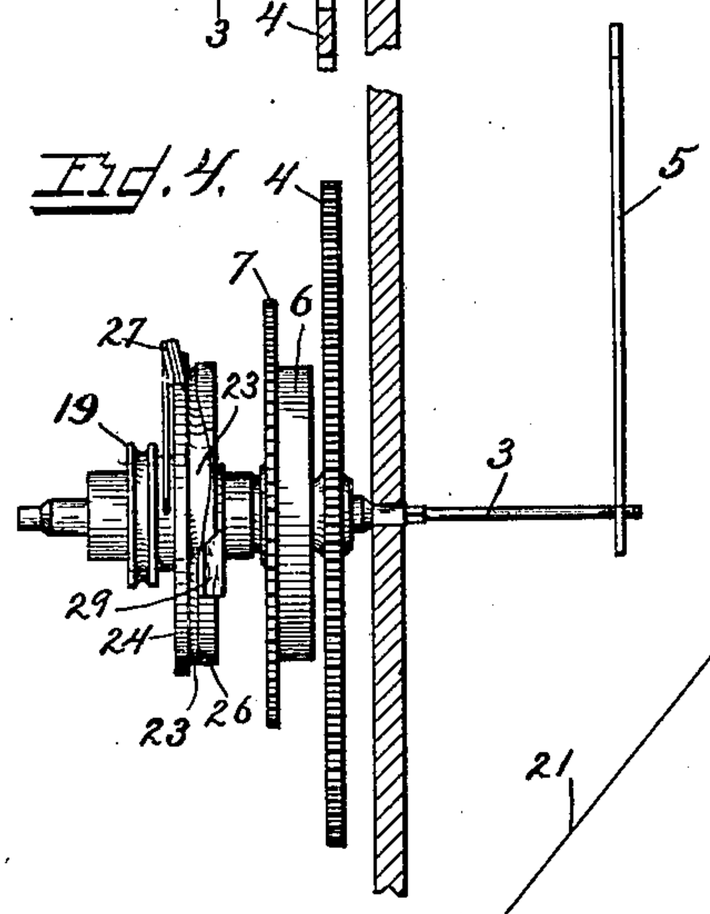
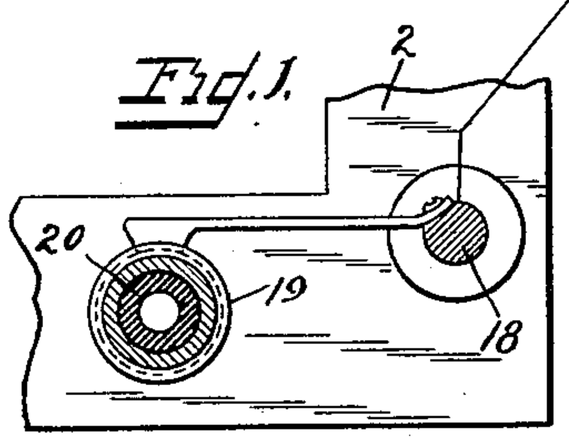
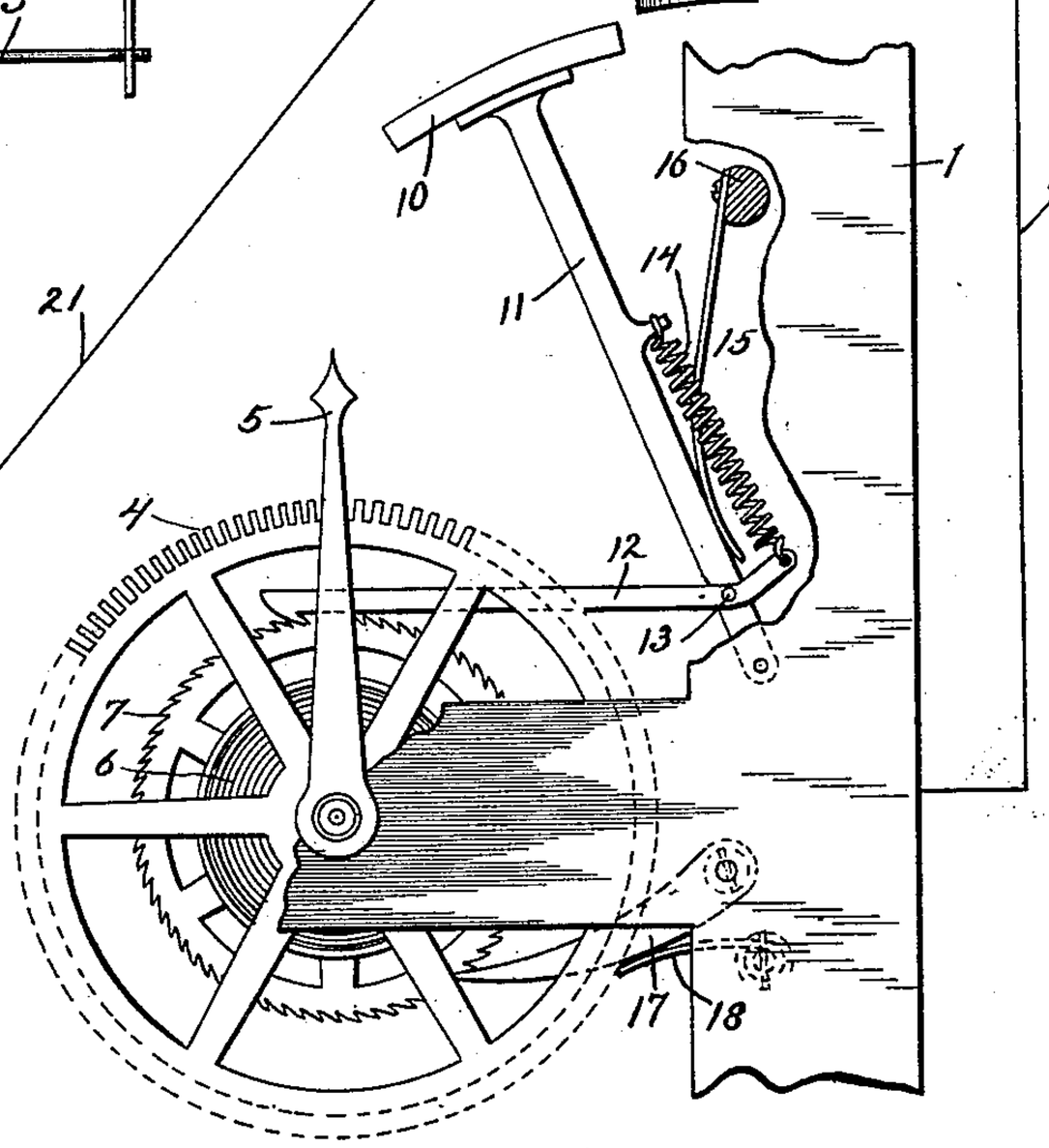


Fig. 1.





Witnesses
Ira D. Perry
J. B. Weir

Inventor
David W. Thompson
by Henry W. Cook
Atty.

No. 677,819. Patented July 2, 1901.

D. W. THOMPSON.

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(Application filed Feb. 3, 1900.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 10.

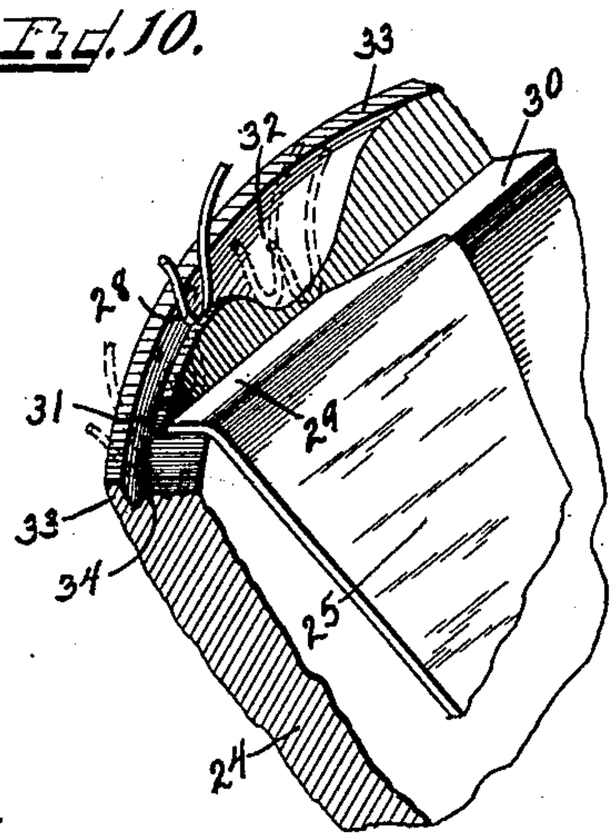
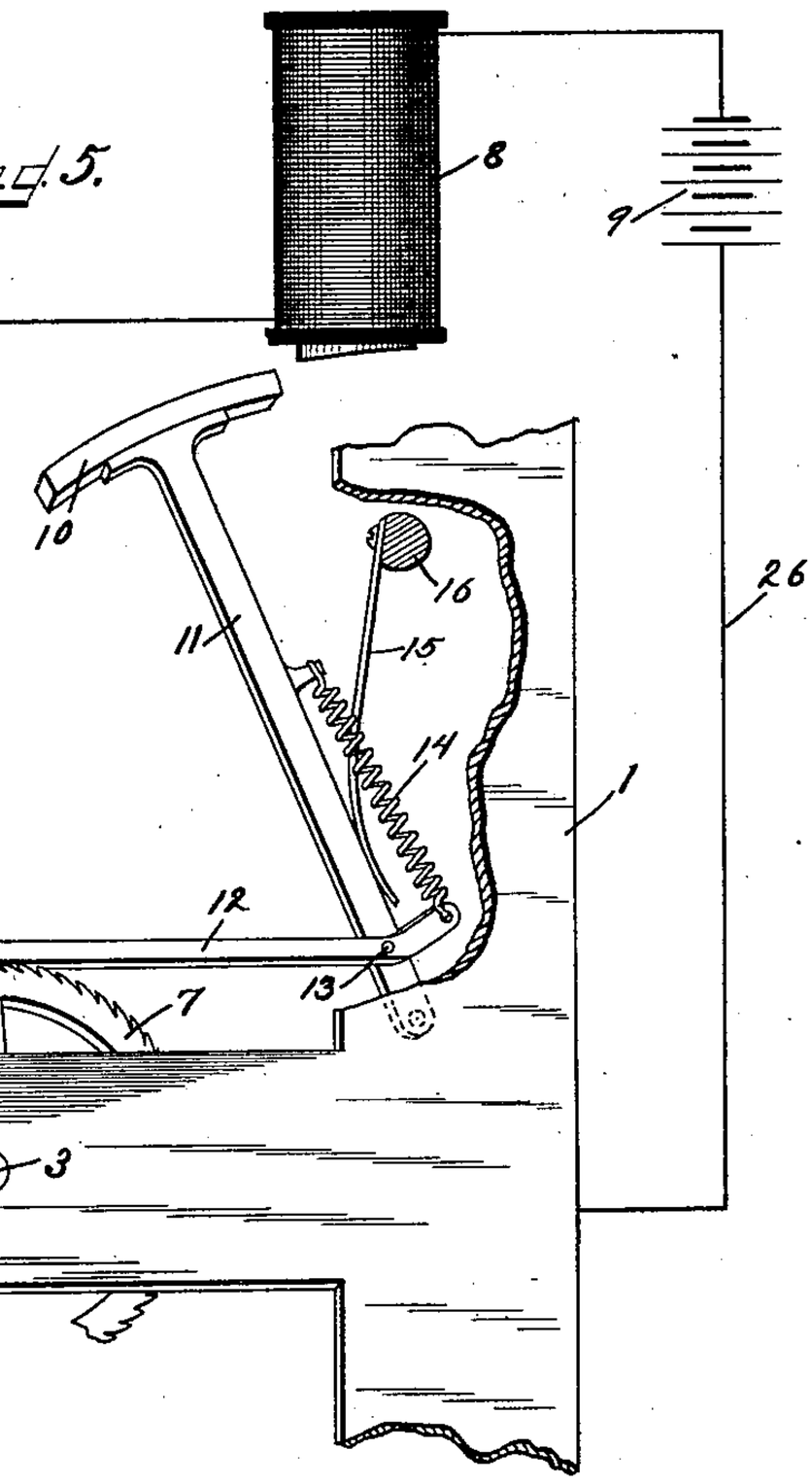


Fig. 5.



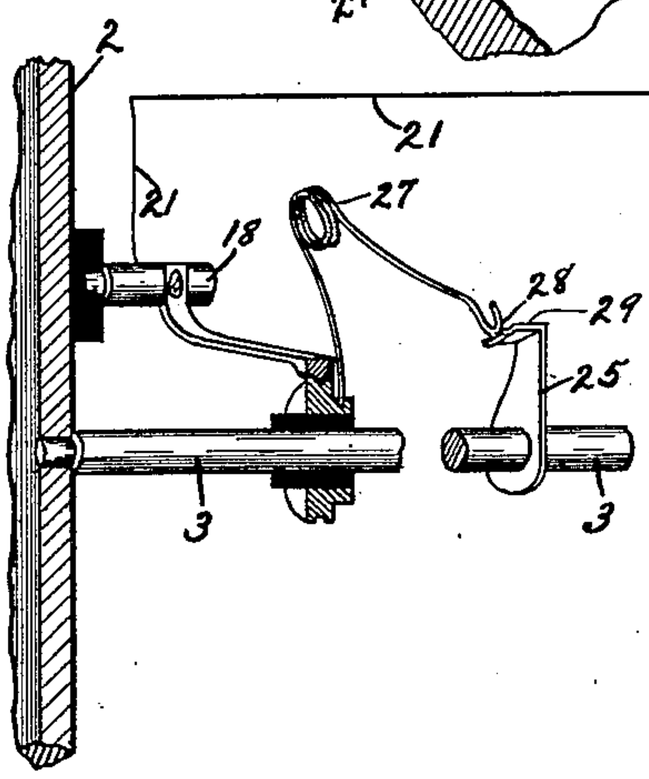


Fig. 6.

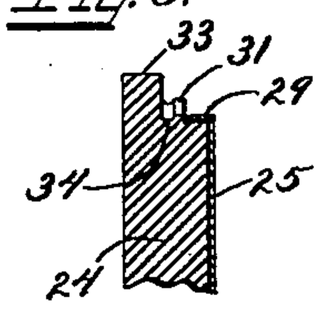


Fig. 7.

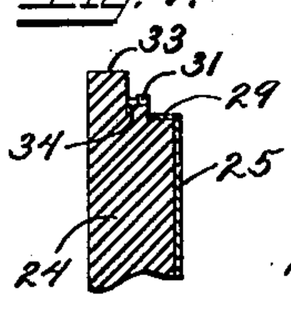


Fig. 8.

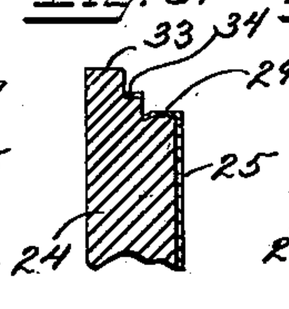
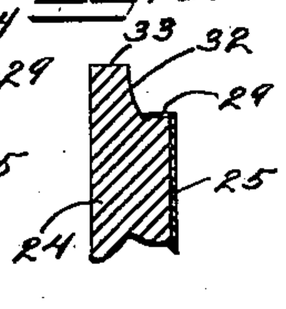


Fig. 9.



Witnesses
Ira D. Perry
J. B. Weir

Inventor
David W. Thompson
by Lemuel W. Serrell
Atty.

UNITED STATES PATENT OFFICE.

DAVID W. THOMPSON, OF CHICAGO, ILLINOIS.

ELECTRIC SELF-WINDING CLOCK.

SPECIFICATION forming part of Letters Patent No. 677,819, dated July 2, 1901.

Application filed February 3, 1900. Serial No. 3,790. (No model.)

To all whom it may concern:

Be it known that I, DAVID W. THOMPSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electric Self-Winding Clocks, of which the following is a specification.

This invention relates to improvements in electric self-winding clocks, and more particularly in those parts of such clock mechanisms which relate to the make-and-break contacts, which effect the completion or interruption of the circuit from time to time as the winding mechanism is brought into or cut out of action.

The object of the invention is to provide an improved construction in devices of the character referred to; and it consists in the matters hereinafter set forth, and more particularly pointed out in the appended claim.

In the accompanying drawings, Figure 1 is a general view, somewhat diagrammatic in character, of parts of an electric self-winding clock mechanism constructed in accordance with my invention, the left-hand portion of the figure being in section on line 1 1 of Fig. 4. Fig. 2 is a sectional detail thereof, taken on line 2 2 of Fig. 3. Fig. 3 is a similar view taken on line 3 3 of Fig. 2. Fig. 4 shows a side elevation of the principal rotary parts. Fig. 5 is a diagrammatic view designed to more fully show the electrical circuit. Figs. 6, 7, 8, and 9 are sectional details taken on lines correspondingly numbered in Fig. 3 for the purpose of showing the shaping of the contact wheel or disk at critical points. Fig. 10 is a fragmentary perspective view of the contact wheel or disk, showing the several positions of the contact-spring relatively thereto.

In said drawings, 1 designates the front plate of the metallic frame which supports and contains the clock mechanism. 2 is the rear plate thereof, and 3 the main shaft, which is journaled within and extends between said plates in the usual manner. Secured tightly upon this shaft to rotate therewith are the hour-wheel 4 and minute-hand 5, and the hour-hand and its driving-train will be applied thereto in any usual or suitable manner. (Not herein illustrated.) One end of a main driving-spring 6 is secured to the shaft 3, while its other end is secured to a winding-wheel 7, that is mounted to rotate independently upon said shaft. In the operation of the clock this winding-wheel will be actuated from time to time to wind up the spring 6 by any suitable electrically-actuated winding mechanism, the exact nature of which is not material to this invention, but which may conveniently be made, for example, of the construction herein illustrated. In this construction an electromagnet 8 when energized by a suitable battery 9 or other convenient source of electrical energy attracts an armature 10, which is herein shown as mounted on the end of a pivoted arm 11, carrying a ratchet-pawl 12, that operatively engages ratchet-teeth on the periphery of the winding-wheel 7. The pawl 12 is herein shown as pivoted to the arm 11 at 13 and has a spring 14 applied between said arm and its rear end for the purpose of holding its forward end yieldingly in contact with the winding-wheel, another spring 15 being applied between said arm and a fixed stud 16 of the clock-frame to normally maintain the armature at that end of its throw away from the magnet. Then when the electric circuit is completed by the means hereinafter described the armature will be drawn toward the magnet and will operate through the arm 11 and pawl 12 to impart to the winding-wheel a rotary impulse in a direction tending to tighten or wind up the spring. A holding-ratchet 17, provided with a spring 18 for maintaining it in contact with the winding-wheel, serves to prevent the latter from turning backward when the circuit is broken again, upon which event the spring 15 will restore the armature 11 to its normal position away from the magnet ready to be drawn up again when the latter is once more energized. The contact devices which effect the making and breaking of the circuit to accomplish such winding action and which embody my present invention are constructed as follows: 19 designates a collecting-ring, which is rigidly mounted upon the shaft 3 to rotate therewith, but is separated therefrom by an insulating-bushing 20, and 21 is a conducting wire or brush, the free end of which rests upon the collecting-ring 19 and is in constant contact therewith, no matter to what extent the shaft and ring may rotate. This brush is connected in

circuit with the magnet 8 and battery 9 by a lead-wire 22, which runs from the magnet to an insulated stud 23, to which the brush 21 is secured. Adjacent to the collector-ring 19 and between the latter and the winding-wheel 7 is a disk or wheel 24, of ebonite or other suitable insulating material, which is mounted to rotate on the shaft 3 in company with said winding-wheel and is provided on its side toward the winding-wheel with a contact-plate 25, that is in constant metallic contact and through the latter with the frame-plate 1, which frame-plate is connected in circuit by a lead-wire 26 with the battery 9 and magnet 8, and consequently with the brush 21 and collecting-ring 19.

To complete the circuit between the collecting-ring and the contact-plate 25, I provide a contact-spring 27, which is secured at one end to the collecting-ring to rotate therewith and then after being extended outwardly beyond the periphery of the adjacent contact-wheel 24 is doubled upon itself and its other end carried back and allowed to rest resiliently upon the periphery of said contact-wheel, the tension of the spring being such as to tend to swing its free or contact end 28 inwardly toward the center of the wheel and also laterally toward the collector-ring side of the wheel. The latter is then provided at a point adjacent to the outer end of the contact-plate 25 with a double or, in effect, loop-shaped path of engagement for said contact end of the spring, around which the latter travels to make and break the electrical circuit, one portion 29 of this loop-shaped path being formed or bounded by the end of the contact-plate, which is herein shown as bent over upon a flattened spot 30, provided for this purpose on the periphery of the wheel on one side, while the other portion of said loop-shaped path is formed by the insulating material of the wheel and, as herein shown, takes the shape of a ledge 31, which gradually rises above the end 29 of the contact-plate and then suddenly terminates or merges into the face 32 of a peripheral flange 33, that is provided on the opposite side of the wheel from the flattened spot 30. The rotation of the shaft 3 and collecting-ring 19, due to the unwinding of the driving-spring, draws the contact end 28 of the spring 27 along upon the ledge 31 until it reaches the point where the latter merges into the face of the flange 33, whereupon the tendency to spring inward toward the center of the wheel causes it to snap down upon the turned-over end 29 of the contact-plate 25. This instantly completes the circuit, energizes the magnet 8, and causes the latter to draw up its armature 10, thereby imparting a rotary impulse to the winding-wheel, and consequently to the attached contact-wheel. This impulse is in the same direction as the rotary movement of the shaft 3, due to the unwinding of the mainspring, and is of sufficient length and of such great velocity, being practically instantaneous, as to draw the end of the contact-plate along beneath the contact-spring to the rear edge of the plate, where the ledge 31 is coincident in level therewith, whereupon the tendency of the spring to move laterally toward the collecting-ring will cause its end 28 to snap across the ledge and against the flange 33, thus breaking the circuit. The winding-wheel will then be held stationary by the holding-ratchet 27 until by the continued turning of the shaft 3 the conducting-spring is drawn up the ledge again and snaps down upon the contact-plate once more to effect another winding impulse, and this action will be repeated as long as the current supplied is of sufficient strength to move the winding-wheel against the tension of the attached driving-spring. The loop-shaped path of movement thus provided on the periphery of the contact-wheel for the end 28 of the contact-spring need occupy but a small portion of the circumference of said wheel, and the length or extent of each winding impulse need be but a few degrees, and in the best form of the movement which I have yet constructed is not over about fifteen degrees, the impulses being repeated every two or three minutes. The effect of this system of winding, therefore, is to maintain the mainspring 6 under an almost constant tension and tends greatly toward the accurate running of the timepiece. As a further improvement, however, and to guard against the stopping of the clock by reason of the failure of the winding mechanism to operate at any particular time a continuous path of movement for the end of the contact-spring is provided around the entire periphery of the contact-wheel at the base or inner margin of the flange 33, so that in event of such failure of a winding impulse said contact-spring will simply be drawn around the full circumference of the contact-wheel until it again rides up on the ledge 31 and snaps down on the contact-plate to complete the circuit. Then if the cause of the previous failure to wind was that the strength of the battery was insufficient to overcome the tension of the mainspring the lessened tension of the latter due to its having just unwound one full turn may enable the current to accomplish the winding impulse at this time. If not, the spring will simply continue to unwind and actuate the clock and to draw the contact-spring around the contact-wheel until the point is reached where the strength of the battery is sufficient to overcome the tension of the mainspring and accomplish the winding. This construction, furthermore, renders it obviously possible to set the device so that the mainspring will operate at any desired degree of tension, which may be varied to accommodate the load and increased as required to drive any attachments added to the clock for other than time-keeping purposes. Ordinarily in practice the spring will be wound to the least tension at which it will safely carry its load, and since all the power

of the winding mechanism is exerted directly upon the mainspring its momentum, as well as its potential energy, will be effectively employed in the winding operation. Thus the contact may be only long enough to produce a movement of the armature sufficient to rotate the winding-wheel the length of but two teeth of the ratchet, for example, before the current is cut off; but the inertia of the armature and its connected parts will still continue to act for some time longer and may rotate the winding-wheel the length of two more of the ratchet-teeth, for example, before the action ceases. The spring itself thus serves to absorb the surplus energy of the battery impulse and brings the parts to rest without jar and without requiring any positive stop, and this utilization of the inertia or momentum of the winding device makes it very easy on the battery by prolonging the interval between the windings.

My improved contact has no fixed time interval as measured by the train, but operates as soon as the mainspring unwinds to a predetermined point. It may fairly be said to be located directly between the ends of said mainspring, and its terminals revolve with them and maintain said mainspring at any desired tension, varying according to the requirements of each particular situation, always maintaining a perfectly uniform pressure upon the train. The contact is built into the clock-movement, so as to require no adjustment, and the clock can be taken to pieces without disturbing it. The rake-off or length of contact of its terminals is, furthermore, equal to a considerable part of an inch—nearly one-fourth of an inch in actual practice as against one or two hundredths of an inch at most, as is ordinarily common on other clock-contacts. This obviates all tendency for the terminals to burn out and renders the use of platinum or other expensive materials unnecessary in its construction, the parts remaining bright indefinitely when made of the ordinary metals. Moreover, this contact device, being entirely independent of the other parts of the train, may be applied without substantial alteration to any kind of movement from a mantel to a tower clock.

It will be understood that various changes in the details of the construction shown may be made without involving any departure from the broad spirit of the invention claimed.

I claim as my invention—

A contact device for electric self-winding clock-movements one member of which is connected with and operated by the shaft carrying the inner end of the mainspring and the other member of which is connected with and operated by the outer end of the mainspring, so that the unwinding and rewinding of the mainspring directly closes and opens the electric circuit, both of said members being supported upon and removable with said shaft and rotating in the same direction about the axis thereof, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two subscribing witnesses, this 30th day of January, A. D. 1900.

DAVID W. THOMPSON.

Witnesses:
HENRY W. CARTER,
N. R. BAILEY.