No. 686,222. Patented Nov. 5, 1901.

T. E. HEETER.

ELECTRIC CLOCK.

(Application filed Jan. 7, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig.1.

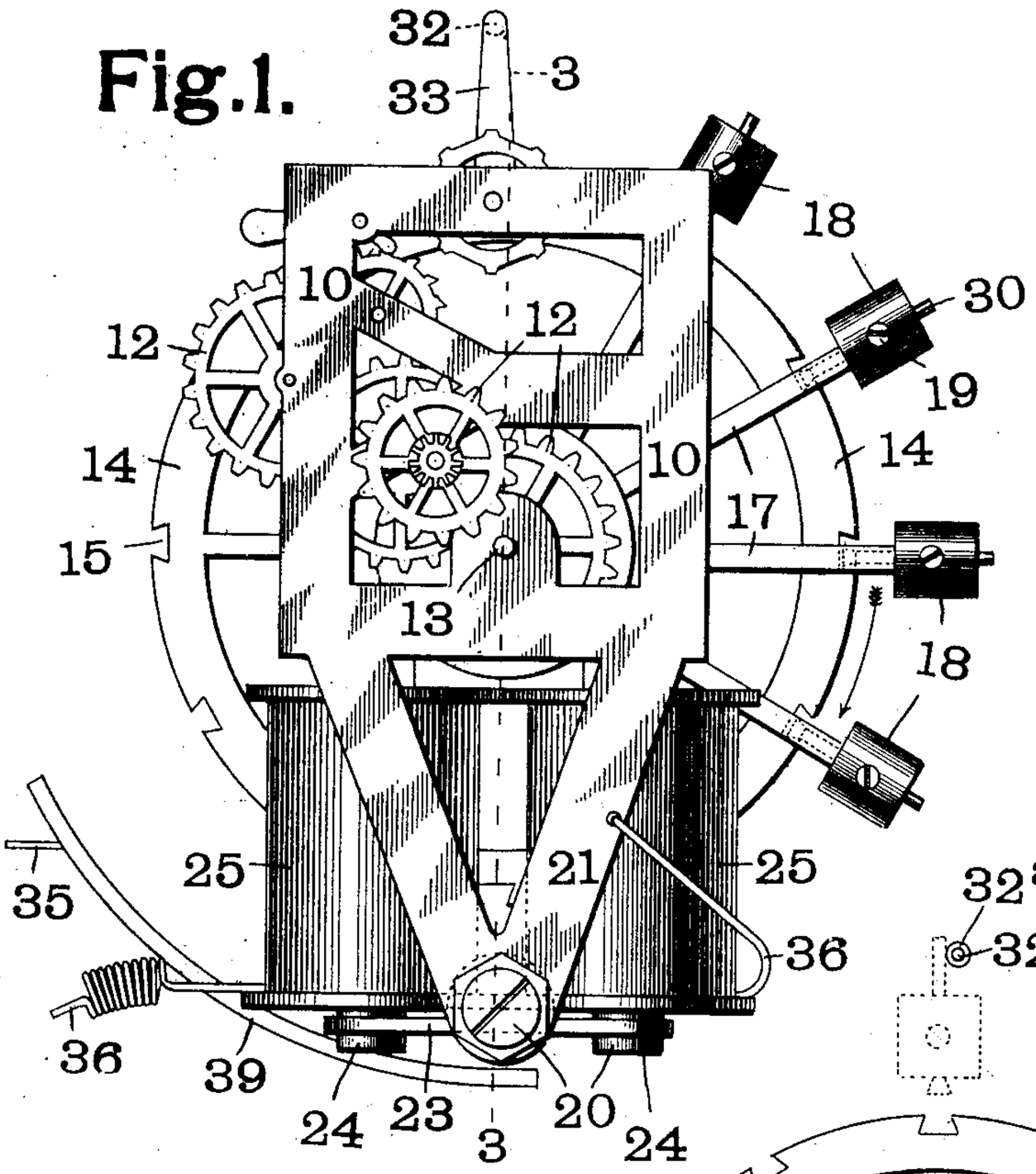
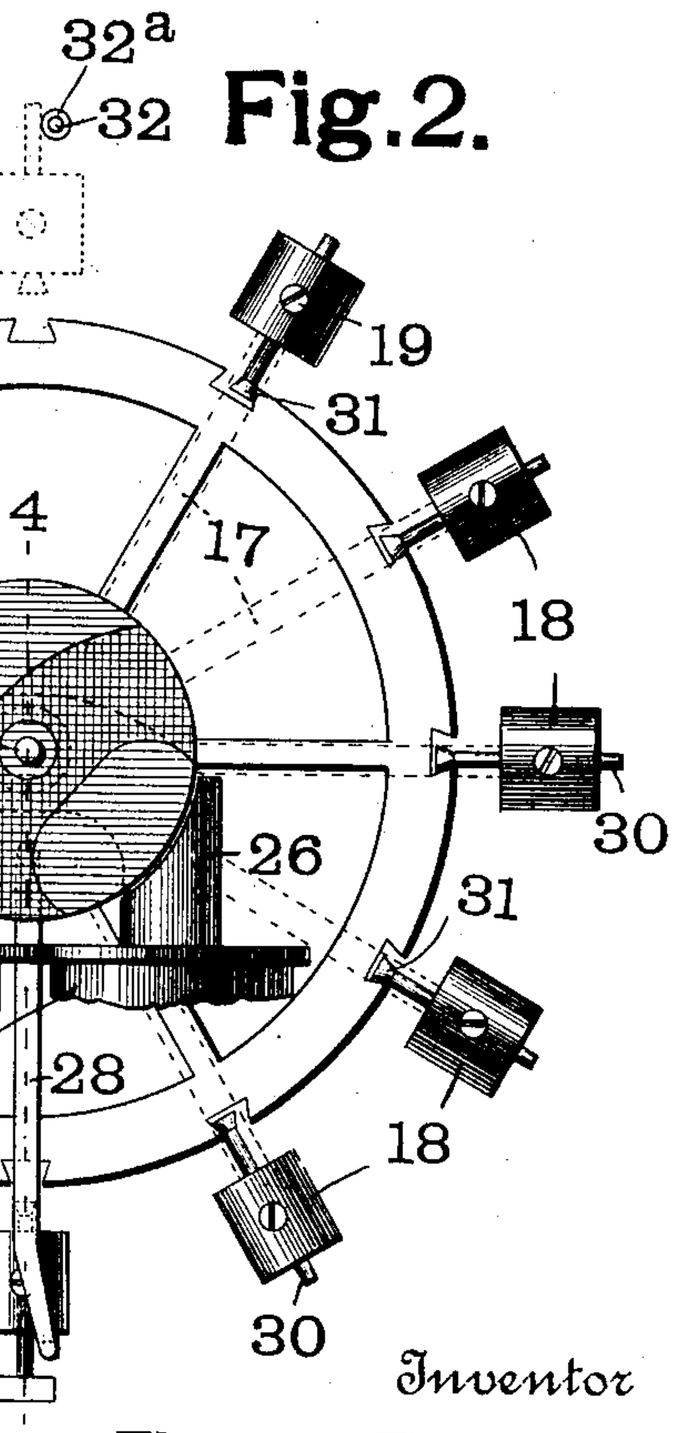


Fig.2.



Witnesses
W. A. Alexander
Jessie R. Watkins.

Inventor
Thomas E. Heeter
By Attorneys
Fowler & Bryson.

No. 686,222. Patented Nov. 5, 1901.

T. E. HEETER.

ELECTRIC CLOCK.

(Application filed Jan. 7, 1901.)

(No Model.) 2 Sheets—Sheet 2.

Fig.5.

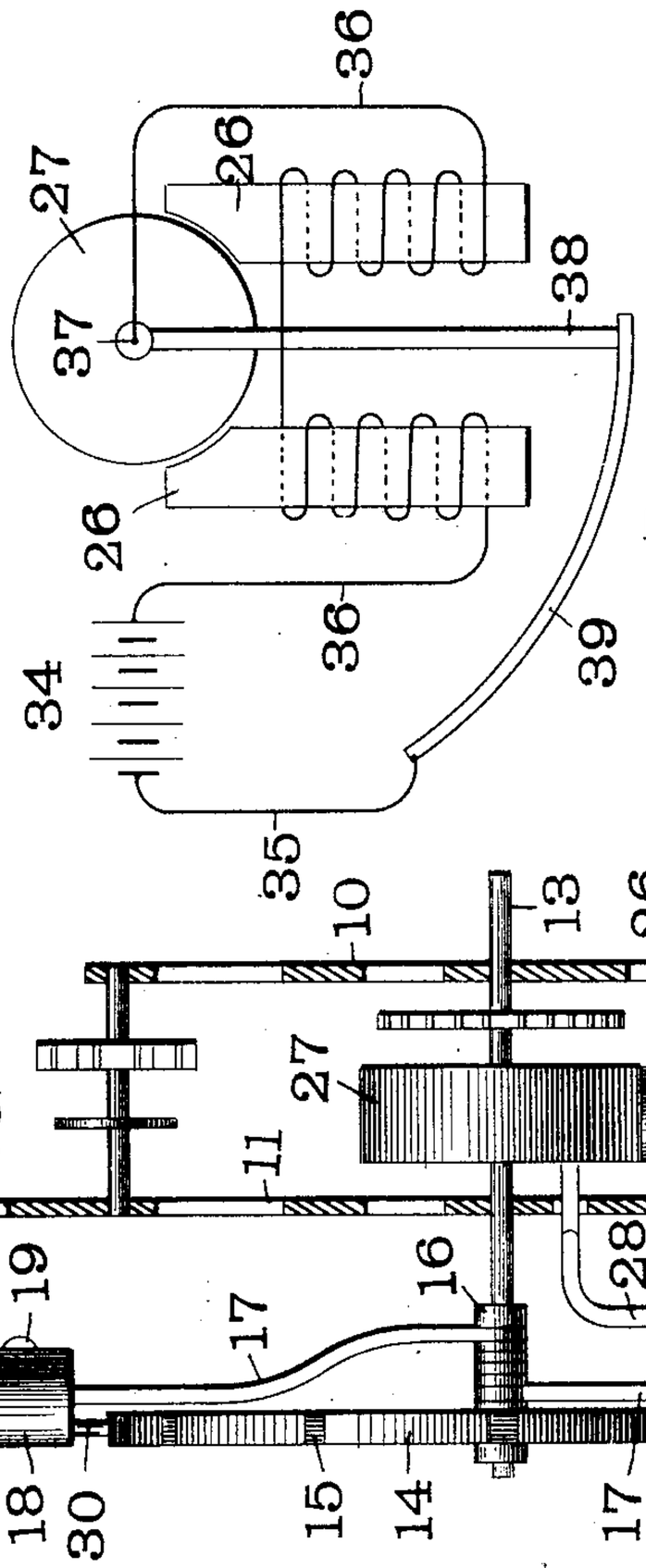


Fig.4.

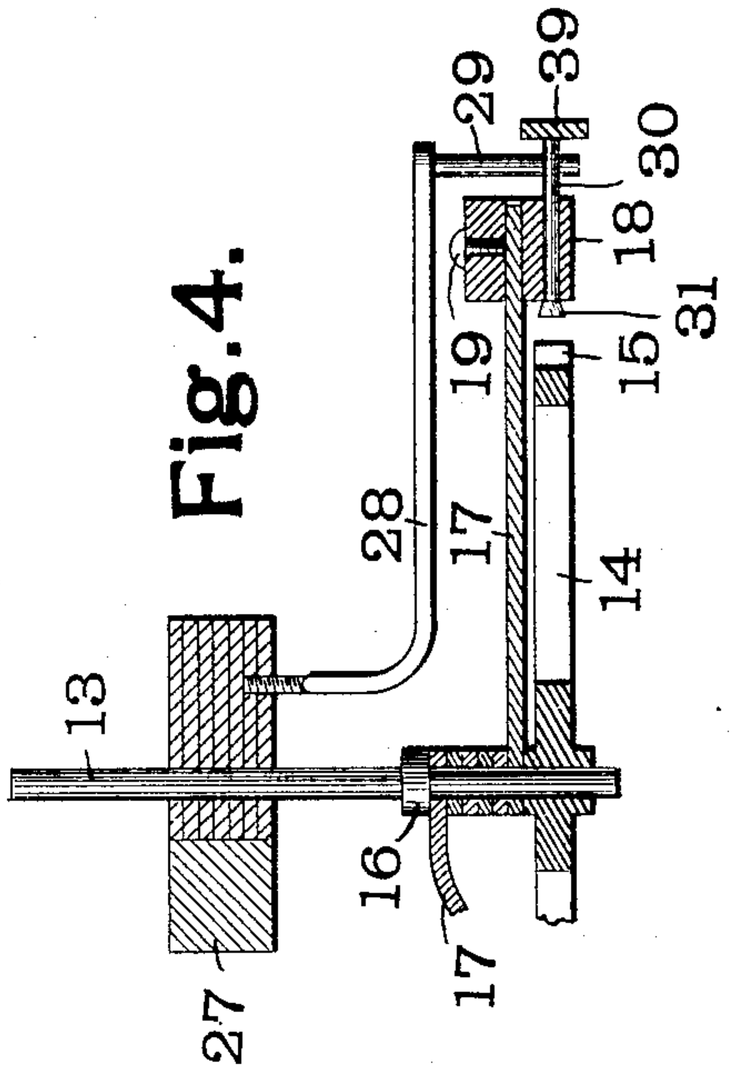
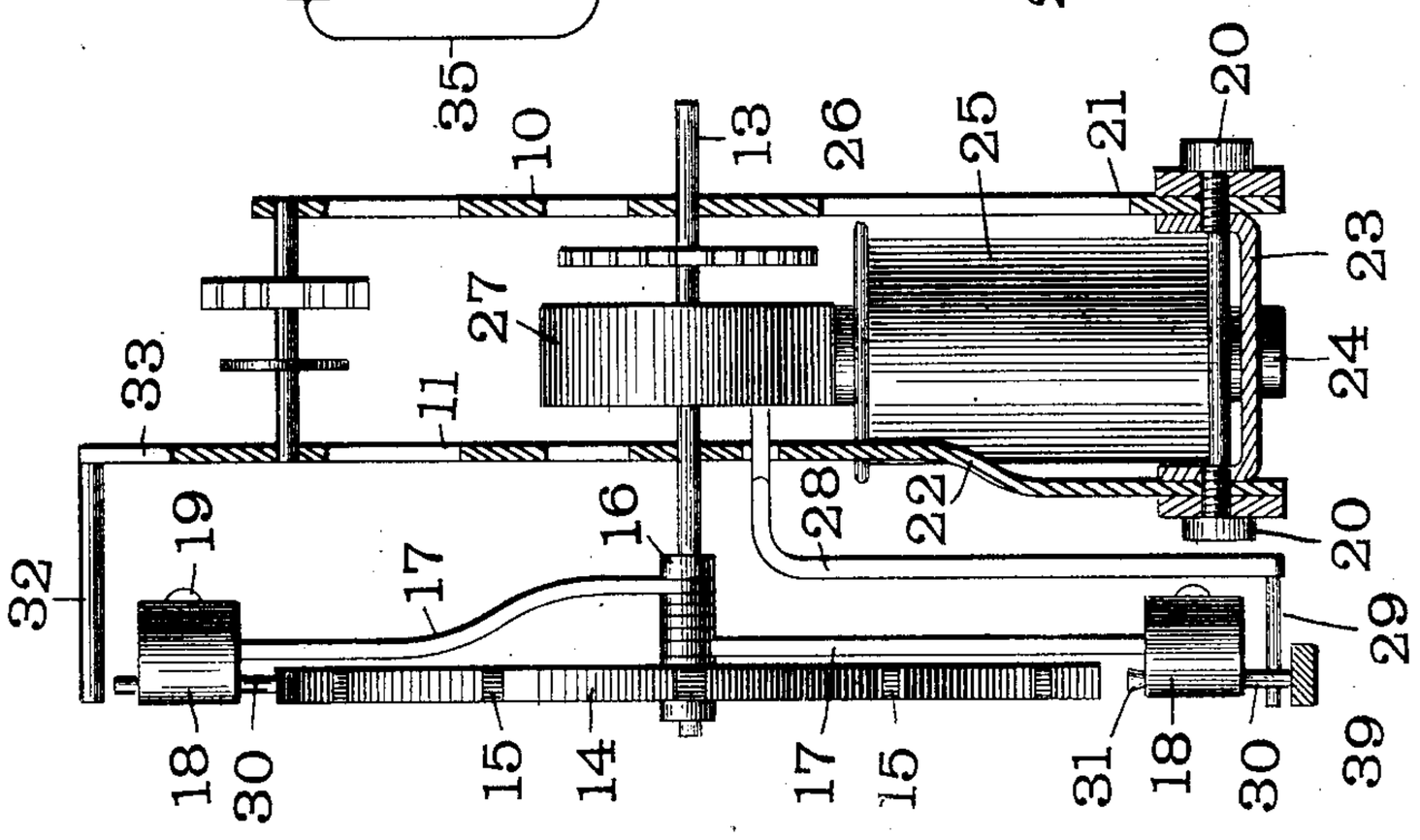


Fig.3.



Witnesses

W. A. Alexander

Jessie R. Hatkins

Inventor

Thomas E. Heeter

By Attorneys Fowler & Bryson.

UNITED STATES PATENT OFFICE.

THOMAS E. HEETER, OF ST. LOUIS, MISSOURI.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 686,222, dated November 5, 1901.

Application filed January 7, 1901. Serial No. 42,334. (No model.)

To all whom it may concern:

Be it known that I, THOMAS E. HEETER, a citizen of the United States, residing at the city of St. Louis, in the State of Missouri, have invented a certain new and useful Electro-mechanical Clock, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to clocks the actuating means of which is an automatic electro-magnetic mechanism attached to the center arbor of the clock-train and energized intermittently by a suitable source of electric current.

The object of my invention is to provide an electric-clock driving mechanism which will operate the clock-train smoothly and without interruption with the smallest possible amount of attention and a minimum consumption of electrical energy.

Before my invention when electrically-actuated weighted levers have been employed in driving a clock-train their motion has been reciprocal. In such case in order to avoid the necessity of stopping the clock-train during a part of such reciprocation of the lever—that is, during its return to operative position—it has been necessary to interpose between the lever and the clock-train a spring or weight or equivalent device in order to continue uninterrupted the motion of the clock mechanism. My invention, on the contrary, may be employed without such interposed means, the movement of the weighted lever or levers being circular and not reciprocating and needing only the use of the usual escapement-wheel or equivalent controlling device to regulate its action.

In the accompanying drawings, forming part of this specification, in which like characters of reference refer to like parts in the several views, Figure 1 is a front elevation of a clock embodying one form of my invention. Fig. 2 is a front elevation of the electromechanical means for operating the clock-train, the clock mechanism itself being omitted. Fig. 3 is a vertical section on the line 3 3, Fig. 1, parts of the clock-train being omitted. Fig. 4 is a vertical section on the line 4 4, Fig. 2, and Fig. 5 is a diagram of a way of connecting up the electrical circuit for operating the clock-driving mechanism.

In Figs. 1 and 3, 10 and 11 represent, respectively, the front and back plates of a suitable clock-frame, which carries a clock-train 12 of any known arrangement. To the center arbor 13 of this clock-train is rigidly attached the wheel 14, in the periphery of which are the equally-spaced dovetailed notches 15. Sleeved upon the center arbor 13 between the wheel 14 and the back plate 11 and held in position by the collar 16 are the arms 17, so bent that the cylindrical weights 18, fastened to their extremities by the set-screws 19, will occupy positions in substantially the same vertical plane and project somewhat over the periphery of the wheel 14, as best shown in Fig. 3. Fastened by means of screws 20 to downward projections 21 and 22 of the front and back plates 10 and 11 is the base-plate 23, to which is fastened by screws 24 the electromagnet 25, the pole-pieces 26 of which, as best shown in Fig. 2, extend upward and are in close proximity to the armature 27, sleeved upon the center arbor 13 between the front and back plates 10 and 11. In practice this armature may advantageously be surrounded with a casting of lead or other heavy metal, which forms, with the armature, a thick heavy disk and acts as a fly-wheel during the operation of my invention, as described below. This expedient, however, is optional and does not affect the successful operation of my invention. From one side of the armature 27 depends the rearwardly-bent lever 28, having at or near its lower extremity the arm 29, projecting from it rearwardly and at right angles. This arm is adapted to engage with pins 30, loosely set in perforations in the weights 18. These pins 30 have on their ends nearest to the wheel 14 beveled enlargements 31, which limit the outward motion of the pins through the perforations in the weights 18 and are adapted to engage with the dovetailed notches 15 in the periphery of the wheel 14 when said pins occupy their inmost positions, as hereinafter described. Adapted to engage with the outward ends of the pins when the same occupy nearly their extreme outward position from the center arbor 13 is the segmental race 39, preferably made of

electroconductive material. The pins 30 when in their extreme outward position are also adapted to engage with the arm 32, which projects rearwardly at right angles to the upward extension 33 of the back plate 11. This arm is preferably covered with a sleeve 32ª, of felt or similar material, for a purpose hereinafter described.

In Fig. 5 is shown a way of arranging the electric circuit for operating my invention. Here 34 represents a battery, the component cells of which are preferably of the kind known as "dry" cells. One of the terminals of this battery is connected by means of a wire 35 to the race 39, while the other terminal is connected to a wire 36, which passes in turn around the cores of the electromagnet in the usual way and is then fastened at 37 to the arm 38, which in this figure represents one of the arms 17 with its attached weight 18 and pin 30. The lower extremity of the arm 38 contacts with the race 39, and thus completes the electric circuit. A way of carrying out this form of connection in actual practice is shown in Figs. 1 and 2, the only difference being that the wire 36 as it leaves the electromagnetic coil 25 is simply fastened to a point on the frame of the clock instead of being carried directly to each of the arms 17. In Fig. 2 one of the pins 30 is represented as completing the circuit through the race 39. In this case the whole clock-frame being magnetized it is necessary to employ a hair-spring of non-magnetic material, such as platinum.

The operation of my invention is as follows: Supposing the arms 17, bearing the weights 18, to be placed as shown in Figs. 1 and 2—that is, distributed so that each weight is in such position that the enlargement 31 on its pin 30 engages one of the dovetailed notches 15 in the periphery of the wheel 14, thus holding the weight in position over this notch—it will be evident that if the number and size of the weights be sufficient the wheel 14 will be rotated in the direction of the arrow and that the clock-train will be set in motion. In order, however, to prolong this motion, it is necessary that when each weight reaches approximately the lowest point during its rotation with the wheel 14 it shall be restored to its operative position at the topmost point of this rotation. This is accomplished in the following way: Owing to the weight of the bent lever 28 the armature 27 will assume the position shown in the drawings, causing said lever to hang nearly vertically. When one of the weights 18 has reached its lowest position during rotation, its pin 30, after having passed the arm 29 of the lever 28, will be disengaged by its own weight from the dovetailed notch 15 and will fall in front of the arm 29 until its end comes in contact with the race 39. This dropping of the pin is made positive by the dovetailed shape of the notches coöperating with the beveled pin-heads. This contact, as explained above in connection with Fig. 5, closes the electric circuit through the coils of the electromagnet 25, and the armature 27 being within the field generated by the poles 26 will be suddenly moved into the position shown by dotted lines in Fig. 2, causing the lever 28 to move rapidly in the direction of rotation of the wheel 14 and weights 18, carrying with it that one of these weights whose pin by dropping in front of the arm 29 has contacted with the race 31, and thus set the lever in motion by completing the electric circuit. When the weight has been carried forward until its pin 30 leaves the race 39, the electric circuit is broken; but owing to the impetus already imparted to the lever 28 and the heavy disk, of which the armature 27 forms part, the lever will continue to urge the weight upward until or nearly until the pin 30, still held in its extended position by the centrifugal effect produced upon it by its rapid circular movement, strikes noiselessly and without jar the felt sleeve 32ª of the arm 32, as shown by dotted lines in Fig. 2, and becoming again stationary drops by its own weight into one of the notches 15, when the weight 18 is again in position to assist in operating the clock-train. In the meantime the lever 28 has returned by its own weight to its original position, and when the next weight 18 has progressed far enough to drop its pin and renew the electric circuit the operation above described will be repeated.

It is obvious that many changes may be made in the device shown and described herein as embodying my invention. For instance, the wheel 14 need not be carried directly by the center arbor, but may be connected therewith by a suitable gearing, the number of weights may be largely varied, other ways of making the requisite electrical connections may be used, and many different forms of magnets and armatures may be employed; but all these modifications may be made without departing from my invention in the least and are intended to be covered by the claims hereto annexed.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an electromechanical clock, the combination with a clock-train, of a pivoted arm adapted to revolve in a substantially vertical plane, a rotary member for actuating said train, electromagnetic means for propelling said arm upward at one side of said rotary member, and means for actuating said clock-train from the downward movement of said arm at the other side of said rotary member.

2. In an electromechanical clock, the combination with a clock-train, of a plurality of pivoted arms adapted to revolve in a substantially vertical plane, a rotary member actuating said train, electromagnetic means for successively propelling said arms upward at

one side of said rotary member, and means for actuating said entire train from the downward movement of said arms at the other side of said rotary member.

3. In an electromechanical clock, the combination with the clock-train, of a rotary member for actuating said train, a revolving arm, electromagnetic means for propelling said arm upward at one side of said rotary member while out of engagement therewith, and means for engaging said arm with said rotary member during its downward movement at the other side of said rotary member.

4. In an electromechanical clock, the combination with the clock-train, of a rotary member for actuating said train, a plurality of revolving arms, electromagnetic means for propelling said arms upward at one side of said rotary member while out of engagement therewith, and means for engaging said arms with said rotary member during their downward movement at the other side of said rotary member.

5. In an electromechanical clock, the combination with the clock-train, of a rotary member for actuating said train, a revolving arm pivoted in substantial alinement with the axis of rotation of said rotary member, electromagnetic means for propelling said arm upward at one side of said rotary member while out of engagement therewith, and means for engaging said arm with said rotary member during its downward movement at the other side of said rotary member.

6. In an electromechanical clock, the combination with the clock-train, of a rotary member for actuating said train, a plurality of revolving arms pivoted in substantial alinement with the axis of rotation of said rotary member, electromagnetic means for propelling said arms upward at one side of said rotary member while out of engagement therewith, and means for engaging said arms with said rotary member during their downward movement at the other side of said rotary member.

7. In an electromechanical clock, the combination with the clock-train, of a rotary member for driving said train, a plurality of revolving arms, electromagnetic means for propelling said arms successively upward while out of engagement with said rotary member, and a stop for limiting the movement of said arms at their highest point until they become engaged with said rotary member.

8. In an electromechanical clock, the combination with a clock-train, of a rotary member for driving said train, a revolving arm, a weight carried by said arm, a pin sliding in said weight and adapted to engage with said rotary member, an electromagnet for propelling said weight upward while said pin is out of engagement with said rotary member, and a stop for limiting the movement of said weight at its highest point until said pin becomes engaged with said rotary member.

9. In an electromechanical clock, a plurality of pivoted arms, adapted to revolve in a substantially vertical plane, weights attached to said arms, a driving-wheel attached to the clock-train, notches in said driving-wheel, electromagnetic means for propelling said arms through the upward half of their revolution, and pins reciprocating in said weights for engaging said notches during the downward motion of said arms.

10. In an electromechanical clock, a plurality of pivoted weighted arms adapted to rotate in a substantially vertical plane, a driving-wheel for the clock-train, means for attaching said weighted arms to said driving-wheel during the downward portion of the revolution of said arms, and an electromagnetic device controlled by said weight-attaching means for propelling said arms through the upward portion of their revolution.

11. In an electromechanical clock, a revolving arm, a driving-wheel for the clock-train, dovetailed notches in said driving-wheel, a reciprocating pin carried by said arm and having a beveled head for engagement with said notches during the downward revolution of said arm, and electromagnetic means, controlled by the reciprocation of said pin, for propelling said arm through the upward portion of its revolution.

12. In an electromechanical clock, a plurality of arms adapted to revolve in a substantially vertical plane, a driving-wheel for the clock-train, dovetailed notches in said driving-wheel, reciprocating pins carried by said arms and having beveled heads for engaging with said notches during the downward revolution of said arms, and electromagnetic means controlled by the reciprocation of said pins for propelling said arms through the upward portion of their revolution.

In testimony whereof I have hereunto set my hand and affixed my seal in the presence of two subscribing witnesses.

THOMAS E. HEETER. [L. S.]

Witnesses:
H. HOPKINS,
ORPH W. COWGILL.