(No Model.)

2 Sheets—Sheet 1.

D. F. SWEET.

ELECTRIC CLOCK.

No. 273,634. Patented Mar. 6, 1883.

Fig 1.

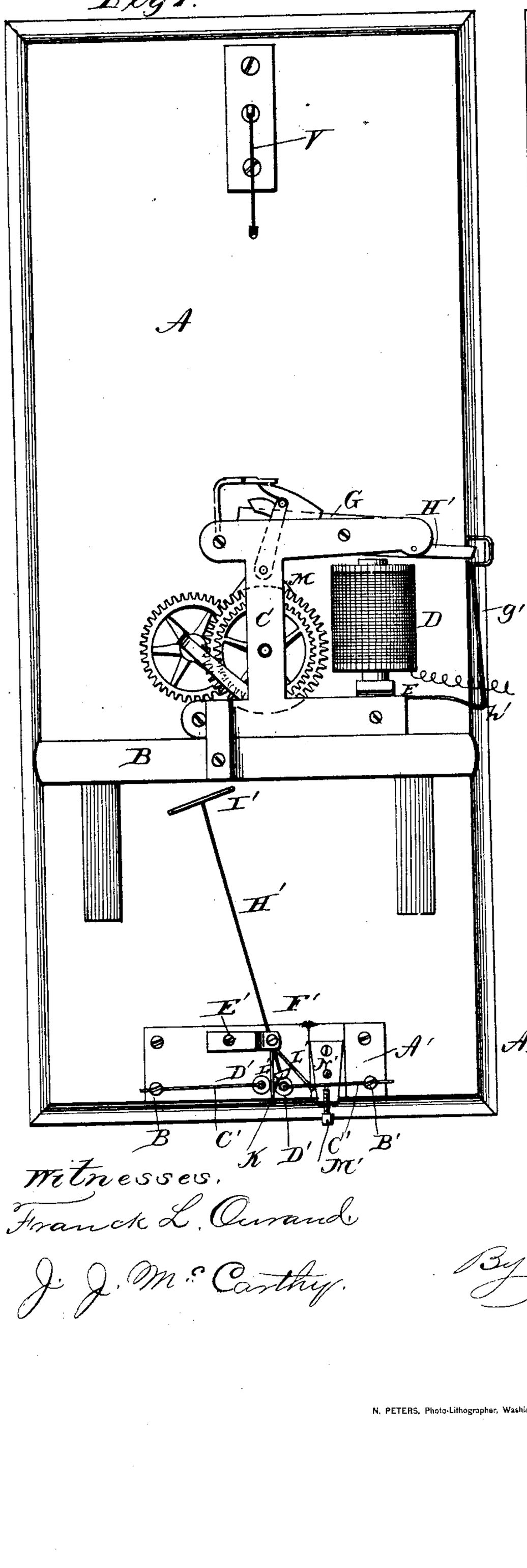
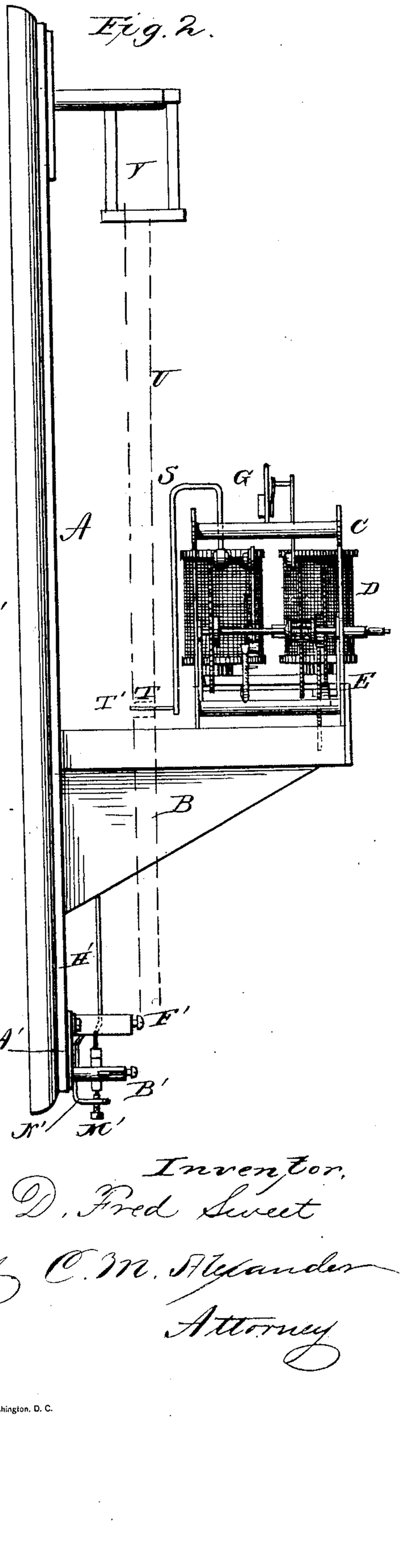


Fig. 2.



Witnesses.
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J. J. McCarthy.

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 3.

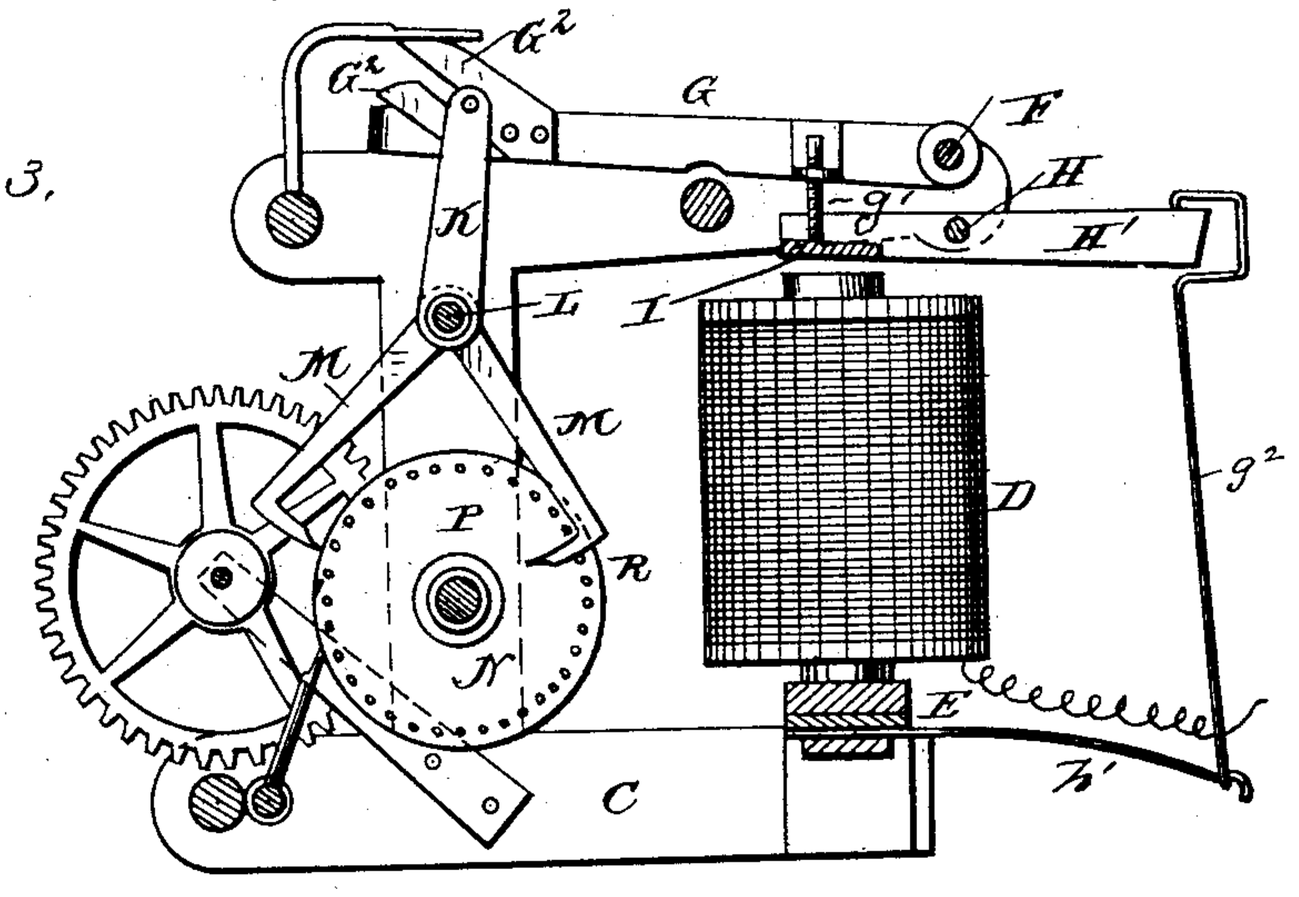


Fig. 5.

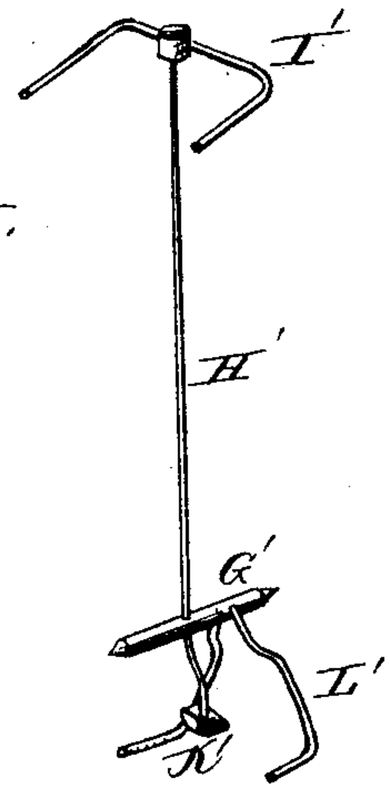


Fig. 4.

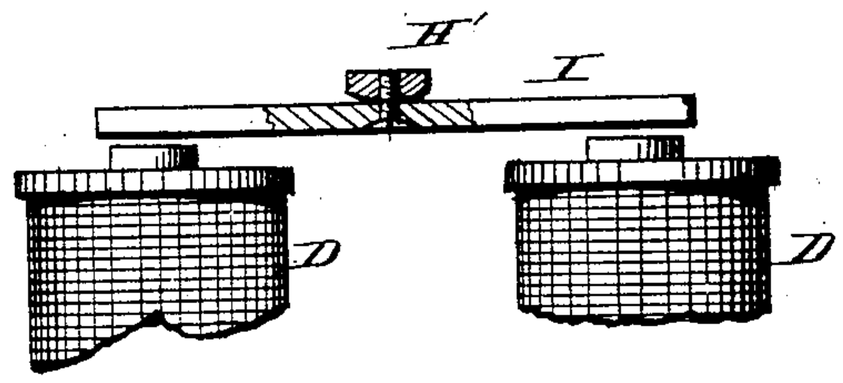
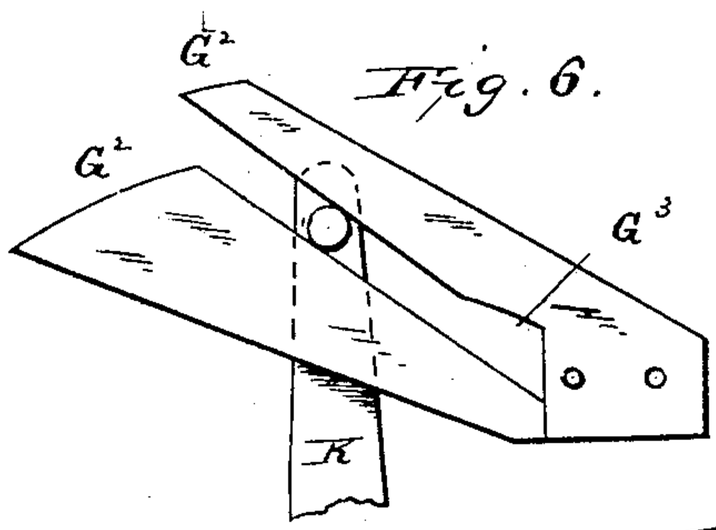


Fig. 6.



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UNITED STATES PATENT OFFICE.

D. FRED SWEET, OF HASTINGS, MICHIGAN.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 273,634, dated March 6, 1883.

Application filed July 27, 1881. (No model.)

To all whom it may concern:

Be it known that I, DANIEL F. SWEET, of Hastings, in the county of Barry, and in the State of Michigan, have invented certain new and useful Improvements in Electric Clocks; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

This invention relates to certain improvements in electric clocks; and it has for its objects to provide an improved circuit-breaker adapted to operate in connection with the pendulum to give the necessary intermittent current through the magnet to attract and release the armature, and through the medium of the same and suitable mechanism give motion to the gearing carrying the hands, and to provide suitable mechanism to be operated in connection with the armature to impart motion to the driving-gearing of the clock, as more fully hereinafter specified. These objects I attain by the devices and mechanism illustrated in the accompanying drawings, in which—

Figure 1 represents a front elevation of my improved clock; Fig. 2, a side elevation of the same; Fig. 3, a detached sectional view of the clock mechanism proper; Fig. 4, a detached view, showing the means of attaching the armature to its lever; and Fig. 5, a detached perspective view of the oscillating lever actuated by the pendulum to operate the circuit-breaker. Fig. 6 represents a detached view of the dog or pawl which operates the escapement-lever.

The letter A indicates the supporting-board of my improved clock, and B a bracket which supports the clock-movement proper.

The letter C indicates the frame which carries the working parts of the clock.

The letter D indicates an electro-magnet secured to the transverse bar E, forming part of the frame C.

The letter F indicates a rock-shaft journaled in suitable bearings in the frame C and carrying an oscillating lever, G, to be more fully hereinafter described.

The letter H indicates a similar rock-shaft, suitably journaled in the frame C, the said rock-shaft carrying a lever, H′, provided with an armature, I, located in such position as to vibrate over the poles of the magnet before mentioned.

The lever G is provided with two dogs, G^2.

The letter K indicates an oscillating arm, secured to a rock-shaft, L, journaled in suitable bearings in the frame C. The said shaft carries the two pawls M, which are constructed and operate in conjunction with the dogs, as more fully hereinafter specified. These at their extremities are gradually curved, and are adapted to operate in connection with a disk or wheel, N, mounted on the second-hand shaft P. The said wheel is provided with a series of pins, R, (thirty in number,) and is operated by the pawls to give a partial rotation to the wheel or disk at each vibration of the pawls, so as to make one complete rotation every minute. The said second-hand shaft is connected by the ordinary gearing with the minute and hour hand shafts of the clock, so as to give the same the proper relative movement.

The letter S indicates a lever attached to the rock-shaft L, and provided with a pin, T, which sets in a slot, T′, in the pendulum U of the clock, the pendulum being secured to a vibrating spring-frame, V, attached to the supporting-board of the clock.

The letter A′ indicates a metallic plate, secured, in any convenient manner, to the supporting-board of the apparatus. This is provided with two standards, B′, which carry the flat springs C′, which at their contiguous ends are slotted and provided with friction-rollers D′.

F′ indicates a bracket secured to the plate, which is provided with a set-screw, E′, forming a bearing for one of the journals of a rock-shaft, G′, the other journal having its bearing in the said plate A′. The said rock-shaft is provided with an oscillating arm, H′, which has two lateral branches, I′, at its upper end, between which the pendulum vibrates, the said pendulum playing loosely between said branches, so as to oscillate the rod properly as it swings back and forth. The lower end of said arm is provided with a metallic segment, K′, which vibrates in contact with the peripheries of the upper part of the friction-rollers, and with two branches, L′, which vibrate in contact with

the peripheries of the lower portions of said rollers, so as to oscillate the springs, the oscillation being effected with comparatively little friction.

The letter M′ indicates an adjustable circuit-breaker, secured to an insulated standard, N′, attached to the plate A′. The said standard connects with one end of the helix of the magnet, the other end of said helix being connected to one pole of a suitable battery, the other pole of which connects with one end of the wire forming the helices of the magnets D, the other end of said wire connecting with the standard carrying one of the springs C′ in such manner as to make and break the circuit at proper intervals.

The circuit-breaker and springs are provided with suitable platinum contact-points to prevent oxidation.

It is evident that duplicate circuit-breakers may be employed in connection with the springs when duplicate alternately-operating magnets are employed.

The lever G, which may be denominated an "impulse-lever," is provided with an adjusting-screw, g', by means of which its movement with respect to the armature-lever is controlled. The said armature-lever is held and returned to normal position by means of a connection, g^2, and spring h', the attraction of the magnet giving the impulse in one direction and the spring the impulse in the opposite direction.

The armature is secured to its lever by a universal or ball joint, so that it may automatically adjust itself to the poles of the magnet when attracted thereby. The armature is provided on its face with a thin sheet of suitable material—say hard rubber, for instance—which prevents it from coming into metallic contact with the poles of the magnet, and thus dispenses with the set-screws usually employed to hold the armature from the magnet and prevent the objectionable effects of residual magnetism.

The second-hand disk may be provided with a notch on its periphery, into which one end of a suitable pawl controlling a secondary circuit-breaker may drop at each revolution of the disk to operate a secondary circuit embracing one or more secondary clocks to operate the same synchronously with the primary clock.

It will be perceived, by reference to Fig. 6 of the drawings, that the pin on the arm K is just large enough to move in the slot between the dogs G^2 without binding. The end of the lower dog, G^2, is formed on an arc of a circle described upon the point L as a center. At the end of the slot between the two dogs the upper side is cut away upon a different but parallel arc described from the same center, as indicated by the letter G^3, Fig. 6. As thus constructed, when the pendulum is directly on its meridian or center of oscillation, the pin on the arm K will be about midway between the ends of the slot. When the pendulum has nearly reached the termination of its stroke on either side of the meridian line, the circuit is closed through one set of magnets and opened through the other, and vice versa. The pendulum does not stop at either end of its stroke, as the pin passes slightly around the curved arcs at the ends of the slot until the force of gravity starts said pendulum back again. By this means the pendulum is allowed its full swing with but little resistance, whereas if it were not for the arcs the pin would travel wholly in the inclined slot and would tend to check the pendulum; but it would be impracticable to check the momentum of a heavy pendulum, and the consequence would be that the oscillating arm would continue to move until gravity had stopped the pendulum, crowding the upper dog against the stop-wire or against the lower stop. These objections are thoroughly overcome by the construction described and shown, and a uniform movement is obtained.

The operation of my invention is as follows: The pendulum, when oscillated alternately, makes and breaks the circuit through the magnets, as above mentioned, alternately attracting and releasing the armature and oscillating the arm carrying it. This causes the dogs G^2 to oscillate the arm K and pawls M, which, operating alternately on the pins R of the wheel N, rotate the wheel N and the clockwork in the proper direction. The lever S, attached to the rock-shaft L, at each oscillation of the same caused by the alternate attraction and release of the armature, gives the necessary impulse to the pendulum through the pin T to keep up its momentum and insure the operation of the clock.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In combination with the electro-magnet and the circuit-breaker, operated by the pendulum of the clock, the lever carrying the loosely-fitted armature and mounted on a suitable rock-shaft, the lever carrying the pawls, also suitably mounted on a rock-shaft, the actuating pawls and wheel provided with pins on the second-hand shaft, and the arm connecting with the pendulum, the whole arranged to operate substantially as specified.

2. In combination with the pendulum of the clock and the electro-magnet and clock-gearing, the oscillating rod, its segment and branches, the oscillating springs and their friction-rollers, and the adjustable circuit breaker or breakers, all arranged to operate substantially in the manner specified.

3. In combination with the impulse-lever provided with bearing-surfaces curved as described, the lever carrying the pawls to actuate the second-hand, and provided with a pin adapted to operate in conjunction with said pawls, substantially as and for the purposes specified.

4. In combination with the impulse-lever of

an electric apparatus, and its adjusting-screw, the armature-lever having the armature attached thereto by a universal or ball joint, whereby said armature adjusts itself automatically to the poles of the magnet when attracted thereby, substantially as specified.

In testimony whereof I affix my signature, in presence of two witnesses, this 27th day of July, 1881.

D. FRED SWEET.

Witnesses:
J. J. McCARTHY,
M. L. STOWELL.