No. 709,818.

Patented Sept. 23, 1902.

N. HARRISON.

ELECTRIC CLOCK.

(Application filed May 11, 1901. Renewed Jan. 18, 1902.)

(No Model.)

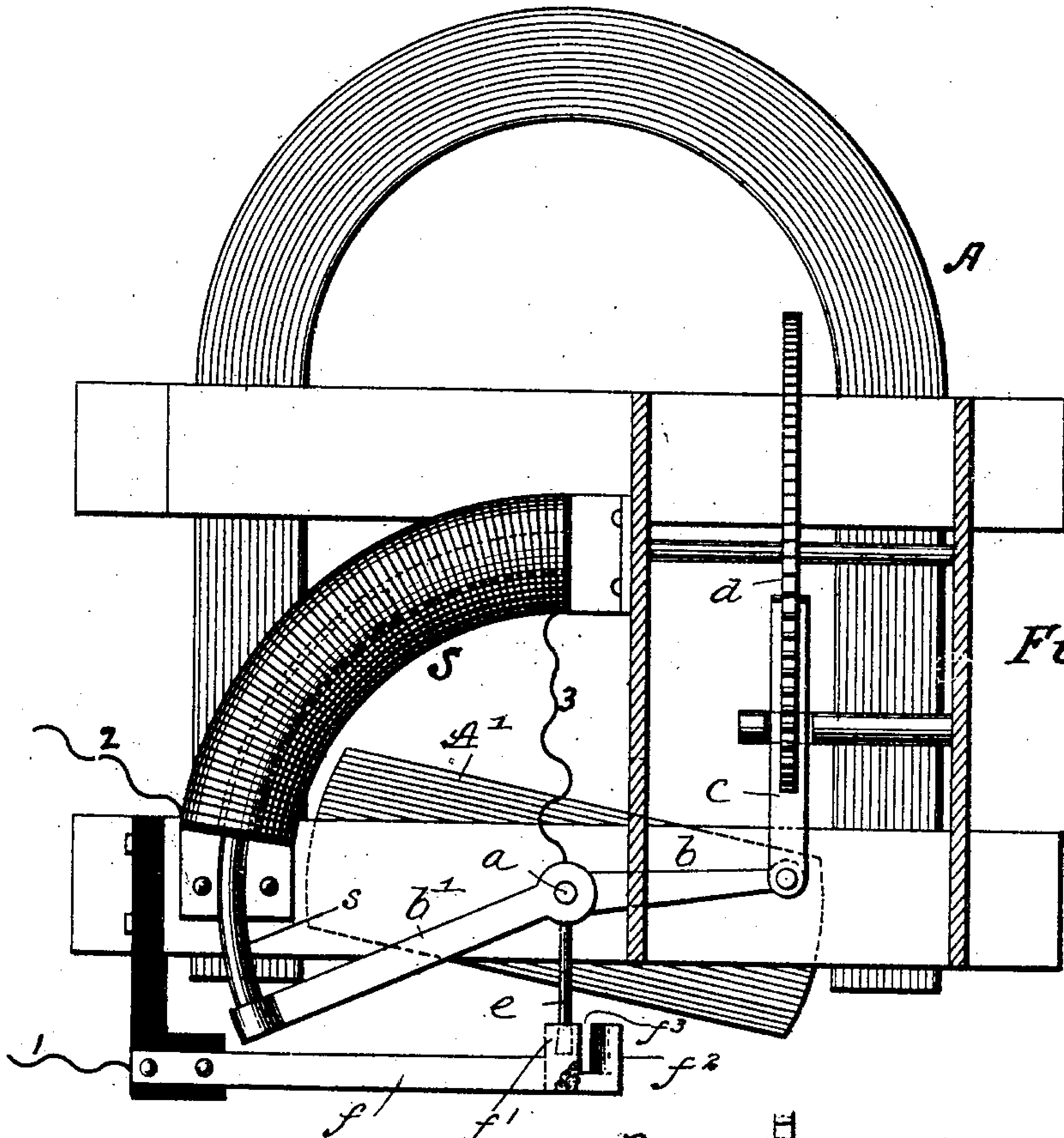

Fig. 1

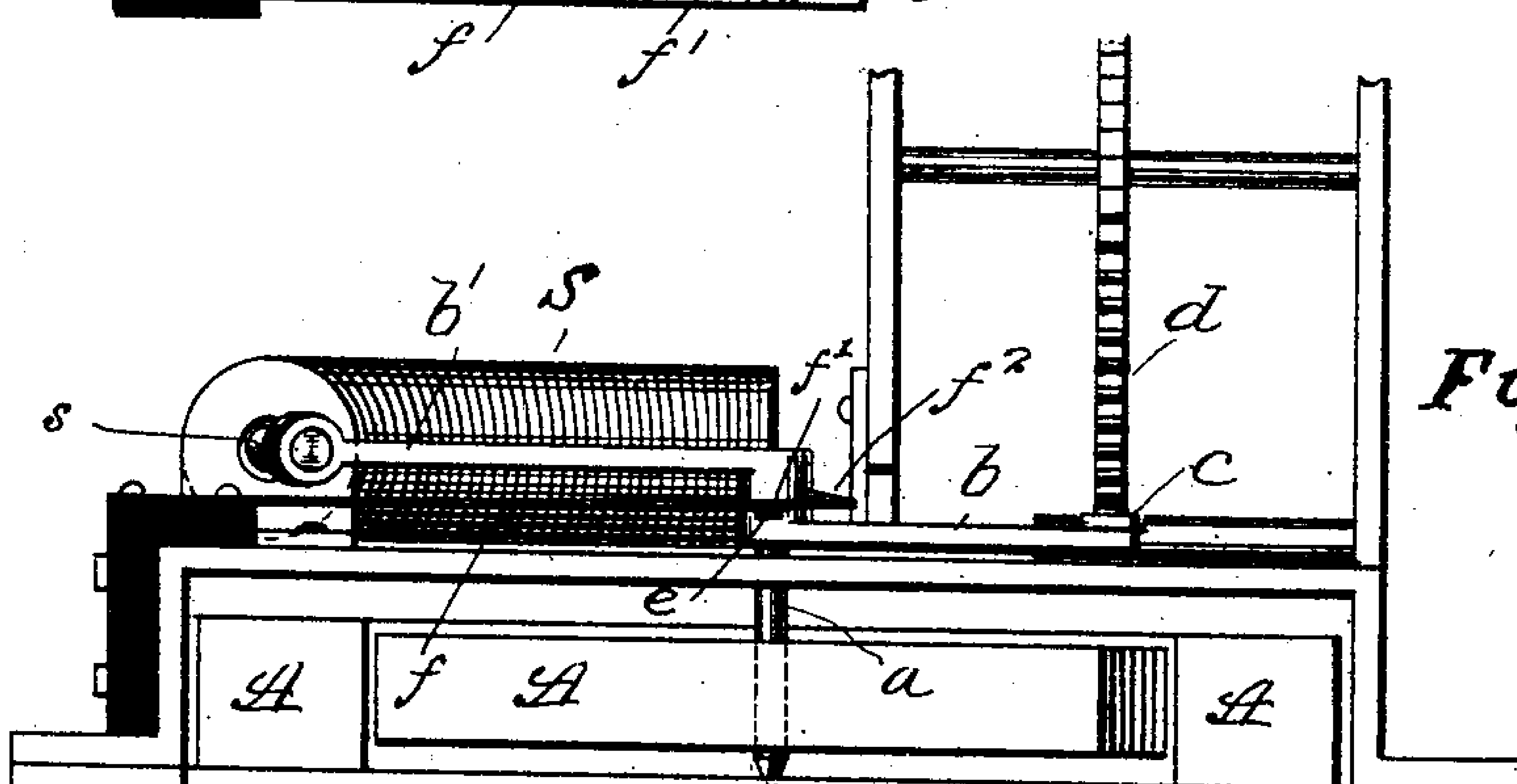

Fig. 2.

WITNESSES:

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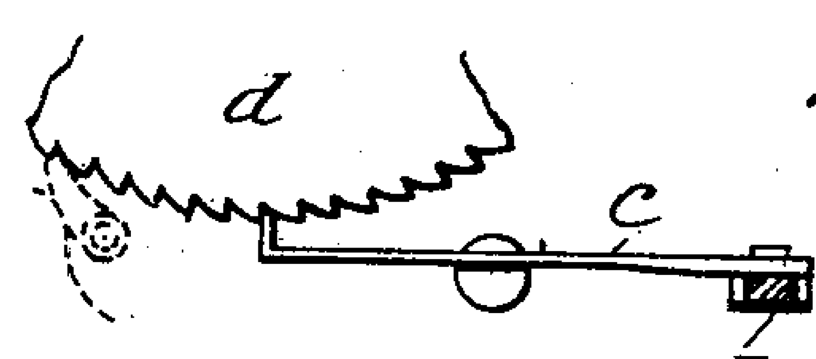

Fig. 3.

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UNITED STATES PATENT OFFICE.

NEWTON HARRISON, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO WILLIAM HENRY LAIRD, OF NEW YORK, N. Y.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 709,818, dated September 23, 1902.

Application filed May 11, 1901. Renewed January 18, 1902. Serial No. 90,283. (No model.)

To all whom it may concern:

Be it known that I, NEWTON HARRISON, a citizen of the United States, residing at the city of New York, in the borough of Manhattan and State of New York, have invented certain new and useful Improvements in Electric Clocks, of which the following is a full, clear, and exact description.

This invention relates to electrically-driven clocks, the object in this particular instance being to dispense with springs entirely and provide a substitute therefor which will propel the clock with an equal if not greater regularity than is possible with a spring and at small expense of battery-power.

In carrying out my invention I utilize the attractive power of a permanent magnet to propel the train of gears for a certain period of time and then the power of an electromagnet to restore the initial relation between the permanent magnet and the train.

The invention includes likewise certain details which add to the commercial value and practicability of the clock.

In the accompanying drawings, Figure 1 is a plan of the electromagnetic features of my improved clock, showing only a portion of the clock-train. Fig. 2 is a side elevation of the same, and Fig. 3 illustrates the engagement of the driving-pawl with the main wheel of the train.

The power which directly drives the clock is obtained from a permanent magnet, (indicated by A,) the size and construction of which will be adapted for application to a particular wheel of the clock-train. The armature of this magnet is indicated at A′ and is itself a permanent magnet also. It consists of a bar located between the poles of the magnet A with unlike poles opposed and mounted upon an axis *a*, so as to turn in a plane coincident with the plane in which the magnet A lies. The ends of the armature are rounded concentrically, so as to maintain a fixed air-gap between the armature and the poles. The axis of the armature carries a double arm, the two branches of which are lettered *b* and *b′*, respectively. The former carries at its outer end a spring *c*, whose end is bent and adapted to engage the ratchet-teeth of one of the wheels *d* of the clock-train. It will be seen that so long as the armature A′ occupies a position at right angles to the poles of the magnet there will be no torque in the armature; but as soon as the armature is deflected to an oblique position with respect to the poles power is immediately exerted to draw the armature back to its position at right angles to the poles. The spring *c* is so adjusted with respect to the wheel *d* that when the magnet and armature are free to exert their mutually attractive force the clock-train is driven. For the purpose of returning the armature to its angular or oblique position after it has completed its stroke I provide a solenoid S, shaped like the arc of a circle, whose core *s* is attached to the outer end of the arm *b′*. Attached to the hub of the double arm *b b′* is another arm *e*, which normally rests against the under side of a spring *f*. The spring is provided with two projections f' and f^2, placed side by side and with a space f^3 between them, the edge of the projection f^2 adjoining the space being bent upward slightly. The under side of projection f' is covered with insulating material, while the under side of projection f^2 and the top of projection f' are bare. The spring *f* forms one terminal of a source of electricity and the arm *e* the other terminal, the circuit being indicated by the wires 1, 2, and 3 and including the solenoid S.

The operation is as follows: The clock, we will say, starts with the armature A′ in the oblique position shown, under which condition the contact *e* is raised against the insulation on the under side of the projection f' and the solenoid S is deënergized. By the mutual attraction between the magnet and the armature the latter is gradually drawn to the position at right angles to the poles of the permanent magnet, during which movement pawl *c* pushes wheel *d* and the clock is driven. When the armature has reached the end of its stroke, which may be sufficient to force the wheel *d* forward the length of several of its teeth, the end of the pawl *c* runs out of engagement with the tooth on the wheel against which it has been pushing, and the armature completes its stroke by a sudden short movement, which carries the contact-arm *e* across the space f^3 and against the metallic face of the projection f^2, whereupon the circuit 1, 2, and 3 being closed the solenoid is energized and the armature is drawn again to its oblique position, the pawl *c* meanwhile sliding over the ratchet-teeth freely. In order to be sure of a full stroke of the armature of the solenoid, the contact-arm *e* is maintained for a definite time in contact with the metallic surfaces of the spring *f*. This is accomplished by the arm *e* running through the space f^3 and into the naked side of the projection f', the duration of the contact being as long as it takes the arm *e* to traverse forward and back on the projection f^2 and across the upper space of the projection f'. The arm *e* eventually runs beyond the projection f', whereupon the circuit is broken and the spring rises slightly to allow the arm *e* to pass beneath the projection f'.

It will be seen that the permanent magnet affords a uniform power for propelling the clock, which, in fact, is more regular and certain than that of a spring and will last an indefinite period. The battery is brought into use for an instant only. The permanent magnet and its polarized armature together being powerful can be applied, for instance, to the hour-wheel of the train and arranged so that the solenoid will be brought into action only about once in five minutes.

Having described my invention, I claim—

1. In an electrically-driven clock, the combination with the clock-train, of two magnets, one of which is a permanent magnet and the other an electromagnet, the permanent magnet being adapted to act first upon the train through a limited movement, and the electromagnet adapted to act at the end of such movement to restore the permanent magnet to the beginning of its working position.

2. In an electrically-driven clock, the combination with the clock-train, of a permanent magnet having a pivoted armature adapted to engage the train, and an electromagnet, the permanent magnet being adapted to act independently on its armature to drive the clock through a limited stroke, and the electromagnet being adapted to restore the armature to the beginning of its stroke after each completion thereof, substantially as described.

3. In an electrically-driven clock, the combination with the clock-train of a permanent magnet having a pivoted armature adapted to engage the train and an electromagnet adapted to move the armature, the permanent magnet acting independently of the electromagnet to move the train through a limited stroke, and a switch adapted to close the circuit of the electromagnet at the end of the stroke of the armature, substantially as described.

4. In an electrically-driven clock, the combination with the clock-train of a permanent magnet having a pivoted armature adapted to engage the train and an electromagnet adapted to move the armature, the permanent magnet acting independently of the electromagnet to move the train through a limited stroke, and a switch adapted to close the circuit of the electromagnet at the end of the stroke of the armature and hold it closed for a prolonged period.

5. In a clock, a permanent magnet movably mounted and connected to the train, a second permanent magnet having its poles opposed to those of the first and within the influence thereof, whereby the combined action of the two permanent magnets will drive the clock.

6. In an electrically-driven clock, the combination with the clock-train of two magnets, one of which is adapted to act independently of the other to drive the clock-train, and the second of which acts upon the first at regular intervals to restore it to the beginning of its working position.

7. In an electric clock, the combination of the clock-gearing, an electromagnet and a circuit-controller consisting of a movable contact and two fixed contacts arranged in the path of movement of the movable contact, one of said two contacts having insulation on one side against which the movable contact normally bears and means whereby the movable contact will first be carried onto the naked face of the insulated contact to maintain the closure, substantially as described.

In witness whereof I subscribe my signature in presence of two witnesses.

NEWTON HARRISON.

Witnesses:

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