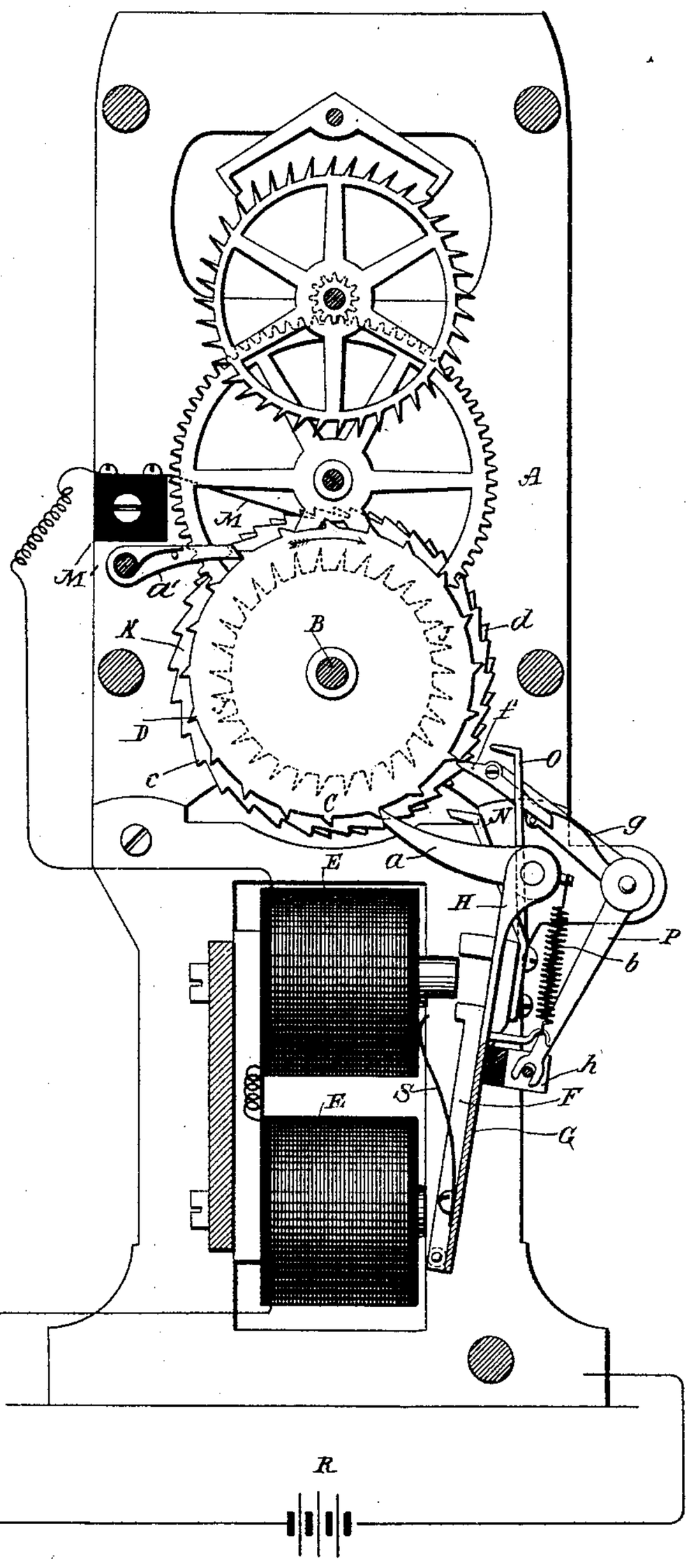
(No Model.) 2 Sheets—Sheet 1.

# F. M. SCHMIDT.

## SELF WINDING CLOCK.

No. 452,392. Patented May 19, 1891.

*Fig. 1*

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(No Model.) 2 Sheets—Sheet 2.

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## SELF WINDING CLOCK.

No. 452,392. Patented May 19, 1891.

*Fig. 2*

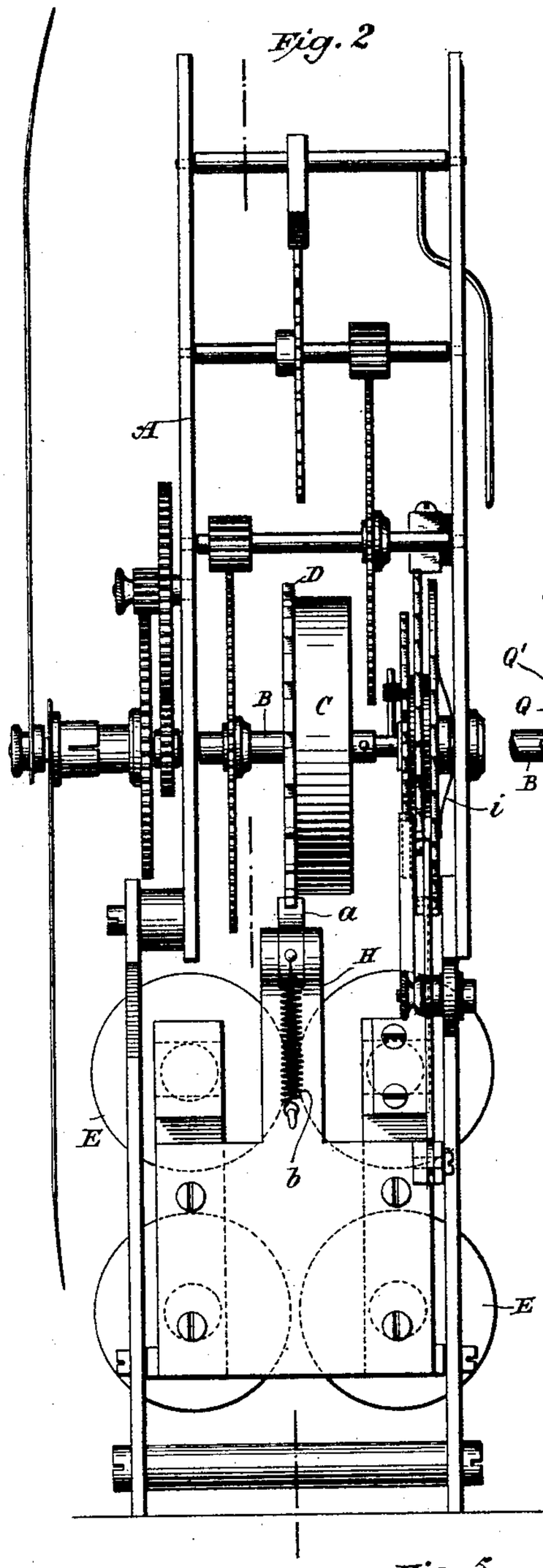



*Fig. 3*

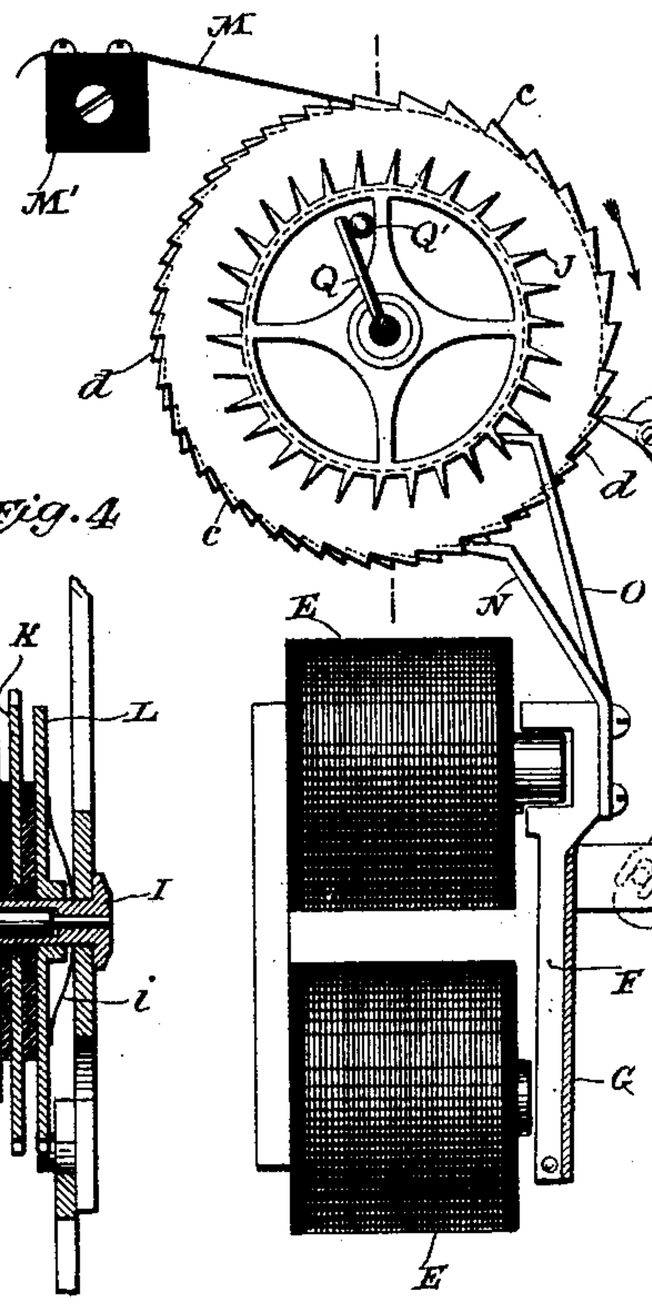



*Fig. 4*




*Fig. 6*

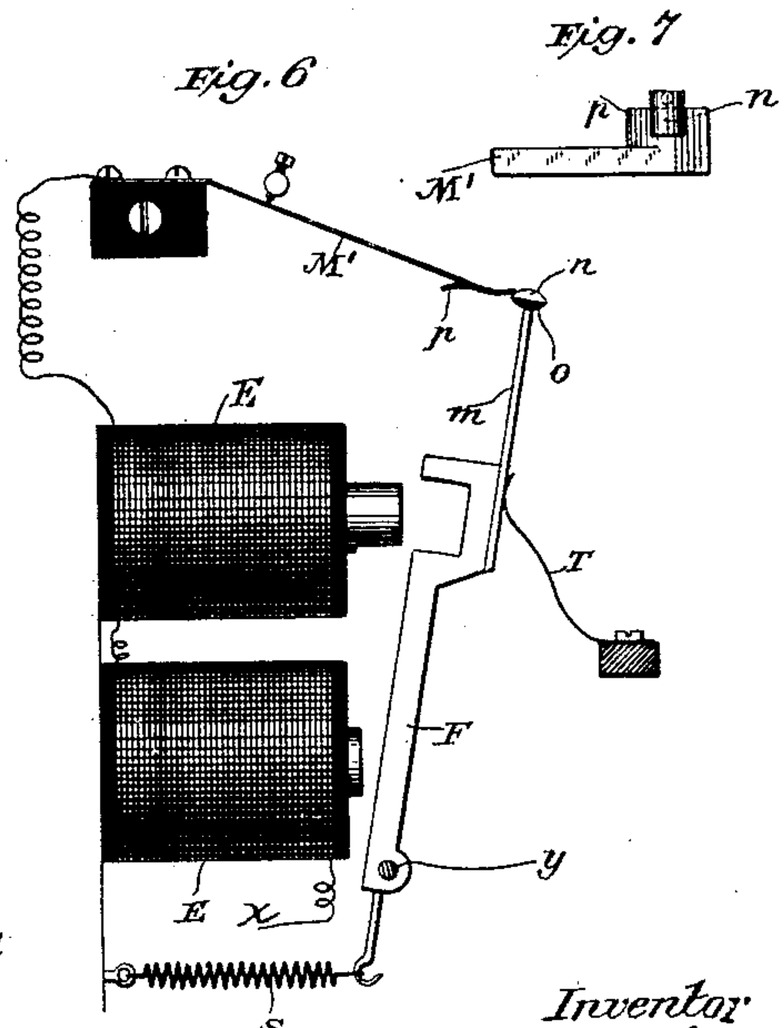
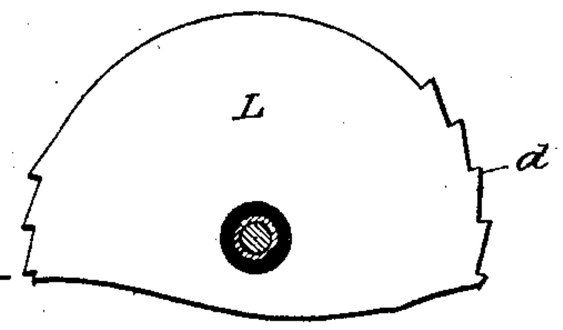



*Fig. 7*

*Fig. 5*

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# UNITED STATES PATENT OFFICE.

FREDRICK M. SCHMIDT, OF BROOKLYN, NEW YORK.

## SELF-WINDING CLOCK.

SPECIFICATION forming part of Letters Patent No. 452,392, dated May 19, 1891.

Application filed November 25, 1890. Serial No. 372,621. (No model.)

*To all whom it may concern:*

Be it known that I, FREDRICK M. SCHMIDT, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Electro-Mechanical Clocks, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

This invention is an improvement in that class of clocks commonly known as "self-winding," or, in other words, clocks that are run by means of a weight or spring, but which at predetermined intervals are automatically wound by means of an electro-magnetic motive device.

The object of the invention is to simplify the mechanism which such clocks contain and to provide for the least possible drain upon the battery used to supply the motive power for rewinding them.

The winding mechanism which I employ is a ratchet-wheel fixed or attached to the going-barrel and a reciprocating motor that at predetermined intervals operates a pawl and advances the ratchet-wheel step by step through the space of a given number of teeth. The circuit of the motor, however, is controlled automatically by independent mechanism, the function of which is, first, to maintain the motor-magnets energized until the armature has moved the winding-ratchet through the full space of a tooth; second, to then interrupt the said circuit and permit the armature to recede to its full extent; third, then to close the circuit of the magnet again and so repeat the first operation. Such an operation, it will be observed, differs essentially from that of an ordinary make-and-break escapement pawl and ratchet and with suitable provision for the number of makes and breaks insures the proper winding of the clock-spring.

The details of the construction of this invention are illustrated in the accompanying drawings.

Figure 1 is a view in elevation of the complete mechanism with one side of the frame removed. Fig. 2 is a view in elevation of the same at right angles to Fig. 1. Fig. 3 shows a portion of the winding mechanism detached from the rest of the works. Fig. 4 is a sectional detail of a portion of the winding mechanism. Fig. 5 shows a portion of one of the circuit-controlling wheels. Fig. 6 is a modified form of winding-motor. Fig. 7 is a detail of a portion of the same. The character of the going-train may be very greatly modified, and it will be understood that the form shown herein is merely selected as an illustration of the principle of construction.

The frame A for the works, the escapement, pendulum, and other parts of this kind are similar to those commonly used.

On the main or driving arbor B is the going-barrel C, in which is the mainspring, one end connected to the arbor, the other to the barrel. A ratchet-wheel D is fixed to the barrel and turns loosely on the shaft. This wheel is normally locked by engagement with a pawl *a'*, so that the tension of the spring is applied to driving the clock-train when the spring has been wound up.

A clock may be constructed to be automatically rewound at any desired intervals on the plan which I am about to describe; but I prefer that the clock shall be so arranged that the winding mechanism shall be brought into operation once an hour, and in the present case I have shown only the mechanism for this purpose.

The ratchet-wheel D has a certain selected number of teeth. I prefer about twenty, so that the circuit for the mechanism which I have designed to effect the winding will be closed that number of times only during each hour.

E are the electro-magnets that are utilized for winding the clock. They act upon armatures F, carried by a pivoted frame G. I prefer to use the form of magnet and armature shown and described in my patent, No. 438,780, dated October 21, 1890; but any other that is adapted for the purpose may be substituted therefor.

The armature-frame carries an arm H, to which is pivoted the pawl *a*, which is held in engagement with the winding-ratchet D by means of a spiral spring *b*, attached to the said pawl, and a pin *c* on the arm H, respectively.

It is obvious that if the magnets E be energized twenty times and each impulse be of sufficient force and duration the ratchet D will be turned through one revolution and

the spring in the barrel C be wound up to a corresponding extent. I shall describe, therefore, the means for securing this result, which I have devised and which form the subject of this invention.

I is a sleeve turning loosely on the shaft B. This sleeve carries three wheels J K L. The wheel K, which is between the other two, is insulated from the sleeve and the other two. Its periphery is cut in teeth, which are marked *c*. The wheel or disk L has also teeth *d* of the same width as those of wheel K, and the two wheels are set so that the teeth of one lie midway between those of the other. A portion of the teeth of wheel L are, however, cut away, so that when the two are turned under a contact-spring M, secured to an insulating-block M′ and adapted to bear upon the peripheries of the two wheels, the said strip or spring will not make contact with the cut-away portion of the said wheel L; but after passing this cut-away part the spring will bear alternately upon the two wheels. The wheel J is a star or escapement wheel, with teeth corresponding in number and position to those on the wheel K.

The armature-frame G carries two fixed pawls N O, one engaging with the teeth of wheel K and the other with the teeth of wheel J, the latter pawl serving as a detent to stop the wheels and forward movement of the armatures when by the movement of the latter the said pawl O is brought between two of the teeth of the said wheel J. The pawl *a* and the pawls N O are so adjusted as to position that the movement of the armatures will not be arrested until the pawl *a* has completed its stroke and advanced the ratchet D the full space of one tooth.

P is a bell-crank lever pivoted at *e* to the frame. One arm carries a pivoted pawl *f*, acted upon by a spring *g*, and the other is connected by a slot and pin to an extension *h* from the armature-frame. The pawl *f* is arranged to engage with the ratchet-wheel K and moves it in the same direction as pawl N, but only by the complete backward movement of the armature-frame. The pawl *f* being pivoted, the wheel K is free to move by it in one direction.

On the arbor B is a pin Q that engages with a pin Q′, set in the side of the wheel K.

A bowed spring *i* is placed between the frame and the wheel L to prevent displacement of the latter by jars and other causes.

One pole of the battery R is connected to spring M through the magnets E and the other to the metal frame of the clock, from which pawls N O and lever P are suitably insulated.

The operation of this device is as follows: By the operation of the clock mechanism the pin Q comes at a given point into engagement with pin Q′ and turns the three wheels J K L in the direction of the arrow, Fig. 3, until the spring M passes over the cut-away portion of wheel L and slips from one of the teeth *c* onto one of the teeth *d*. Fig. 3 shows the parts in this position. The contact of the spring M with wheel L completes the battery-circuit, wheel L being in metallic connection with the frame, and draws up the armatures toward the magnets until the ratchet-wheel D has been advanced one tooth. Before the armature has completed its stroke the pawl N engages one of the teeth *c* and advances the three wheels J K L until the first-named is blocked by pawl O; but at the end of this movement the spring M has been shifted onto one of the teeth *c* of the wheel K. The circuit, therefore, is broken, as said wheel is dead or insulated from the frame. The armatures at once fall back from the poles of the magnet, proper means being provided for effecting this, such as a spring S, and in their return turn the lever P about its fulcrum, causing the pawl *f* to advance the wheels J K L one step or until the spring M slips onto the next tooth *d* of wheel L. This cycle of operation is repeated until the spring M slips from the last tooth *d* of wheel L before the cut-away portion in said wheel. When this occurs, the circuit remains broken until by the movement of the arbor B the pins Q and Q′ are brought into engagement and the wheels J K L turned until the cut-away part of wheel L has again passed the spring M. The number of teeth of the wheels K L and the width of the cut-away part of the latter will obviously depend upon the requirements of each case and may be readily determined. The same result may be secured by other means, and as a modification of the principle of construction I have shown the device in Fig. 6.

In this device the armature or armature-frame that operates to wind the spring carries an arm *m*, on the end of which is a rounded post. The forward or outer side *n* of this post is metallic, and the arm *m* is connected to one pole of the battery. The other side *o* of said post is insulated, as shown. A spring M′ carries at its extremity a curved plate *p*, with which the metallic part *n* of the post is normally in contact.

This device is applicable to the ordinary self-winding clocks, in which the electric circuit, by means of a rotating contact, is closed for a given length of time during each hour or other period, and after being closed is broken again after a predetermined movement of some of the parts. This structure I have not illustrated, as it is common to all the self-winding clocks now in use and is well understood.

The operation of this device is as follows: When the circuit of the contact-maker of the clock is closed at some point in the circuit between the points *x y*, the magnet draws toward it the armature F. The circuit is maintained closed between the armature and the spring M′ as long as the post *n* is in contact with the plate *p*; nor do these parts separate until the armature has completed its

full movement. The edge of the plate which the post *n* leaves is bent slightly toward the post, so that as soon as the latter passes the edge of the plate the spring M′ carries the same forward, leaving the post to return on the opposite side of the plate. In its return, however, it does not close the contact, because its insulated side is presented to the plate *p;* but, the outer or upper edge of the plate being bent toward the insulated post *o*, the post after reaching its backward limit of movement returns to the plate with its metallic side presented thereto.

In order to insure permanent contact between the post and the plate *p*, I place a comparatively light spring T in position to encounter the armature F on its return and force it slightly forward. The back-and-forth motion of the armature effected in this way continues as long as the circuit is closed between *x* and *y*, as above described.

The above-described mechanism or plan for rewinding a clock I have found to be both effective and economical. The time required to rewind the clock is extremely short and the drain upon the battery is very small.

What I claim is—

1. The combination, with a clock-train, an electro-magnet, and a vibrating armature for winding the same, of a circuit-controller the movement or operation of which is dependent upon the movements of the armature, said circuit-controller having contact surfaces or points adapted to be brought into engagement by the return of the armature to its limit of backward movement and maintained in such engagement during its complete forward movement, as herein set forth.

2. The combination, with a clock-train and an electro-magnet and vibrating armature for winding the same, of a circuit-controlling mechanism intermittently moved in the same direction by both the forward and return movements of said armature, said circuit-controlling mechanism being provided with contact-surfaces so arranged as to be brought into engagement on the return of the armature to its limit of backward movement and separated when said armature has completed its forward movement, as set forth.

3. The combination, with a clock-train and an electro-magnet and vibrating armature for winding the same, of a circuit-controlling mechanism moved intermittently to a given extent in one direction by both the forward and return movement of the armature and adapted to maintain the circuit closed during the forward movement of the armature, as set forth, and a pin or device on a revolving member of the clock-train adapted to engage with said circuit-controlling mechanism and bring it into operative relation with the vibrating armature, as herein set forth.

4. The combination, with a clock-train and an electro-magnet and vibrating armature for winding the same, of two ratchet-wheels, one insulated, the other forming a part of the circuit of the magnet, the two wheels being set so that their teeth alternate, and that which is in the circuit being mutilated or minus a portion of its teeth, a spring-contact in position to bear upon the teeth of the wheels and to make contact with the two alternately, a pin or projection on one of the revolving members of the clock-train adapted to engage with and rotate the two wheels, and two pawls connected with the vibrating armature and operated by the movements of the same in opposite directions, respectively, and adapted to impart movement to said wheels in the same direction, as set forth.

5. The combination, with the magnet and vibrating armature of a self-winding clock, of a perfect and insulated ratchet-wheel, a mutilated ratchet-wheel connected with the circuit, the two being set with their teeth alternating, a spring-contact bearing on said teeth, a pin or projection on a rotating member of the clock-train adapted to engage with and move the said wheels, a direct-acting pawl carried by the armature and engaging with the insulated ratchet-wheel, and bell-crank lever and pawl engaging with the said wheel and adapted to advance the same by a return movement of the armature, as set forth.

6. The combination, with the magnet and vibrating armature of a self-winding clock, of a perfect and insulated ratchet-wheel, a mutilated ratchet-wheel connected with the circuit, the two being set with their teeth alternating, a spring-contact bearing on said teeth, an escapement-wheel fixed to the ratchet-wheel, a pin or projection on a rotating member of the clock-train adapted to engage with and move the said wheel, a pawl carried by the armature and adapted to move the wheels by the forward movement of said armature, a detent carried by the armature adapted to engage with the said escapement-wheel, and a pawl connected with the armature and operated by the return movement of the same to advance the said wheels, as herein set forth.

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