(No Model.) 3 Sheets—Sheet 1.

F. A. LANE.

ELECTRIC WINDING CLOCK.

No. 417,928. Patented Dec. 24, 1889.

Fig. 1.

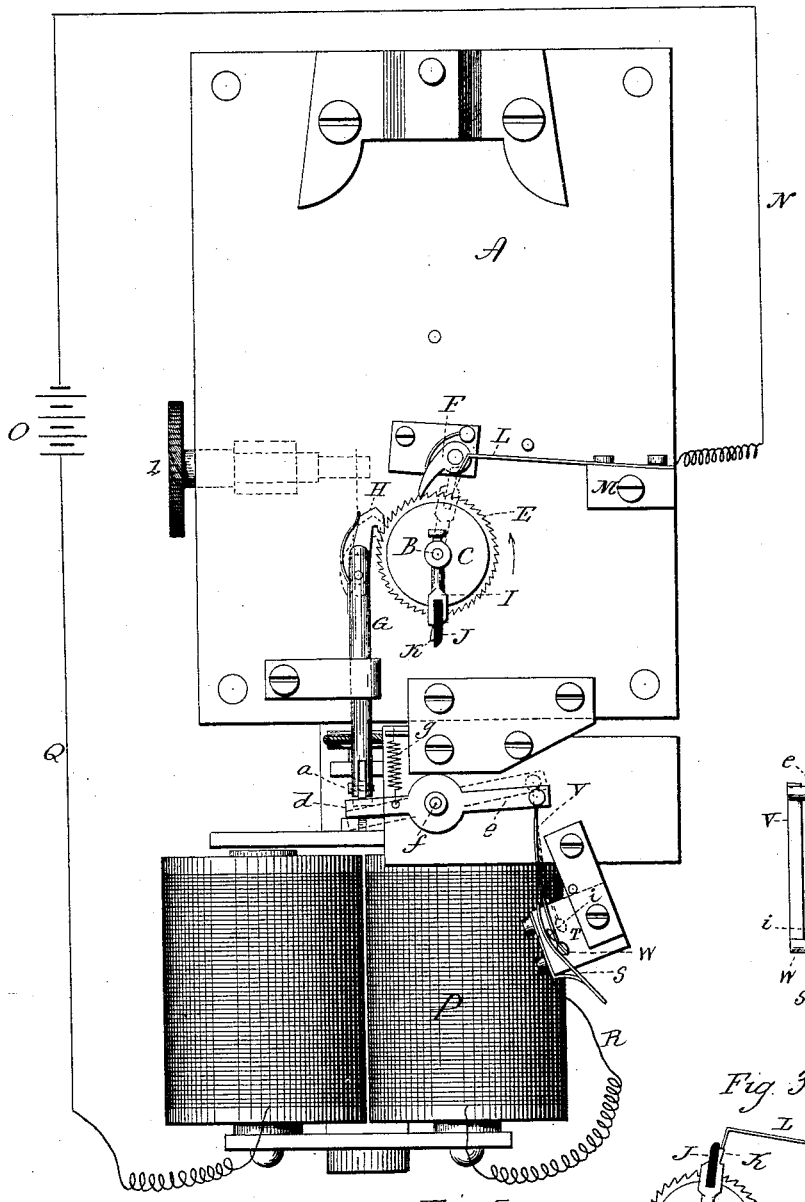


Fig. 4.

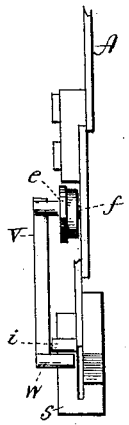


Fig. 3.

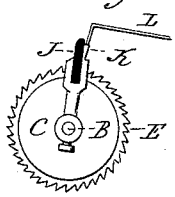
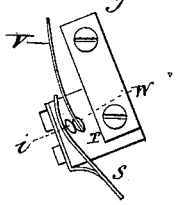


Fig. 5.



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(No Model.) 3 Sheets—Sheet 2.

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ELECTRIC WINDING CLOCK.

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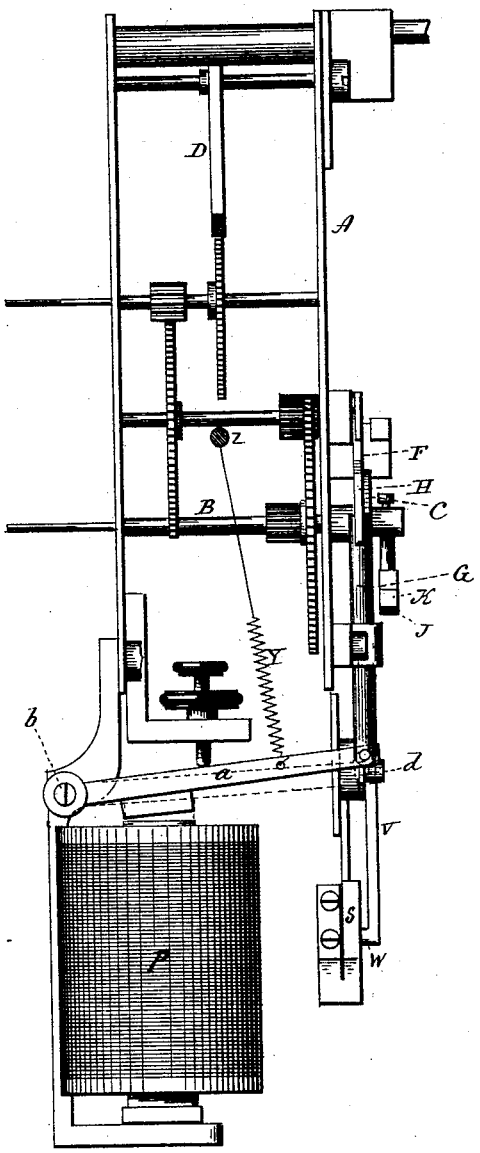
Fig. 2



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(No Model.) 3 Sheets—Sheet 3.

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ELECTRIC WINDING CLOCK.

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Fig. 6

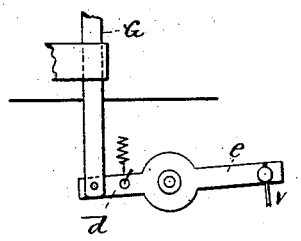

Fig. 7

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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.

ELECTRIC-WINDING CLOCK.

SPECIFICATION forming part of Letters Patent No. 417,928, dated December 24, 1889.

Application filed September 9, 1889. Serial No. 323,378. (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 new Improvements in Electric-Winding Clocks; and I do hereby declare the following, when taken in connection with 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 embodying the invention; Fig. 2, a side view of the same; Fig. 3, a detached view showing the revolving contact in engagement with the stationary contact; Fig. 4, a face view of the two contacts S and W, with the stationary post *i;* Fig. 5, a detached view illustrating the return movement of the contact W; Figs. 6 and 7, modifications.

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 the said revolving contact and adapted to engage the said revolving contact during a predetermined portion of each revolution of said revolving contact, a magnet in circuit with said contacts, a second stationary contact and a corresponding movable contact, the said last-mentioned contacts being in the same circuit as the said first-mentioned contacts, the armature-lever of the said magnet in connection with a pawl adapted to engage the said drum in one direction of movement of said armature-lever, and so as to impart winding rotation to said drum, but escape therefrom on the return movement of said armature-lever, the said armature-lever also, in connection with the said second movable contact, and whereby in said winding movement the said second movable contact is withdrawn from its stationary contact to break the circuit at that point while the circuit is closed at the said first-mentioned contact, and as more fully hereinafter described.

A represents the frame of the clock-movement.

B represents the center arbor. As represented, the winding mechanism is applied upon the rear of the clock-movement. The center arbor B therefore projects through the rear plate of the frame. On the said center arbor is a spring-drum C. This drum is of common construction. Within it is a coiled spring, one end of the spring 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 and its connection with the drum and arbor are not shown, the construction being too well known to require illustration. The spring 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 central arbor by the usual gearing.

In the illustration Fig. 2 the usual train of gearing between the center arbor and the escapement-wheel is shown, D representing the verge. This mechanism may, however, be varied as desired, or any of the known clock-movement mechanisms may be substituted therefor.

On the drum, or made as a part of it, is a toothed ratchet-wheel E. F represents a stationary spring-pawl working into said ratchet-wheel E, and so as to catch and hold the drum as it is wound.

G is a vertical slide supported in suitable bearings, so as to receive an up-and-down reciprocating movement, as indicated in broken lines, Fig. 1. This slide carries a spring-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 slide G is depressed, as indicated in broken lines, Fig. 1, the pawl H will impart a corresponding ro-

tation 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 movements of the slide G will therefore impart corresponding repeated winding movement to the spring-drum. On one of the arbors of the clock-movement, here represented as the center arbor B, a metal arm I is made fast, and so as to revolve therewith. The outer end of this arm carries a non-metallic finger J, the forward side of which is beveled, so as to produce a cam shape. On the back of the non-metallic finger J is a metallic shoulder K, this shoulder being a portion of the arm I.

L represents a spring-metal contact insulated from the clock-frame, preferably by securing it to an insulating-block M, the block secured to the frame, as shown. The said contact projects inward, so that its free end stands in the path of the finger J, and so that as the arm I revolves with the shaft to which it is attached the non-metallic finger J will strike the free end of the contact L and operate thereon as a cam, as indicated in broken lines, Fig. 1, and so as to raise the contact L; but so soon as the finger has passed beyond the end of the contact the contact will spring down and rest upon the metallic shoulder K, as represented in Fig. 3, and thus make metallic contact between the contact L and the arm I during the time that the said contact rests upon the shoulder K.

From the contact L a wire N runs to one member of a battery O.

P represents a magnet, from which a wire Q runs to the other member of the battery O. The other wire from the magnet runs to a contact S, insulated from the clock-movement, here represented as attached to an insulating-block T. This contact S is in the form of a flat metal spring. (See Fig. 2.)

The magnets are preferably arranged as seen in Fig. 2, so that the armature-lever *a* may extend from front to rear, hung at the front upon a pivot *b*, and preferably the pawl-carrying slide G is hung to the inner arm of the armature-lever, and so that vibration of the armature-lever will be communicated to the slide G, as represented in broken lines, Fig. 2. A two-armed lever *d e* is hung upon an axis *f*, so that its one arm *d* will stand below the free end of the armature-lever. To the other arm *e* of the said lever a spring V is attached, which extends downward toward the contact S and carries at its end a contact W. The lever *d e* is provided with a spring *g*, the tendency of which is to hold the arm *d* up against the free end of the armature-lever and to turn the arm *e* downward to hold the contact W in engagement with the contact S; but when the circuit is closed through the magnet the movement of the armature-lever in thus closing will impart a vibratory movement to the lever *d e*, so as to raise the contact W from the contact S, as represented in broken lines, Fig. 1. The circuit is closed only while the shoulder or contact K is in engagement with the contact L. Consequently the circuit is normally open, and, while so open, the contact W normally rests in engagement with the contact S, as represented in Fig. 1, it being understood that the contacts S and W and the contacts K and L are in the same circuit.

Supposing the spring of the drum C to be wound sufficient to afford power to drive the clock-movement and the arm I in the position represented in Fig. 1, in due time the arm I will have revolved so far as to bring the non-metallic finger J into engagement with the contact L, which, operating thereon as a cam, will cause it to rise, as indicated in broken lines, Fig. 1, until the non-metallic finger J has passed the end of the contact L. Then the contact L will instantly drop and come into engagement with the shoulder K, as seen in Fig. 3. This closes the circuit and brings the armature to its poles, and in such closing the armature-lever will impart to the pawl H the before-described movement, as indicated in broken lines, Fig. 1, and such movement of the armature-lever will turn the lever *d e* into the position indicated in broken lines, Fig. 1, and take the contact W away from the contact S, which breaks the circuit at that point, as represented in broken lines, Fig. 1. The arm I revolves slowly, so that metallic contact is made between the contact L and the shoulder K for a considerable length of time. As soon as the circuit is broken by the contact W leaving the contact S the armature is released from its magnet and rises under the action of a spring Y, (which is adjusted by the usual adjuster Z,) turning the pawl H for a new engagement of the ratchet-wheel, at the same time permitting the lever *d e* to return by the action of its spring *g*, and so as to again bring the contact W into engagement with the contact S, thereby again closing the circuit and causing a second movement of the armature-lever and of the lever *d e* to take the contact W from engagement with the contact S, again breaking the circuit at that point, and, so continuing, the contacts W and S separating and closing under each action of the armature-lever, and so long as the contact shall be maintained between the contact L and the shoulder K. Each movement of the armature thus imparted produces the winding movement of the spring; but if at any time under such successive operations of the armature-lever the spring shall have been wound to a power equaling that of the power of the electric circuit the said power of the spring-drum will resist the closing of the circuit. 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 mainspring. The time during which

such winding movement may be performed depends upon the time which the circuit is closed through the contact L, and this may be increased or diminished by a correspondingly increasing or diminishing extent of metallic contact between the arm I and the contact L. From this it will be seen that at each time the circuit is closed between the arm I and the contact L a succession of winding operations will be performed until the maximum power of the spring is attained.

In order that the contacts W and S may not be brought together until the lever *d e* has substantially made its full return, a stationary insulated post *i* is arranged near the face 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 it is in the down position, and so that as the contact W begins to rise under the action of the armature-lever it will pass up between the post *i* and the contact S, the post *i* serving to press and hold 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 *i* then the spring V operates to throw the contact W away from the contact S and to a position in rear of the post *i*, and as represented in broken lines, Fig. 1. Then as the contact W returns it will strike the back of the post *i* and pass down over that post, as represented in Fig. 5, thus being held away from the contact S until the contact W shall have passed to a position below the post *i*. Then the contact W, under the action of the spring V, will fly toward and into engagement with the contact S, as seen in Fig. 1. The result of this combination of the stationary post *i* with the contacts W and S is that the circuit remains closed until the winding movement has been completed, and the circuit is not again closed at this point until the winding-pawl has returned to substantially its normal position, and thus a full and complete action of the winding mechanism is insured.

While I prefer to attach the winding-pawl H to the armature-lever, it may be attached to the same lever which carries the contact W, as represented in Fig. 6, the armature-lever acting directly upon the arm *d* of the lever so carrying the pawl.

Instead of employing a slide, as G, to carry the pawl, the lever carrying the contact W may be hung directly to the same shaft on which the winding-drum is arranged, as represented in Fig. 7, and so that the lever thus hung will swing in a plane at right angles to the axis of the winding-drum, the pawl being hung directly to one arm of the said lever, so as to operate in the teeth of the ratchet on the spring-drum, the same as in the first illustration. In this case the armature-lever operates upon one arm of the said winding-lever, and the other arm carries the contact W, substantially the same as in the first illustration.

Instead of making the metallic contact K as a shoulder upon an arm and upon the back of the non-metallic finger J, it may be made as a portion of the periphery of a wheel on one of the arbors, as represented in Fig. 7, and so that contact will be made with the contact L during the time the metallic portion of the periphery of the said wheel K is in engagement therewith, this metallic portion of the periphery extending into the arbor, so as to make metallic connection therefrom with the frame of the movement. The particular construction of this modification (represented in Fig. 7) is embodied in another application, Serial No. 311,988.

The winding-drum is best applied to the center arbor, as I have represented and described; but it may be applied to either arbor of the clock.

The non-metallic finger J may be omitted, the metal end of the arm as one contact directly engaging the stationary contact; but I prefer to employ the non-metallic finger, as by its use the contact is instantly made instead of gradually made, as it would be were the non-metallic finger omitted.

It will be understood that either of the great variety of known substitutes for a toothed ratchet and pawl working therein may be substituted for the spring-drum, pawl, and ratchet, and that by the terms "pawl and ratchet" as used herein such well-known equivalents are to be understood as included.

In illustrating the invention I have shown it as working with an open circuit. It will be understood that if a closed circuit is to be used the usual reversal in the operations will be necessary.

From the foregoing it will be understood that I do not limit the invention to the precise mechanism described for operating the winding-pawl, or to specific mechanism for closing the circuit through the clock-movement at a predetermined time and for a predetermined length of time combined with a stationary and movable contact in the same circuit, which said movable contact is operated through the winding mechanism to break the circuit as the winding mechanism advances and to again close the circuit upon the return of the said winding mechanism, and whereby a succession of winding operations will be produced during the said predetermined time in which the circuit is closed through the first-mentioned contacts; but I do not wish to be understood as claiming, 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, said lever adapted to be operated by the automatic breaking or closing of an electric circuit, as such, I am aware, is not new.

I claim—

1. In a self-winding clock mechanism, the

combination of a spring-drum arranged upon one of the arbors, a magnet provided with an armature-lever, a pawl adapted to engage said spring-drum in one direction of revolution to wind the spring, but free therefrom in the opposite direction, mechanism between said pawl and said armature-lever whereby said pawl will receive its winding movement from said lever, an electric circuit through said magnet, a pair of contacts in said circuit, one of said contacts revolving under the action of the clock-movement, the other stationary, but in the path of said revolving contact, whereby said contacts will be engaged during a predetermined portion of said revolution, a second pair of contacts in the same circuit, one of said contacts stationary, the other movable, mechanism, substantially such as described, between the said armature-lever and said second movable contact, substantially as specified, and whereby in the closing movement of the said armature-lever, produced under the closing of the circuit by the first-mentioned contacts, said second contacts will be separated to break the circuit, and on such breaking of the circuit the opening movement of the armature-lever brings the said second contacts again together to close the circuit, such breaking and closing of the circuit by the said second contacts continuing during the time in which the first-mentioned contacts are engaged.

2. In a clock-movement, the combination of a spring-drum arranged upon one of the arbors of the said movement, an electric contact revolving with one of the arbors of the said movement, a stationary contact insulated from the movement, but in the path of the said revolving contact, and adapted to engage said revolving contact during a predetermined portion of each revolution thereof, and so as to close the circuit during such engagement, a magnet in circuit with said contacts, a second stationary contact, a vibrating lever carrying a movable contact adapted to engage said second stationary contact, said second stationary contact being in the same circuit with the magnet and the first-mentioned contacts, the armature-lever of the said magnet arranged to impart swinging movement to said contact-lever as the armature-lever is drawn to and from its poles, and a vertical slide carrying a pawl adapted to engage the spring-drum, the said slide in connection with said armature-lever, substantially as and for the purpose described.

3. A self-winding clock mechanism consisting of a spring-drum upon one of the arbors of the movement, a magnet, a pawl adapted to engage said spring-drum, mechanism between the armature-lever of said magnet and said pawl, whereby the movement of the armature-lever imparts winding movement to said pawl, a stationary contact and a revolving contact which derives its revolution from the clock-movement, and adapted to engage said stationary contact during a predetermined portion of its revolution, the said contacts in circuit with said magnet, a second stationary contact and corresponding movable contact also in the same circuit with the said first-mentioned contacts and magnet, mechanism between the said second movable contact and the armature-lever, the said second contacts being normally closed, but adapted to be opened when the armature-lever is drawn to its poles by the engagement of the first-mentioned contacts, the said revolving contact provided with a non-metallic cam-finger J and constructed with a metallic shoulder K in rear of said non-metallic finger, substantially as and for the purpose described.

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