No. 704,620. Patented July 15, 1902.

C. M. CROOK.

SELF WINDING ELECTRIC CLOCK.

(Application filed Sept. 26, 1901. Renewed May 28, 1902.)

(No Model.)

Fig. 2.

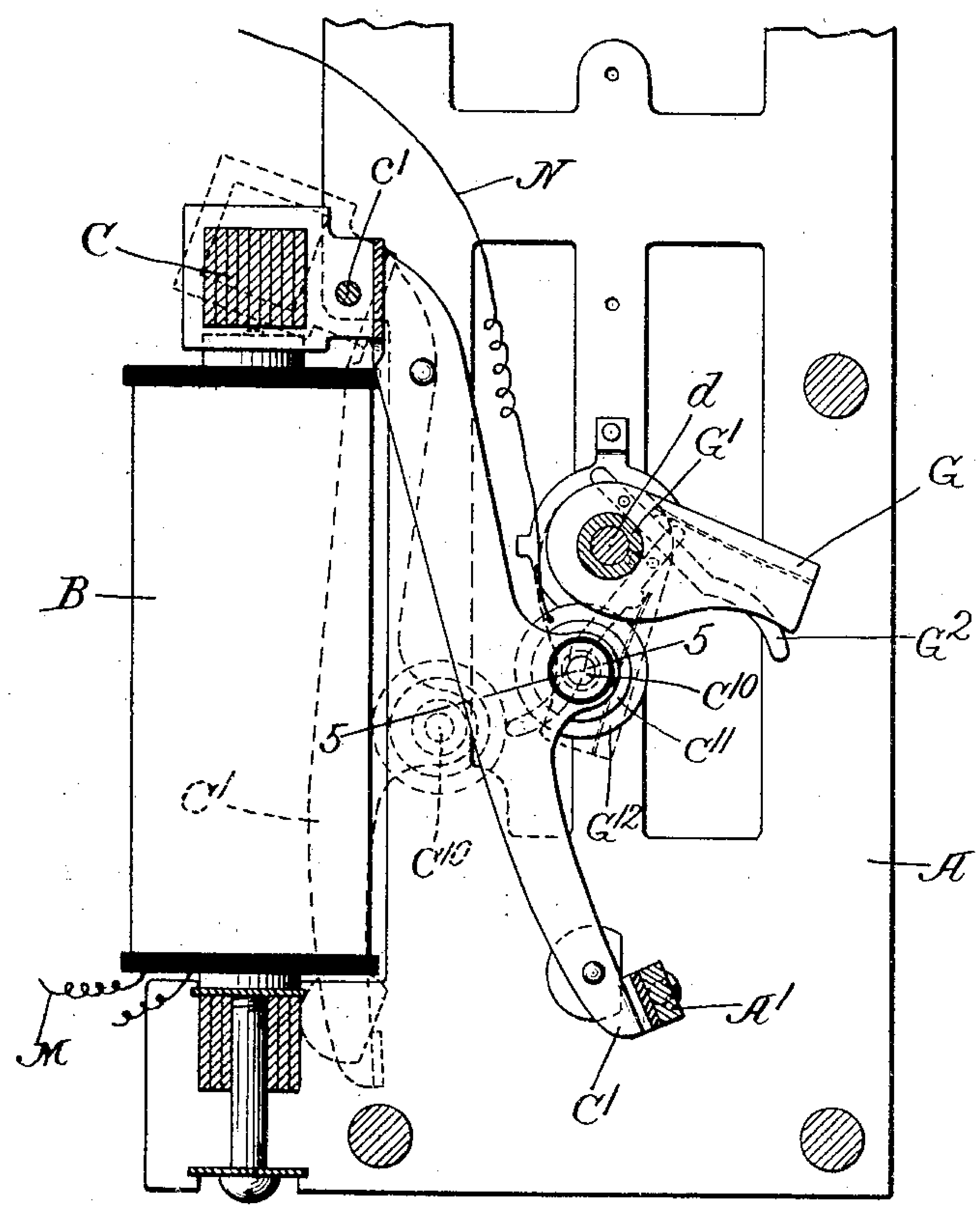


Fig. 5.

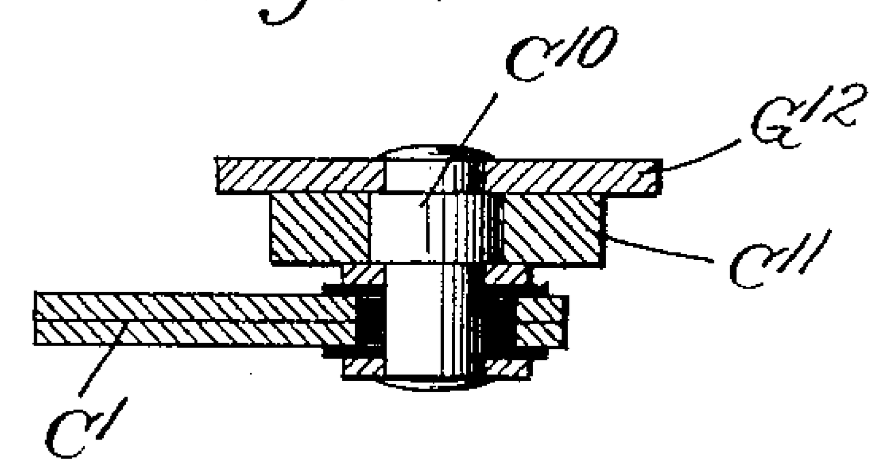


Fig. 4.

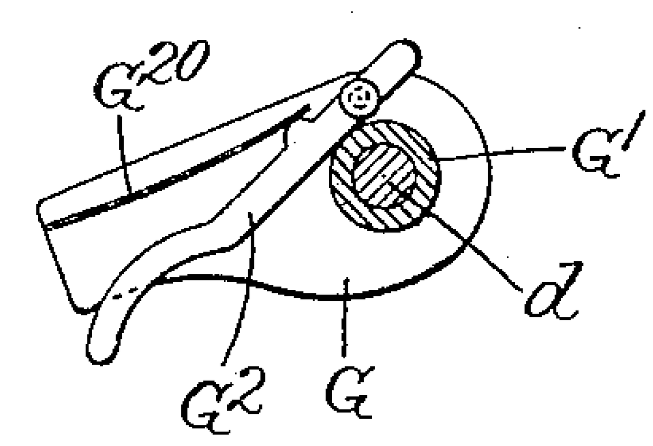


Fig. 6.

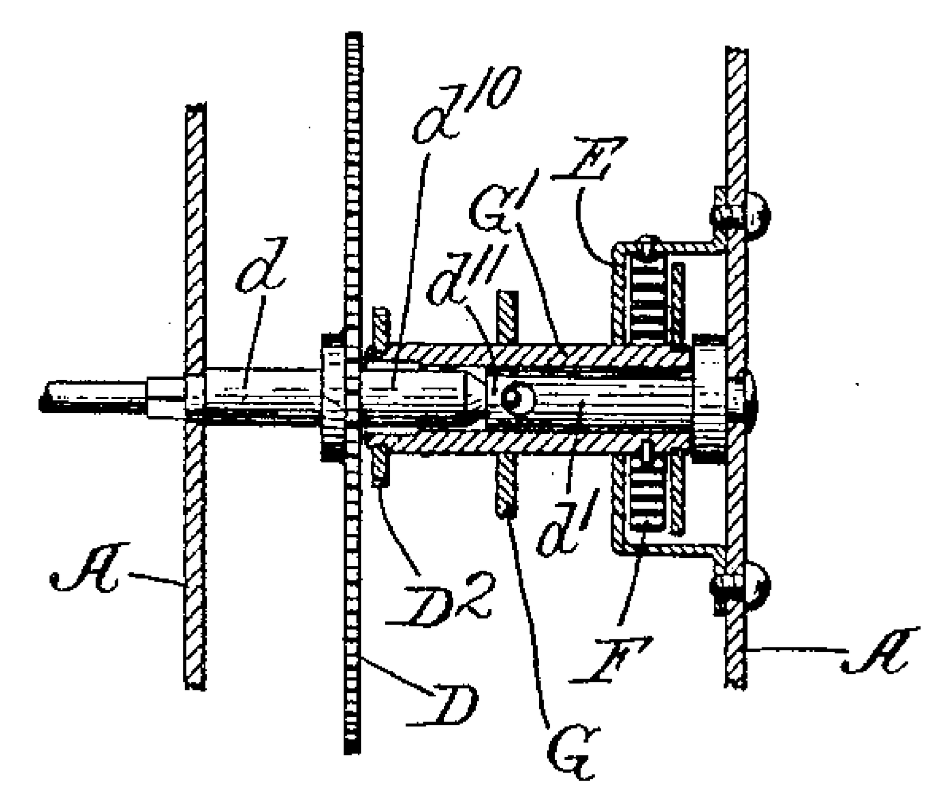


Fig. 1.

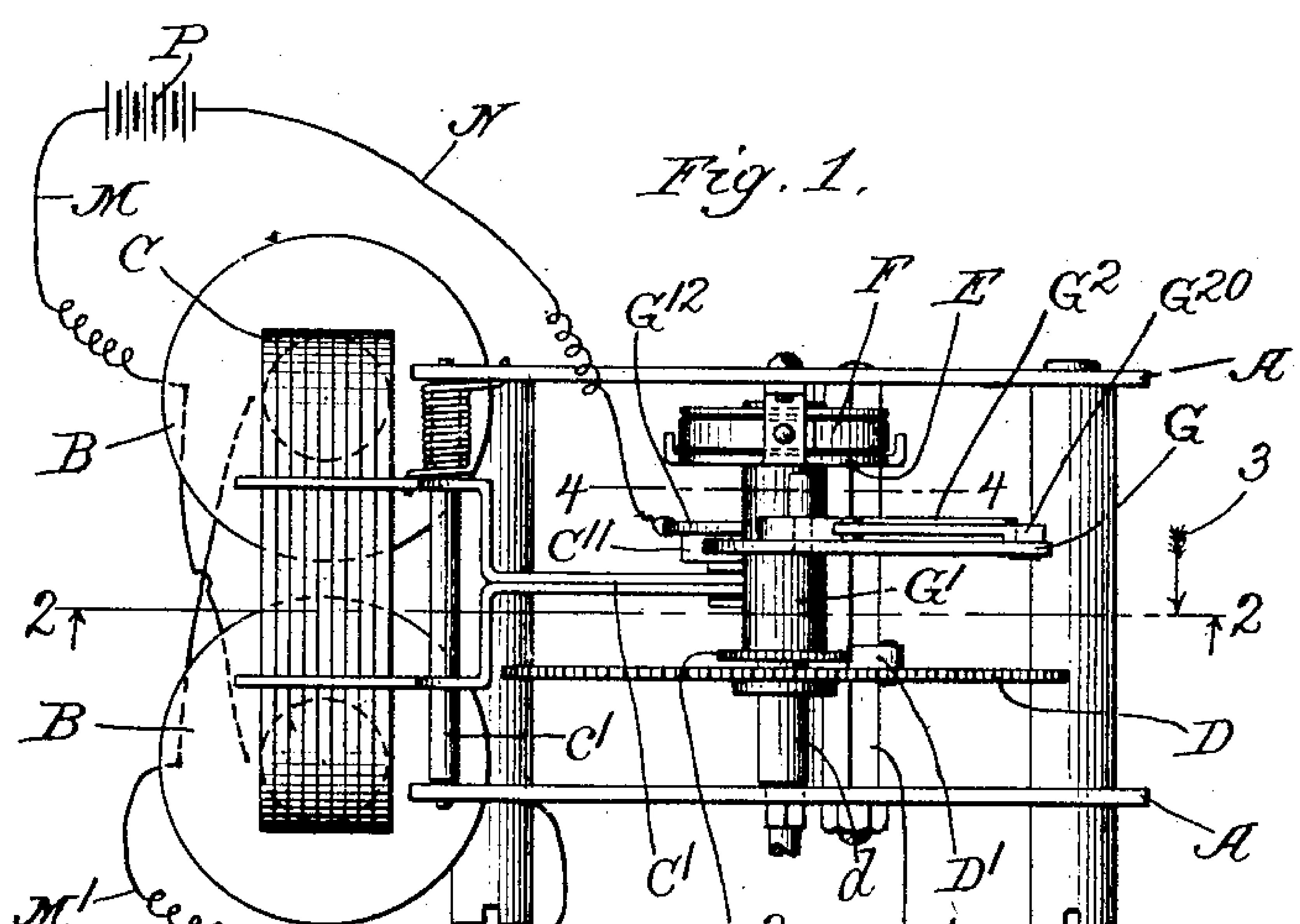
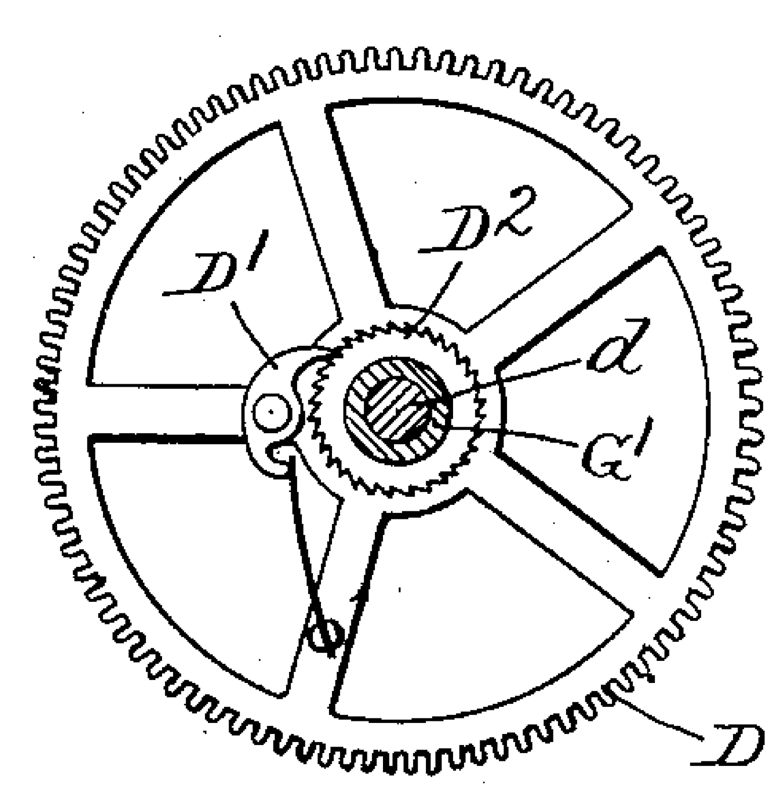


Fig. 3.



Witnesses.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CHARLES M. CROOK, OF BRISTOL, CONNECTICUT, ASSIGNOR TO CHARLES S. BURTON, TRUSTEE.

SELF-WINDING ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 704,620, dated July 15, 1902.

Application filed September 26, 1901. Renewed May 28, 1902. Serial No. 109,306. (No model.)

To all whom it may concern:

Be it known that I, CHARLES M. CROOK, a citizen of the United States, residing at Bristol, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Electrically-Wound Clocks, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

This invention relates to devices for electrically winding clocks; and its purpose is to reduce the power necessary for such winding or to adapt a magnet energized by a given current to keep the clock wound by less frequent action.

It consists in the means for preventing the friction or pressure at the circuit making and breaking contact-pieces from operating as a resistance to the running of the train or as a resistance to the winding impulse of the winding devices.

It consists also of the means by which the tension of the spring or corresponding force of such other motor as may be employed, as a weight, which is overcome by the winding devices in winding, operates to increase the pressure at the contact-point at which the circuit is closed for the purpose of energizing the winding-magnet, thereby diminishing the resistance of the current in passing such contact.

It consists, further, in specific features of construction, which are set out in the claims.

In the drawings, Figure 1 is a top plan of a portion of a clock-movement embodying my invention, only the first wheel of the running-train being shown, the construction of the remainder of the train being immaterial to the present invention. Fig. 2 is a section at the line 2 2 on Fig. 1 looking in the direction of the arrow 2. Fig. 3 is a section at the same plane looking in the direction of the arrow 3. Fig. 4 is a detail elevation, partly sectional, showing the winding-lever, section being made at the line 4 4 on Fig. 1. Fig. 5 is a detail section through the axis of the contact-roller on the armature-lever, as at the line 5 5 on Fig. 2. Fig. 6 is a section at the line 6 6 on Fig. 1.

A represents the frame of the clock; B, the electromagnet for winding the same; C, the armature of said magnet; C′, the armature-lever, fulcrumed at c' on the frame.

D is the prime wheel of the train, loose on its shaft d, which is also the mainspring-shaft.

F is the mainspring, having its outer end attached to its housing E, which is rigid with the back plate of the frame, and its inner end attached to the hub or sleeve G′ of the winding-lever G, said lever G being mounted loosely on the stud d', which projects rigidly from the back plate of the frame A and in its forward end has a bearing d^{11} for the rear end of the staff d, which penetrates the forward plate and is the minute-hand staff. This staff reaches the bearing d^{10} by projecting into the forward end of sleeve G′ without making contact therewith and is rigid with it at the forward end of the sleeve. The gear-wheel D, which is the prime wheel of the train and carries a pawl D′, which is engaged by a ratchet-wheel D^2, is rigid with the stem G′ at the forward end of the latter, rotary movement being thus concentrated to a prime wheel and the staff in one direction, while said winding-lever and hub may rotate in the opposite direction without action on the wheel or train. Rigidly secured in the end of the armature-lever arm C′ is an insulated stud C^{10}, on which there is a loose roller C^{11}. This roller stands in the plane of the winding-lever G, and the two levers are in such relation to each other that when the armature is attracted to the poles of the magnet and the armature-lever is thereby swung away from the magnet the winding-lever being encountered is swung back around its shaft in direction to coil and wind the spring, and as the spring runs down, operating the train, said winding-lever swings back toward the end of the armature-lever in position to be again encountered and actuated. The circuit by which the magnet B is energized is represented by the wires M and N, the former running from one pole of the battery P to the magnet, thence by the branch M′ to the frame, which thus constitutes a part of the circuit, while the other wire runs from the insulated stud C^{10} back to the other pole of the battery. The circuit is closed and the magnet energized when the roller C^{11} on the insulated stud C^{10} comes into contact with the winding-lever, which completes the circuit from the frame to the point of contact. It will be seen, therefore, that when one winding impulse has been given and the contact between the roller C^{11} and the winding-lever G is broken, so that the magnet is deënergized and the armature returned to its position of rest, the train will run until in its running it carries the winding-lever back toward the end of the armature-lever and brings said lever into contact again with the roller C^{11}, whereupon the magnet being energized the impulse will be given to the armature-lever, causing it to drive the winding-lever back and restore the tension to the spring. In this action the swing or stroke of the armature-lever might be limited by the armature reaching the poles of the magnet; but preferably it is limited by the stop-bar A′, which connects the front and rear plates of the frame at a position to be encountered by the end of the armature-lever before the armature reaches the pole of the magnet, thus preventing adhesion of the armature to the poles, inducing prompt return when the circuit is broken. The breaking of the circuit at the end of the armature-stroke is caused by the momentum of the winding-lever and parts attached due to the stroke given by the armature-lever to said winding-lever, and no other means need be provided for breaking the circuit, since if the magnet has sufficient force to do the winding the armature will necessarily move with a stroke sufficiently swift to insure the continued movement of the winding-lever by momentum at least a little distance after the armature-lever is stopped by encountering the bar A′. The slightest additional movement of the winding-lever after the armature-lever stops insures the breaking of the circuit and the return swing of the armature-lever.

In order that the initial movement of the armature-lever in the winding stroke may be easy, so that some momentum will be required before the full resistance of the winding-lever is encountered, I provide said winding-lever with a yielding terminal consisting of a finger G^2, mounted on the said lever and swung forward by a spring G^{20}, and on the stud C^{10}, I mount the rigid disk or guard-flange G^{12}, of greater diameter than the roller C^{11}, so that it projects beyond the periphery of the latter, said guard-flange standing in the plane of the yielding finger G^2, so that it is encountered by said finger when the winding-lever approaches the armature-lever in the running down of the spring and train before the main body of said winding-lever reaches the roller C^{11}. The first contact, therefore, which closes the circuit and causes the magnet to be energized and the armature-lever to move is that which occurs between the disk or guard-flange G^{12} and the spring-finger G^2. The contact thus established is very light, but sufficient to energize the magnet and start the armature's movement, and said movement being commenced the pressure increases by said movement first to the full extent of the tension of the spring G^{20} until the roller C^{11} comes into contact with the lever G, and by this time the armature has approached sufficiently toward the magnet-pole so that it experiences more fully the force of the magnet, and the roller is therefore pressed more and more forcibly upon the edge of the lever B, establishing a better and better contact and causing an increasing current to pass to the magnet, increasing its energy and the force with which it attracts the armature, as the movement of the parts winds the spring to greater tension and at the same time diminishes the leverage with which the armature-lever acts on the winding-lever. The energy developed is thus automatically adapted to the requirement at every stage of the winding movement. Thus the contact through which the circuit is closed instead of constituting or introducing a resistance to the movement of the winding devices or to the running of the train is the very contact by which the winding is effected mechanically, and the greater the resistance to the winding the greater the pressure at this contact and the less the resistance to the passage of the current which energizes the magnet, and therefore the more powerful the action of the latter. This is the chief result sought by my present invention.

Difficulty has been experienced heretofore arising from the tendency of the winding mechanism to drive the hands by the friction of the winding-sleeve on the staff when the winding stroke is made by the armature-lever. This difficulty is overcome by providing the rigid stud d', on which instead of on the staff d the winding-sleeve G′ is mounted. The only friction to which the staff is exposed in the winding action with this construction is that which arises from the drag of the pawl d' on the ratchet-wheel d^2, for the rear part d^{10} of the staff d', which reaches into the forward end of the sleeve G′ in order to reach and obtain its bearing at d^{11} in the end of the stud d', has a diameter less than the inner diameter of the sleeve, so that no contact occurs between these two parts.

I claim—

1. In an automatically-wound clock-train, a rigid stud projecting from the frame; a sleeve mounted on the stud and connected to the motor-spring for winding the latter; the prime-wheel staff of the train journaled in the end of the stud and a two-part clutch structure adapted to communicate rotation in one direction only, one part of such clutch being on the sleeve and the other on the staff.

2. In an automatically-wound train, a rigid stud projecting from the frame and a sleeve mounted on the stud and connected to the train-motor for winding the same, the prime staff of the train journaled in one frame-plate and in the end of the stud which projects

from the opposite plate; a pawl and a ratchet coöperating therewith, one of said elements being mounted on the sleeve and the other on the staff, and arranged to transmit rotation from the sleeve to the staff in the running-down movement only of the motor.

3. In an automatically-wound train, the combination with the prime-wheel shaft of the train of a winding element coaxial therewith which is rotated in the winding; a rigid stud projecting from one frame-plate toward the opposite plate, the prime shaft being journaled in the end of said stud and in said opposite plate, the winding element being journaled on the stud and coöperating clutch parts one on the prime shaft and the other on the winding element communicating motion in the opposite of the winding direction.

4. In an electrically-wound clock, in combination with a motor (as a spring or weight,) a winding-electromagnet; a magnet-actuated lever and a motor-actuated lever; a magnet-energizing circuit which is closed by the contact of the two levers, the latter lever being carried into contact with the other by the running down of the motor, and being connected so as to wind up the motor by reverse movement, the magnet-actuated lever having its movement under the magnet impulse, toward the other lever, and giving the latter said reverse or motor-winding movement.

5. In an electrically-wound clock, in combination with a motor (as a spring or weight,) a winding-electromagnet; a magnet-actuated lever and a motor-actuated lever; a magnet-energizing circuit which is closed by the contact of the two levers, the latter lever being carried into contact with the other by the running down of the motor, and being connected so as to wind up the motor by reverse movement, the magnet-actuated lever having its movement under the magnet impulse toward the other lever, and giving the latter said reverse or motor-winding movement; the said movement of the magnet-actuated lever being limited, and the other lever having a range of motor-winding movement beyond such limit of the movement of the first lever; whereby the momentum of the motor-winding lever carries it out of contact with the other lever, and breaks the circuit.

6. In an electrically-wound clock, in combination with a motor adapted to be wound up (as a spring or weight,) and an electromagnet for winding it, a magnet-actuated element and a motor-winding element having back-and-forth movement toward and from each other and adapted to come into contact in such movement; a magnet-energizing circuit which is closed by such contact; the magnet-forced movement of the first element being adapted to cause the motor-winding movement of the second element while the two are in contact, whereby the resistance of the motor to winding increases the pressure at the contact of the two elements where the circuit is closed, and the pressure necessary for such contact is a part of the force operative in the winding.

7. In an electrically-wound clock, in combination with the motor to be wound and an electromagnet for winding it, a magnet-actuated element and a motor-winding element, having back-and-forth movement toward and from each other and adapted to come into contact in such movement; a magnet-energizing circuit which is closed by such contact; the magnet-forced movement of the first element being adapted to cause the motor-winding movement of the second element; said movement of the first element being limited, the second element having a range of winding movement beyond the limit of movement of the first element, whereby the contact and circuit is broken by the momentum of the winding movement.

8. In an electrically-wound clock, in combination with the motor to be wound and an electromagnet for winding it, a lever connected with the motor adapted by movement in one direction to wind said motor and to be carried in the reverse direction by the running down of the same, said lever having pawl-and-ratchet connections with the train and constituting the medium by which the running down of the motor drives the train; a lever actuated by the magnet when energized, the magnet-forced movement of said lever and motor-forced movement of the first lever being toward each other, and adapted to bring them into contact; a magnet-energizing circuit which is closed by such contact; and means for breaking such contact at the limit of said magnet-actuated movement.

9. In an electrically-wound clock, in combination with an electromagnet and an element for winding it by movement in one direction, adapted to be moved in reverse direction by the running down of the spring, and in such reverse movement to come into contact with the magnet-actuated element, said latter element being adapted in its magnet-forced movement to give winding movement to the winding element; an electric circuit in which the magnet is energized, which is closed by the contact of said motor-winding and magnet-actuated elements; one of said elements having a yielding terminal by the contact of which with the other element the circuit is first established; whereby the initial movement of the magnet-actuated element is made against the slight resistance of said yielding terminal.

10. In an electrically-wound clock, in combination with the motor and a lever which winds it by movement in one direction and which is moved in reverse direction by the running down of the motor; an electromagnet and a lever actuated thereby; said lever in its magnet-forced movement being adapted to encounter the winding-lever and give the latter its winding movement; said magnet-

actuated lever having an insulated terminal by which its contact with the winding-lever is made; an electric circuit in which the magnet is energized and which is closed by such contact, comprising an insulated wire connected to said insulated terminal.

In testimony whereof I have hereunto set my hand, at Chicago, Illinois, this 30th day of August, A. D. 1901.

CHARLES M. CROOK.

In presence of—
CHAS. S. BURTON,
EDWARD T. WRAY.