No. 835,516. PATENTED NOV. 13, 1906.

P. G. GIROUD.

ELECTRIC CLOCK.

APPLICATION FILED OCT. 25, 1905.

2 SHEETS—SHEET 1.

Fig. 1

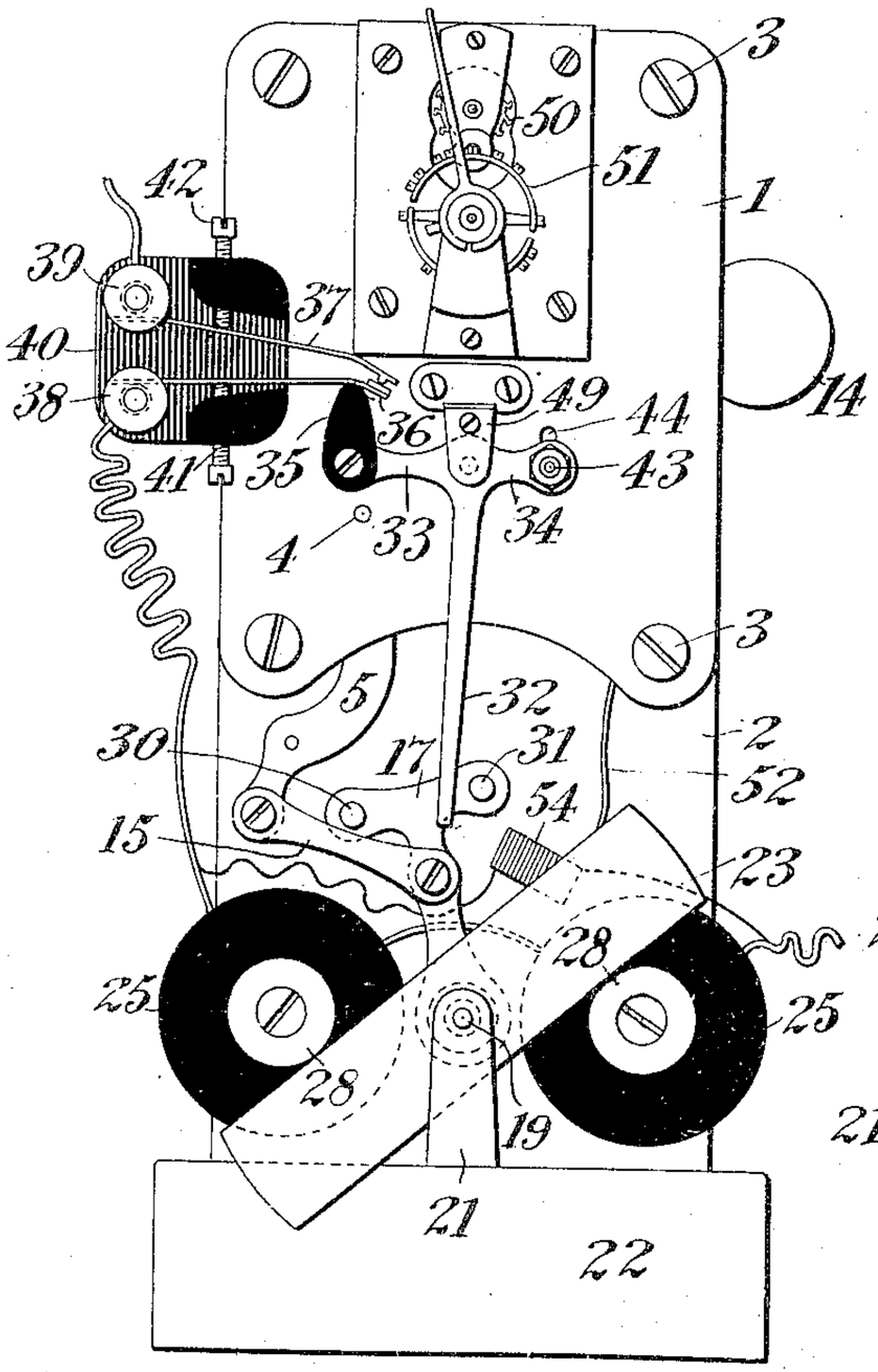
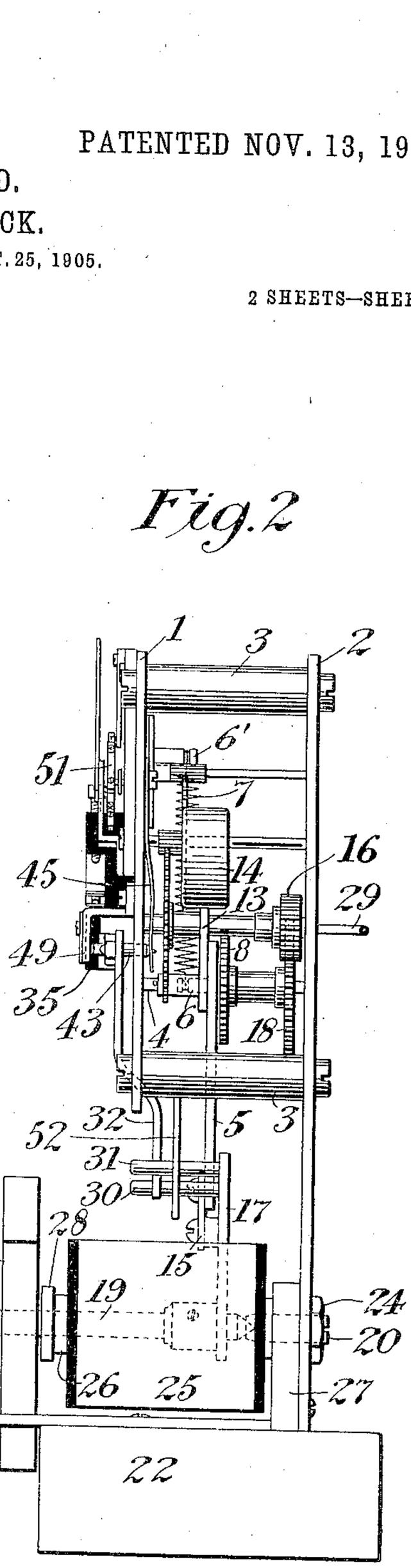


Fig. 2



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2 SHEETS—SHEET 2.

Fig. 5

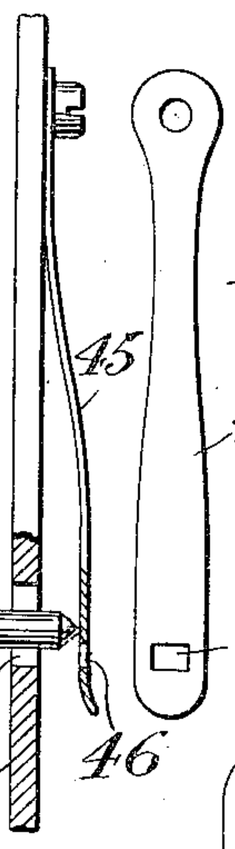


Fig. 6

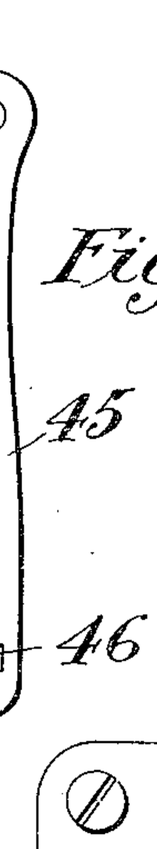


Fig. 3

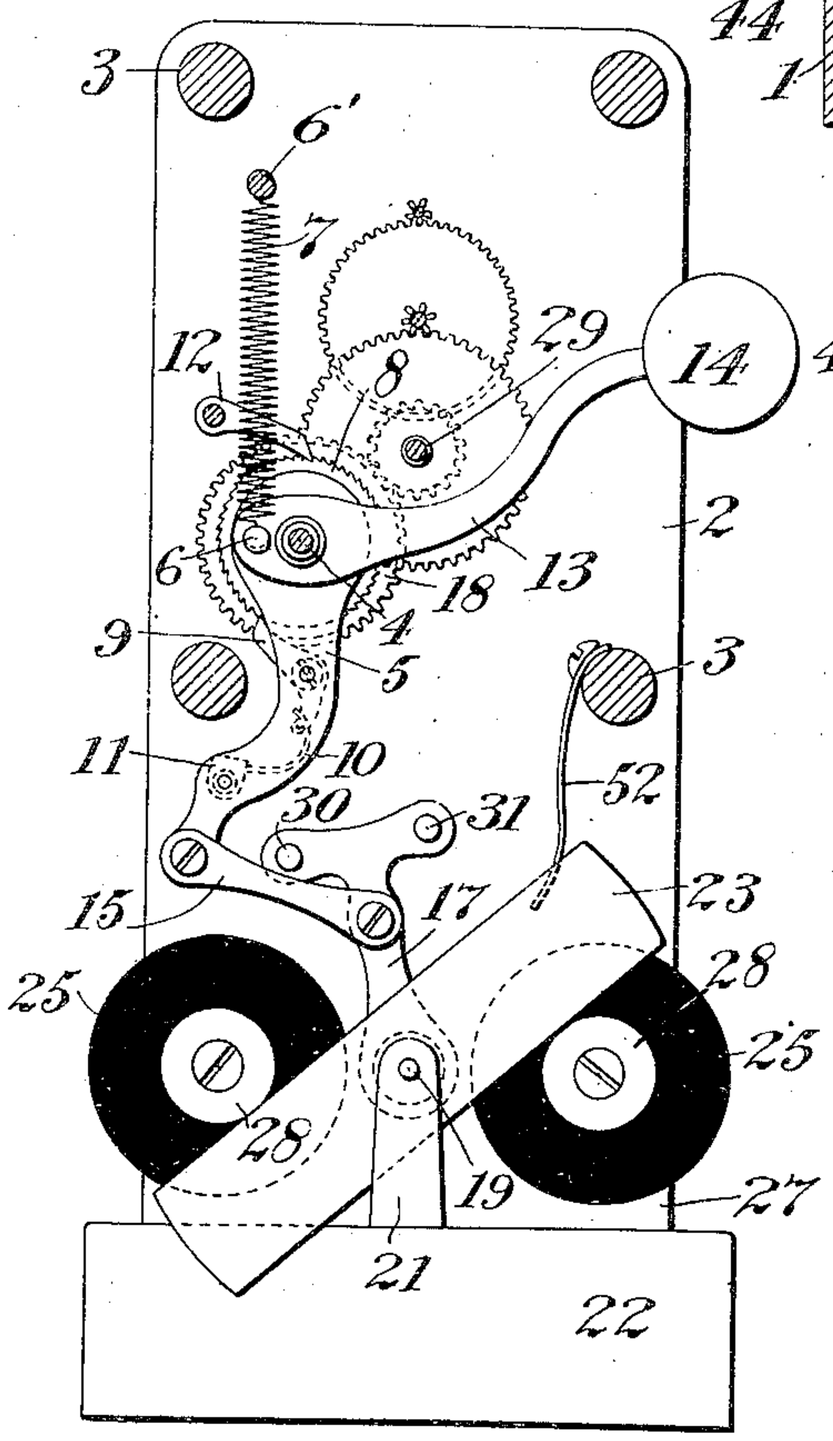
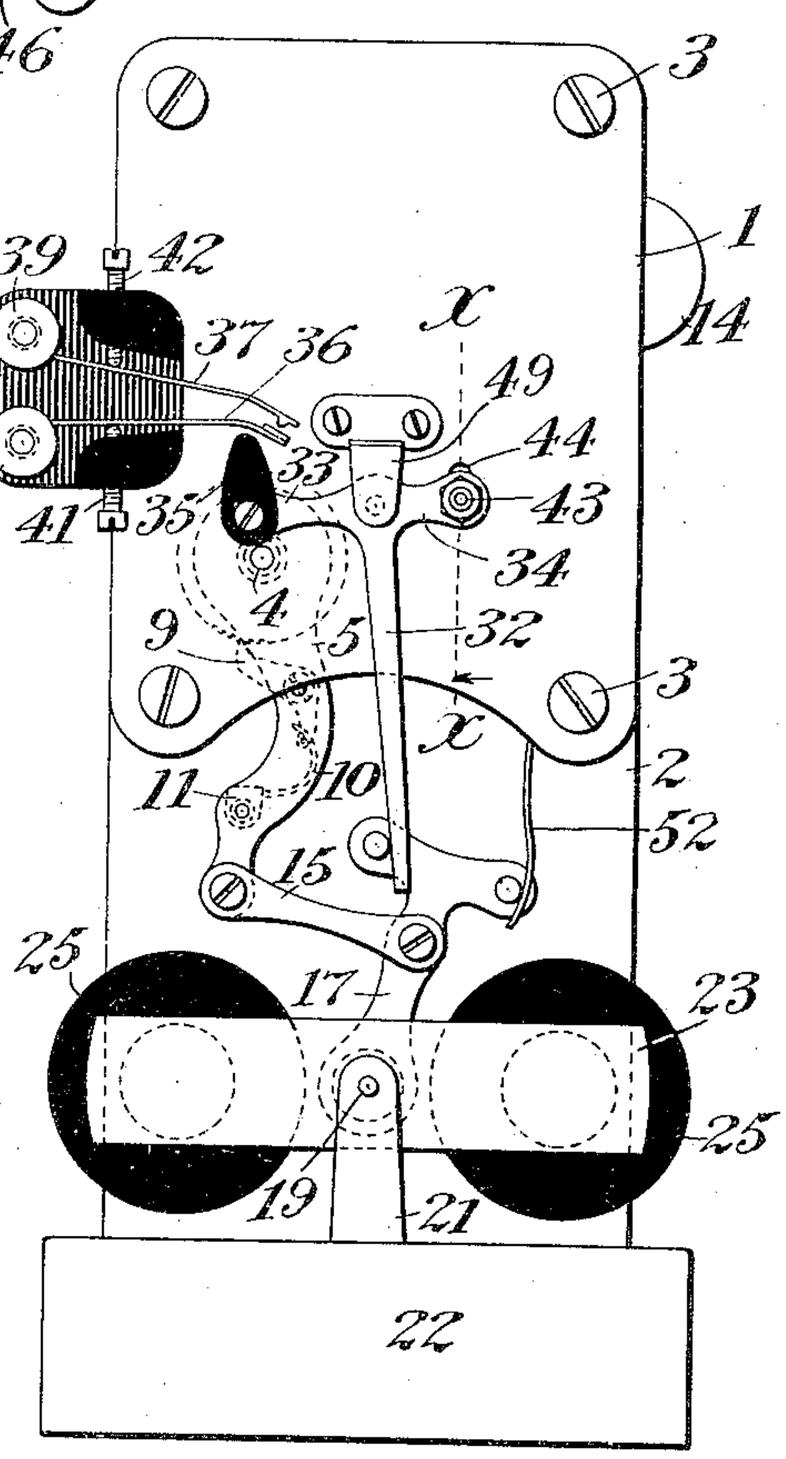


Fig. 4



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UNITED STATES PATENT OFFICE.

PETER G. GIROUD, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN ELECTRICAL NOVELTY AND MANUFACTURING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

ELECTRIC CLOCK.

No. 835,516. Specification of Letters Patent. Patented Nov. 13, 1906.

Application filed October 25, 1905. Serial No. 284,290.

To all whom it may concern:

Be it known that I, PETER GEORGE GIROUD, a citizen of the United States, residing in the borough of Manhattan, city of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Clocks, of which the following is a specification, reference being had therein to the accompanying drawings, forming a part thereof.

My invention relates to electric clocks of that class wherein electric impulses at intervals store up power in or wind a suitable motor, such as a spring or weight, this motor directly driving the clock-train.

My invention has for its objects simplicity of construction and reliability and uniformity of operation, durability, and non-liability of derangement. To the attainment of these desirable objects I provide a circuit-closing device of exceedingly simple construction, actuated with a quick and sharp movement, and producing its winding operation without jarring the clock-train or interfering with the proper operation of the escapement. The circuit-closing device is not only of exceedingly simple construction and rapid operation, but is also highly reliable and durable and practically incapable of being retained in circuit-closing position so long as the battery or other source of electricity will supply an electric current capable of causing even a slight winding movement.

I will now describe the mechanism embodying my invention illustrated in the accompanying drawings, and will thereafter point out my invention in claims.

Figure 1 is a rear elevation of the clock mechanism, the frame, and the winding mechanism, showing the position of parts at the instant when the circuit is closed and the winding operation initiated. Fig. 2 is an end elevation of the same. Fig. 3 is a rear elevation similar to Fig. 1, but with the upper part in section, the plane of section being taken immediately in front of the back plate of the frame. Fig. 4 is a rear elevation, omitting the escapement and balance wheel and showing the position of parts at the conclusion of the winding operation. Fig. 5 is an enlarged sectional view taken on a plane indicated by the line $x\ x$ in Fig. 4 of the circuit-closing stud and its actuating-spring. Fig. 6 is an enlarged face view of the circuit-closer actuating or impulse-spring.

The frame comprises a front plate 2 and a back plate 1, connected by posts 3, the front plate 2 extending the full height of the device and being secured to a base 22 at its lower end, and the back plate extending down only a sufficient distance to receive the arbors of the clock-train.

The clock-train is driven from an arbor 4, journaled in the frame near the lower part of the back plate 1, the first or driving gear 18 of the train being fixed upon this arbor 4 near the front end thereof. A pinion 16, which meshes with this driving-gear 18, is fixed on the minute-spindle 29. The hour-reducing gears are not shown. The minute-spindle is suitably geared up to an escapement-wheel 50, controlled by a balance-wheel 51. The construction of these parts may obviously be varied as desired, and they need not be further described.

The clock-train is actuated at a ratchet-wheel 8, which is fixed on the arbor 4 of the driving-gear 18 of the clock-train. The driving-pawl 9 of this ratchet-wheel 8 is carried by an oscillating arm 5, which is loosely mounted on the arbor 4. A spring 10 controls the pawl and is attached at one end to the pawl and at the other end to a block 11 on the arm 5. A stop-pawl 12 prevents rearward movement of the ratchet-wheel.

The principal motor for directly actuating the clock-train is a weighted arm secured to the arm 5 and shown as comprising an arm 13 and a weight 14 at the outer end thereof. The torque of this weight is assisted, however, by the tension of a helical spring 7, this spring being secured at its lower end to a pin 6, projecting rearward from the arm 5, and at its upper end to a pin 6′, projecting forward from the back plate 1 of the frame. As the weighted arm falls its leverage and torque are increased, while the tension of the spring and its torque are correspondingly lessened, with a resultant constant torque exerted at the actuating-pawl 9 in all working positions.

The lower end of the driving-pawl arm 5 is joined by a connecting-rod 15 to an actuating-arm 17, fixed upon an arbor 19, which also carries the armature 23 of the electro-

magnet and which is therefore actuated when the electromagnet attracts its armature. Conversely, the arm 17 is actuated from the pawl-carrying arm 5 under the torque of the weight and spring when these motive means are driving the clock-train. The armature-arbor 19 has a center-bearing at its front end on a screw-stud 20, threaded into the front plate and clamped by a lock-nut 24, and is journaled at its rear end in a bracket 21, which is also secured to the front plate, as well as to the base 22. The armature 23 is of usual construction, consisting of an iron bar which swings upon a medial axis in a plane parallel to the end faces of the poles of the electromagnet. The electromagnet comprises cores 26, screwed into a back iron or plate 27, which is secured to the front plate 2 of the frame, and the cores are provided at their rear ends with enlarged and detachable pole pieces, consisting of iron disks 28, screwed to the pole pieces. As usual, coils 25 are mounted or wound upon the magnet-cores

The actuating-arm 17 is T-shaped and is provided with pins 30 and 31, projecting rearward from the arm at the extremities of the cross-arm of the T, and between these pins plays the tailpiece 32 of a T-shaped circuit-closing lever, this circuit-closing lever having a short arbor provided with center-bearings in the back plate 1 and in a bracket 49, secured to the back plate 1. The pins 30 and 31 are spaced at such a distance apart that the attracted armature may attain the desired momentum before opening the circuit by actuation of the circuit-closing lever, and this desired lost motion also results in a comparatively small movement of the circuit-closing lever, as is desirable, and this construction also permits a free movement of the circuit-closing lever under the circuit-closing impulse, as is highly desirable. Upon an arm 33 of the circuit-closing lever is secured a circuit-closing hammer 35 of insulating material. Circuit-closing spring-terminals 36 and 37 are respectively secured to binding-posts 38 and 39, which are carried by a block 40 of insulating material and secured to the back plate 1 of the frame. These terminals are so located that the circuit-closing hammer 35 will strike the lower terminal 36 and will force this lower terminal into contact with the upper terminal 37, when the circuit-closing lever is given its circuit-closing impulse. To nicely adjust the positions of the spring-terminals 36 and 37, I provide set-screws 41 and 42 on the block 40, which respectively bear against the outer faces of the springs.

The means for imparting to the circuit-closing lever its circuit-closing impulse comprise a conically-pointed stud 43, carried on an arm 34 of the circuit-closing lever and projecting forward through a slot 44 in the back plate 1 and pressing against a flat spring 45, this spring being secured to the inner or front face of the back plate 1 and being maintained by the stud 43 under sufficient stress to develop the circuit-closing impulse when released. The conical point of this stud 43 is smooth and glass hard. As the stud 43 moves over the impulse-spring 45 under the actuation of the circuit-closing lever from the pin 31 of the actuating-lever 17 the conical point of the stud approaches a rectangular slot 46, formed in the impulse-spring. Its movement over the face of the impulse-spring is necessarily slow, the motive force being the pull of the pawl-lever 5, driven by the clock-motor and driving the clock-train; but when it reaches the slot 46 of the impulse-spring its smooth inclined surface receives an oblique thrust from the impulse-spring, and the retractive force of the impulse-spring thrusts it quickly forward. Thus the circuit-closing lever with no obstacle or resistance in its path, save the circuit-closing terminal springs 36 37, is projected quickly forward, and the circuit-closing hammer closes the circuit at these terminal springs. The slot 46 in the impulse-spring is of such width as to limit this movement to an ample circuit-closing actuation of the terminal springs. The circuit is thus instantly closed, the electromagnet is energized, and the armature attracted. The actuating-arm 17 pulls the pawl-arm 5 backward, and the circuit remains closed until the pin 30 on the actuating-arm engages the tailpiece 32 of the circuit-closing lever and retracts the circuit-closing lever. The retraction of the circuit-closing lever opens the circuit and moves the conical point of the stud 43 out of the slot 46 in the impulse-spring and back into contact with the face of the impulse-spring, putting the impulse-spring again under the stress necessary for the development of the circuit-closing impulse. The movement is completed by the momentum of the armature and connected parts, a spring 52 projecting downward from a lower post 3 of the frame in the path of the pin 31 on the actuating-arm to gently arrest this movement. This operation elevates the motor-weight arm 13 14, puts the motor-spring 7 under tension, and moves the driving-pawl 9 back for a fresh grip on the ratchet-wheel 8. It is so quickly and effectively performed that the operation of the balance-wheel or other escapement-controlling mechanism is not sensibly affected, so that the continuity and precision of movement of the clock-train is not disturbed or impaired.

It will be noted that the circuit-closing lever is restrained in all its movements by the impulse-spring 45. When the conical point of the stud 43 is in contact with the face of the impulse-spring, the impulse-spring is under tension and a slight friction

is developed sufficient to prevent accidental movement of the circuit-closing lever. At the moment of the impulse the impulse-spring actuates the circuit-closing lever, and the extent of movement of the circuit-closing lever under the impulse is regulated by the length of the slot 46 in the impulse-spring. Except for this slight and sufficient control and its control at extreme limits of movement by the contact of the stud 43 with the extremities of the slot 44 in the back plate 1 the circuit-closing lever is a freely-swinging part, merely actuated to be pushed in one direction by the pin 31 of the actuating-lever 17 and to be pushed in the other direction by the pin 30 of the actuating-lever 17, and having a small movement only sufficient for the effective performance of its circuit-closing function. As to the rapidity of the circuit-closing operation it will be noted that with a conical surface at the point of the pin 43 inclined at an angle of forty-five degrees, as shown, the swing of the circuit-closing lever is as rapid as the retractive movement of the impulse-spring 45 and that by reason of the greater radius of the impact-point of the circuit-closing hammer 35 the hammer moves even more quickly than the impulse-spring.

The electrical circuit, which consists of the battery, the magnet-coils connected in series, and the contact terminal springs, includes, as usual, a spark-absorbing shunt-circuit to prevent sparking at the contact-terminals, this spark-absorbing shunt circuit comprising a coil 54 of high resistance in shunt with the magnet-coils 25.

It is obvious that various modifications may be made in the construction shown and above particularly described within the principle and scope of my invention.

What I claim, and desire to secure by Letters Patent, is—

1. In an electric clock, the combination of a clock-train and escapement, a motor therefor, electric means for storing power in the clock-motor, a circuit controlling the electric means, a circuit-closing member actuated by the motor-driven movement of the clock-train, and an impulse-spring, the circuit-closing member and impulse-spring having inclined engaging means whereby a quick circuit-closing movement is imparted to the circuit-closing member.

2. In an electric clock, the combination of a clock-train and escapement, a motor therefor, electric means for storing power in the clock-motor, a circuit controlling the electric means, a circuit-closing member actuated in its movement toward circuit-closing position by the motor-driven movement of the clock-train and in its movement away from circuit-closing position by the electric means, and an impulse-spring, the circuit-closing member and impulse-spring having inclined engaging means whereby a quick circuit-closing movement is imparted to the circuit-closing member.

3. In an electric clock, the combination of a clock-train and escapement, a motor therefor, electric means for storing power in the clock-motor, an actuating-arm moved in one direction by the electric means and in the other direction by the clock-motor, a circuit controlling the electric means, a circuit-closing lever, engaging means between the actuating-arm and the circuit-closing lever permitting free play of the circuit-closing lever in advance of the movements transmitted thereto from the actuating-arm, and an impulse-spring, the circuit-closing lever and impulse-spring having inclined engaging means whereby a quick circuit-closing movement is imparted to the circuit-closing lever.

4. In an electric clock, the combination of a clock-train and escapement, a motor therefor, electric means for storing power in the clock-motor, a circuit controlling the electric means, a circuit-closing member actuated by the motor-driven movement of the clock-train, and an impulse-spring, the circuit-closing member being provided with a projecting conically-pointed stud and the impulse-spring having a slot adapted to engage the conical point of the stud and impart to the circuit-closing member a quick circuit-closing movement.

5. In an electric clock, the combination of a clock-train and escapement, a motor therefor, electric means for storing power in the clock-motor, an actuating-arm moved in one direction by the electric means and in the other direction by the clock-motor, a circuit controlling the electric means, a circuit-closing lever, engaging means between the actuating-arm and the circuit-closing lever permitting free play of the circuit-closing lever in advance of the movements transmitted thereto from the actuating-arm, and an impulse-spring, the circuit-closing member being provided with a projecting conically-pointed stud and the impulse-spring having a slot adapted to engage the conical point of the stud and impart to the circuit-closing member a quick circuit-closing movement.

6. In an electric clock, the combination of a frame, a clock-train and escapement carried thereby, a clock-motor, electric means for storing power in the clock-motor, an actuating-arm moved in one direction by the electric means and in the other direction by the clock-motor, a circuit-closing lever, an inclined projecting part carried by said lever, the frame being provided with a slot located so as to receive said projecting part and limit thereby the movement of the circuit-closing lever, engaging means between the actuating-arm and the circuit-closing lever permitting free play of the circuit-closing lever in advance of the movements transmitted thereto

from the actuating-arm, and an impulse-spring located in proximity to the slot in the frame and adapted to engage the projecting part of the circuit-closing lever to impart a quick circuit-closing movement thereto.

7. In an electric clock, the combination of a frame, a clock-train and escapement carried thereby, a clock-motor, electric means for storing power in the clock-motor, an actuating-arm moved in one direction by the electric means and in the other direction by the clock-motor, a circuit-closing lever, a conically-pointed stud carried by said lever, the frame being provided with a slot located so as to receive said stud and limit thereby the movement of the circuit-closing lever, engaging means between the actuating-arm and the circuit-closing lever permitting free play of the circuit-closing lever in advance of the movements transmitted thereto from the actuating-arm, and an impulse-spring located in proximity to the slot in the frame, substantially as set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

PETER G. GIROUD.

Witnesses:
HENRY D. WILLIAMS,
BERNARD COWEN.