(No Model.) 2 Sheets—Sheet 1.

F. A. LANE.

AUTOMATIC ELECTRIC CLOCK WINDING DEVICE.

No. 417,927. Patented Dec. 24, 1889.

Fig. 1

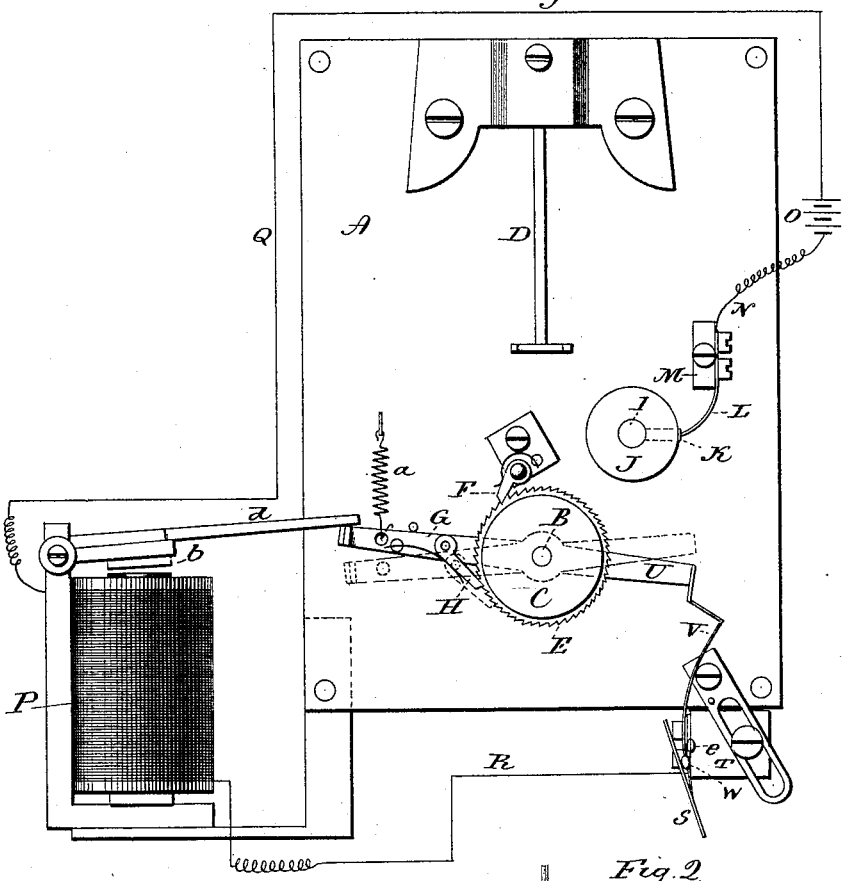
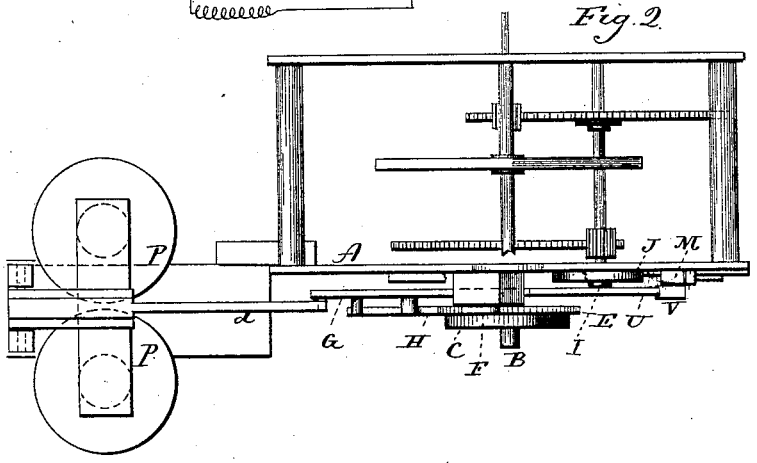


Fig. 2



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

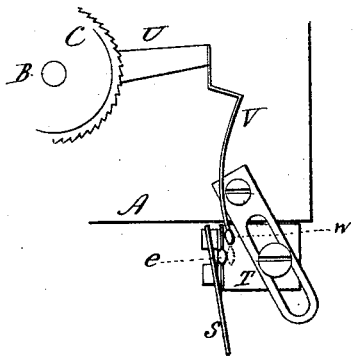
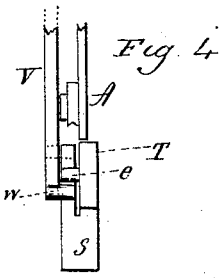


Fig. 4.



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UNITED STATES PATENT OFFICE.

FREDERIC A. LANE, OF NEW HAVEN, CONNECTICUT, ASSIGNOR OF ONE-HALF TO FRANK E. MORGAN, OF SAME PLACE.

AUTOMATIC ELECTRIC CLOCK-WINDING DEVICE.

SPECIFICATION forming part of Letters Patent No. 417,927, dated December 24, 1889.

Application filed May 24, 1889. Serial No. 311,988. (No model.)

To all whom it may concern:

Be it known that I, FREDERIC A. LANE, of New Haven, in the county of New Haven and State of Connecticut, have invented a new Improvement in Electrical Apparatus for Automatically Winding Clocks; and I do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a rear view of a clock-movement, showing the winding mechanism and representing the parts as in the normal position; Fig. 2, a top view of the same mechanism; Fig. 3, the same as a portion of Fig. 1, representing the parts in the position as when the circuit is automatically closed under the action of the clock-movement, but broken under the operation of winding. Fig. 4 represents a rear view—that is, a view from the right hand of Fig. 1—of the post *e* and contacts W and S.

This invention relates to a device for automatically winding clocks by electricity, the object being to employ a light spring as the motive power of the clock, and to maintain that spring under substantially a constant tension; and the invention consists in combining with the movement of a clock a spring-drum arranged upon one of the arbors, a contact revolving with one of the arbors of the clock-movement, a stationary contact insulated from the movement, but in the path of said revolving contact, a magnet in the circuit with the said stationary contact through said movement, a lever arranged to impart winding rotation to said drum under the action of the armature of said magnet when the circuit is closed, the said lever carrying a contact normally in engagement with a second stationary contact in the said circuit, but adapted to escape from said second stationary contact under the said winding movement imparted to said lever, as more fully hereinafter described.

A represents the frame of a clock-movement.

B represents the center arbor, which projects through the plate, the illustration being a rear view.

C represents a spring-drum, which is loose upon the arbor B. This is a common spring-drum, within which is a coiled spring, one end made fast to the drum and the other end of the spring made fast to the arbor, and so that the rotation of the drum in one direction will wind the spring and the reaction of the spring will turn the arbor in the same direction and as usual in this class of spring-drums. The spring-drum being applied to the center arbor may be a very light spring. The drum, however, may be applied to the second or another arbor in the same manner, communicating with the arbor by the usual gearing. I do not illustrate the train of gearing between the center arbor and the escapement-wheel. In this illustration the movement is for a pendulum clock, D representing the verge-rod. On the drum, or made as a part of it, is a toothed ratchet-wheel E. F represents a stationary pawl working into said ratchet-wheel E to catch and hold the drum as it is wound.

A lever G is hung, preferably, upon the arbor B, and so as to swing in a plane parallel with the ratchet-wheel E. The lever G carries a pawl H, which works into the teeth of the ratchet-wheel E, so as to engage the wheel in one direction, but escape in the opposite direction, and so that as the lever is depressed, as indicated in broken lines, Fig. 1, the pawl H will impart a corresponding rotation to the wheel E and the drum C in connection therewith, which movement of the wheel and drum will be caught and held by the pawl F. This movement of the wheel and drum is in the direction to wind the spring. Repeated vibrations of the lever G will therefore impart corresponding repeated winding movements to the spring-drum.

On one of the arbors I of the clock-movement a wheel J is made fast, so as to revolve with the shaft. This wheel J presents an insulated surface, except as to one or more points, as K. At this point a metal surface is presented which communicates with the

arbor, as indicated in broken lines, so that metallic contact extends from the arbor to the periphery of the wheel J.

L represents a brush, preferably secured to an insulated block M on the clock-movement, and so that the brush may bear upon the surface of the wheel J. From this brush L a wire N runs to one member of the battery O.

P represents a magnet, from which a wire Q runs to the other member of the battery O. The other wire R from the magnet runs to a contact S, insulated from the clock-movement, this contact, as here represented, being attached to an insulating-block T.

The lever G extends to the opposite side of the axis upon which it is hung and forms an arm U. This arm carries a spring V, which extends toward the contact S, and carries at its end a contact W.

A spring *a* tends to hold the lever G in its normal position, but yet allow its movement to rotate the ratchet, as before described, and so that normally the contact W of the spring V rests upon the contact S, thus bringing the clock-movement into circuit. The armature *b* of the magnet carries an arm *d*, which extends to the arm G, and so that as the armature closes the said arm G will be depressed to impart to the ratchet-wheel its winding movement; but when that circuit is broken and the armature leaves its magnet the spring *a* will operate to return the lever G to its normal position ready for another action of the armature-arm *d*.

Supposing the spring of the drum C to have been wound sufficient to give the required power to the clock-movement, and the wheel J of the arbor I to be in a position that its metal surface does not engage the brush L, consequently the circuit is open. In due time the wheel J will have revolved so far as to bring the metallic portion K of its surface into contact with the brush L, as represented in Fig. 1. This closes the circuit and brings the armature to its poles, the movement of the armature imparting the before-described movement to the lever G, and as from the position seen in Fig. 1 to that seen in Fig. 3, as indicated in broken lines, Fig. 1, this movement of the lever G takes the contact W away from the contact S and breaks the circuit at that point, as seen in Fig. 3. The wheel J revolves slowly, so that metallic contact is made in the circuit for a considerable length of time. As soon as the circuit is broken by the contact W leaving its contact S the armature is released from its magnet, which leaves the lever G free to turn and bring its contact W again into engagement with the contact S, thereby again closing the circuit and causing a second movement of the lever G, and so on, the contacts W and S separating and approaching under each action of the lever G so long as the contact shall continue between the metal surface of the wheel J and the brush L. Each movement of the lever G thus imparted produces a winding movement to the spring-drum; but if at any time under such successive operations of the lever G the spring shall have been wound to a power equaling that of the power in the electric circuit the said power of the spring-drum will resist the closing of the armature; consequently when such power shall have been acquired by the spring-drum there will be no further winding action until the movement shall have advanced so far as to reduce the power of the spring. In this statement the resisting-power of the spring *a* to the action of the armature has not been considered, as that is very slight; but it will be understood that its resistance is in the same direction as the resistance of the mainspring, and that the equilibrium between the winding-spring and the armature-lever will be actually produced when the combined resistance of the mainspring and the spring *a* equals the power of the electric current to attract the armature to its magnet, the winding always ceasing when this combined power equals the power of the current irrespective of the time when the circuit may be broken between the contacts K and L. From this it will be seen that at each time the contact is made between the metal surface of the wheel J and the brush L a succession of winding operations will be performed until the maximum power of the spring is attained.

The metal surface or contact on the wheel J may be made of any desired length, such length determining the number of vibrations which may be imparted to the lever G, the breaking and closing of the circuit by the contacts W S continuing so long as the contact of the wheel J remains in engagement with the brush or contact L, or until the maximum power of the spring, as before described, is attained.

The wheel J should be upon an arbor revolving more rapidly than the center arbor, and as illustrated, so that the circuit may be frequently closed to bring the winding apparatus into operation.

In order that the contacts W and S may not be brought together until the lever G has made its full return, I arrange a stationary insulated post *e* in rear of the contact S, but in a position above the position of the contact W when in engagement with the contact S, and as seen in Figs. 1 and 4. The spring V tends to bear the contact W upon the contact S when that contact is in the down position, as seen in Figs. 1 and 4, and so that as the contact W begins to rise under the action of the lever G it will pass up between the post *e* and the contact S, the post *e* serving to press the contact W into engagement with the contact S during this upward movement; but so soon as the contact W has risen above the post *e* then the spring V throws the contact W rearward and out of engagement with the contact S and to a position in rear of the post *e*, as seen in Fig. 3. Then as the contact W returns it passes down over the back or rear

side of the post *e*, as represented in Fig. 3, thus being held away from the contact S until the contact W shall have passed to a position below the post *e*, as seen in Fig. 4. Then the contact W, under the action of the spring V, will fly forward and into engagement with the contact S, as seen in Fig. 1.

The contact S is made somewhat elastic, so as to permit the free movement of the contact W, as described, between the contact S and the post, and so as to insure engagement between the two contacts during the upward movement of the contact W. The result of this is that the circuit remains closed until the winding movement of the lever has been completed, and that circuit is not again closed until the lever is returned to its normal position. A full and complete action of the winding-lever is therefore insured.

I have represented the revolving contact as an insulating-wheel having a metal contact in its surface; but it will be understood that the insulating portion may be omitted and the contact project as an arm from the arbor, as in broken lines, the path of the revolving contact being such as to engage the stationary contact at and during predetermined times.

I do not claim, broadly, a clock-movement having a spring-drum arranged upon one of its arbors, with a ratchet-wheel in connection therewith and having a lever carrying a pawl to engage said ratchet, the said lever adapted to be operated by the automatic breaking or closing of an electric circuit, as such, I am aware, is not new; but

What I do claim is—

1. In a clock-movement, the combination of a spring-drum arranged upon one of the arbors of the movement, a toothed ratchet in connection with said drum, a lever arranged to vibrate in the plane of said ratchet, said lever carrying a pawl to engage said ratchet under the vibration of said lever, an electric circuit, a stationary contact in said circuit, a contact arranged to revolve under the power derived from said spring-drum, and so that the said revolving contact will be brought into engagement with the said stationary contact at predetermined times, a magnet in the same circuit, the armature of said magnet adapted to impart a vibratory movement to said lever when the circuit is closed, a second stationary contact in said circuit, and a contact extending from said lever adapted to normally stand in engagement with said second stationary contact, but leave said second stationary contact when the said lever is turned under the action of the said armature, substantially as described.

2. In a clock-movement, the combination of the spring-drum C, arranged upon one of the arbors, a ratchet E in connection therewith, a lever G, arranged to vibrate in a plane parallel with the plane of said drum and carrying a pawl H to engage the said ratchet in one direction, but escape therefrom in the opposite direction, an insulating-wheel J, arranged upon one of the arbors of the movement and presenting in its face a metallic contact K, extending from the arbor of the said wheel J, a brush L, insulated from the clock-movement, arranged to bear upon the surface of said wheel J, a magnet P, the armature of which carries an arm adapted to engage said lever G, the said magnet and the brush L in electric circuit through the clock-movement, a second stationary contact S in the same circuit, the said lever carrying a spring-contact W, adapted to engage the said contact S when the said lever is in its normal position, but to escape therefrom when the circuit is closed by said first-mentioned contacts, substantially as described.

3. In a clock-movement, the combination of the spring-drum C, arranged upon one of the arbors and carrying a ratchet-wheel E, a lever G, arranged to swing in a plane parallel with said drum and carrying a pawl H, arranged to engage said ratchet in one direction and escape therefrom in the opposite direction, a contact K in metallic connection with and adapted to be revolved by one of the arbors of said clock-movement, a stationary contact L, insulated from the movement, but in the path of said contact K, a magnet P, the said contact L and magnet being in circuit through the clock-movement, the armature of the said magnet carrying an arm adapted to engage the said lever when the circuit is closed, a second stationary contact S, a contact W, extending from said lever and adapted to normally engage said stationary contact S, an insulated post *e*, between which and said contact S the said contact W is adapted to pass as the lever receives its impulse from the armature, and back of which post the said contact W will pass when the said lever returns, substantially as described.

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Witnesses:
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