(No Model.) 2 Sheets—Sheet 1.

A. L. PARCELLE.

ELECTRIC PENDULUM CLOCK.

No. 360,903. Patented Apr. 12, 1887.

Fig. 1.

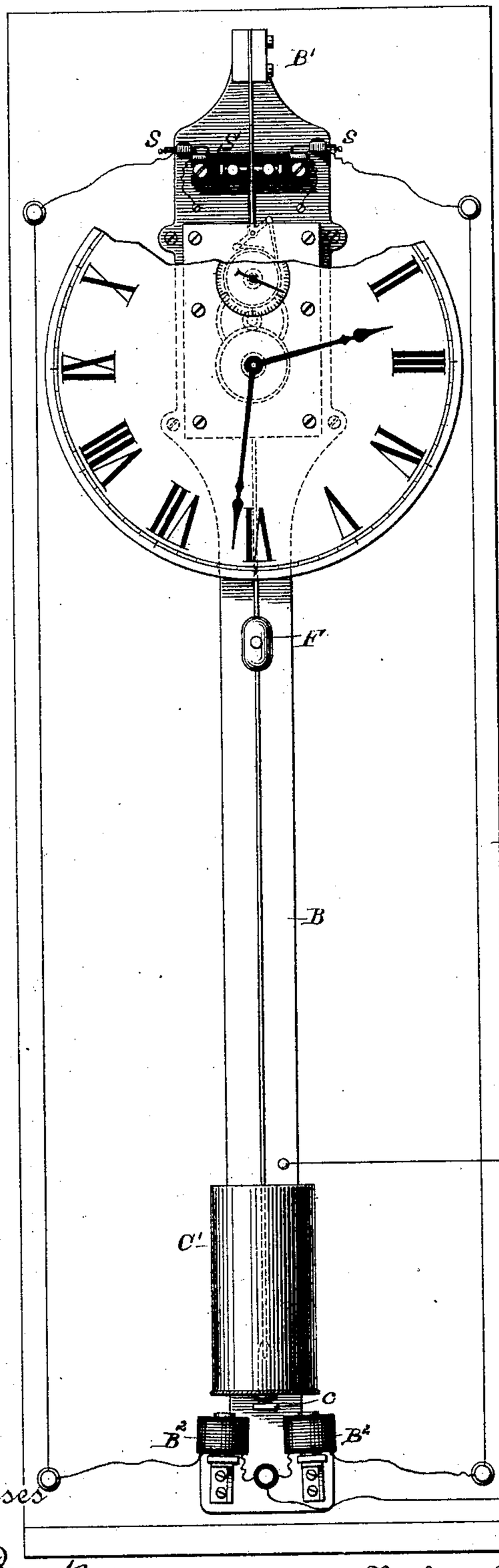
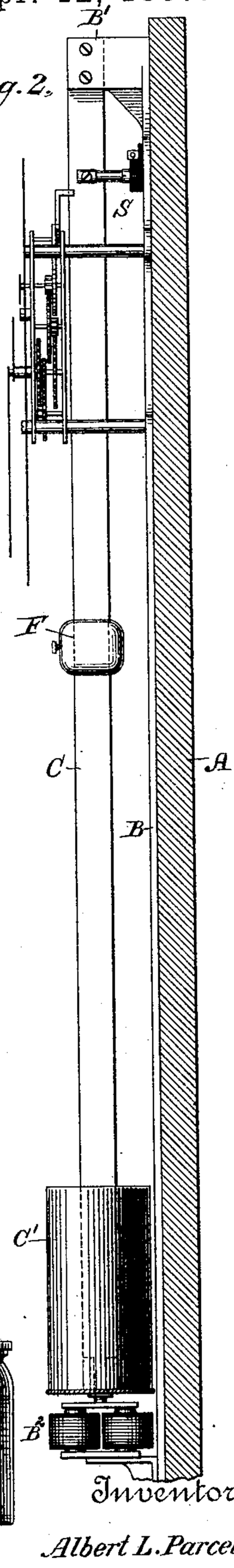


Fig. 2.



Witnesses

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

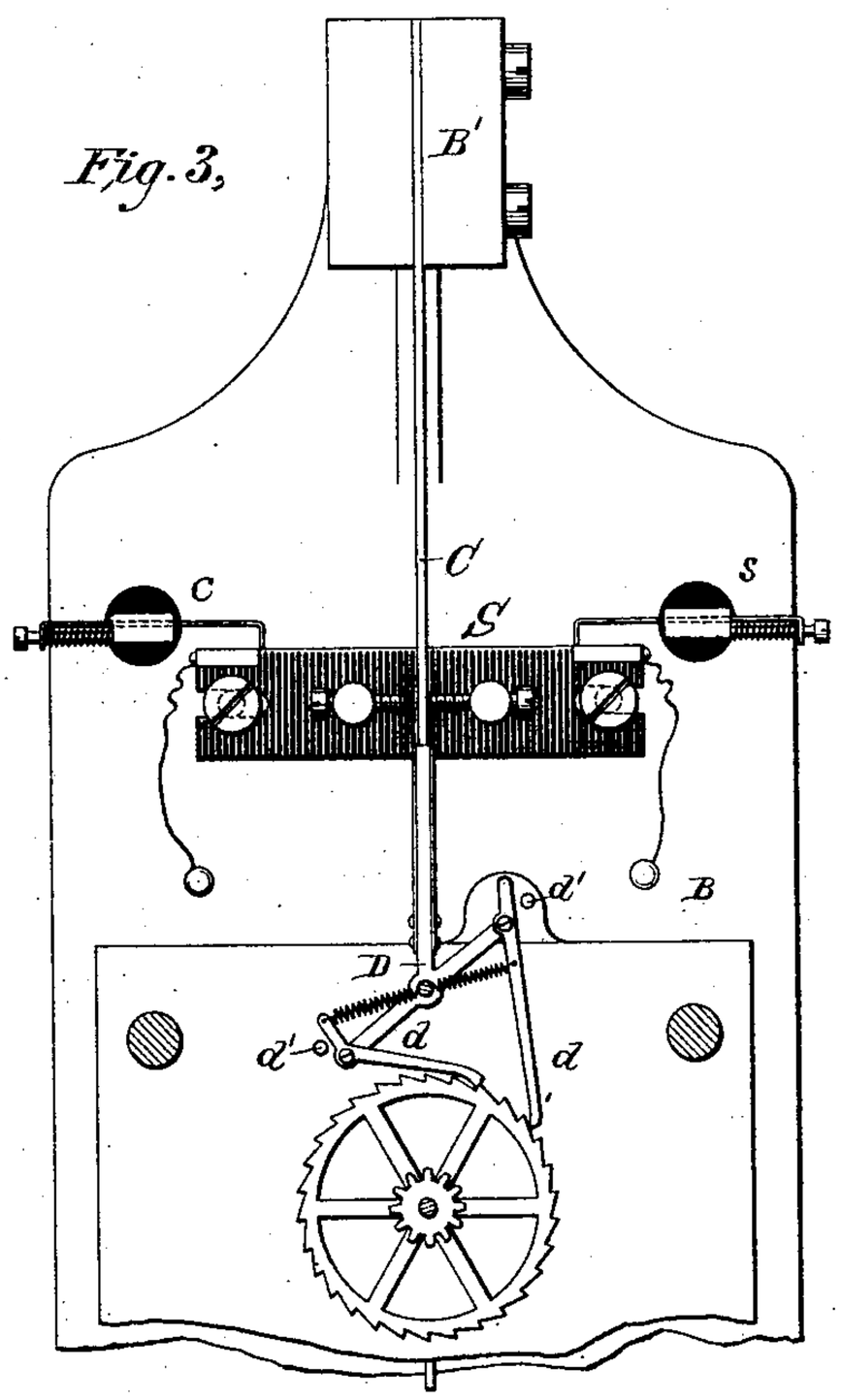


Fig. 4.

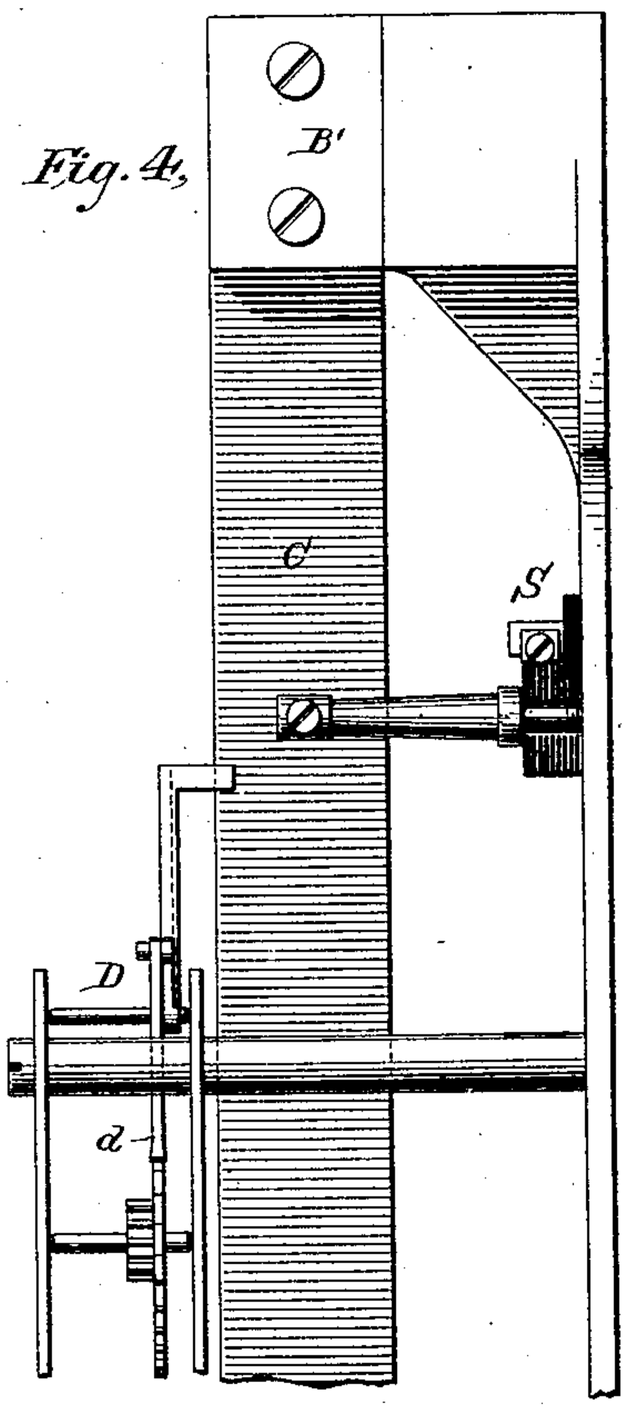


Fig. 5.

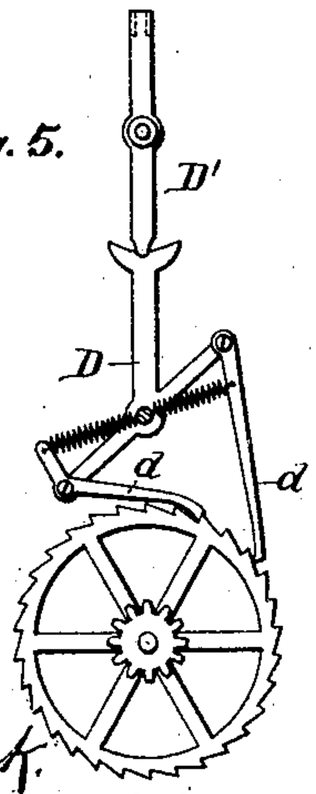
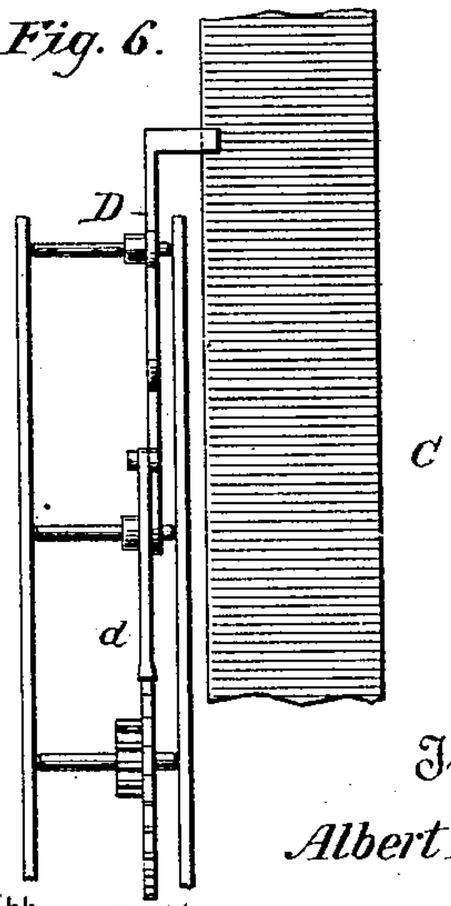


Fig. 6.



Witnesses

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UNITED STATES PATENT OFFICE.

ALBERT L. PARCELLE, OF NEW YORK, N. Y.

ELECTRIC PENDULUM CLOCK.

SPECIFICATION forming part of Letters Patent No. 360,903, dated April 12, 1887.

Application filed June 15, 1886. Serial No. 203,254. (No model.)

To all whom it may concern:

Be it known that I, ALBERT L. PARCELLE, of Boston, in the county of Suffolk and State of Massachusetts, but at present residing in New York city, State of New York, have invented certain new and useful Improvements in Electric Clocks, of which the following is a specification.

Heretofore a swinging pendulum driven by an electro magnet or magnets whose circuit is made and broken by the pendulum has been used to drive the clock-train. Such pendulums have, however, been ordinary pivoted rigid pendulums, or have been suspended by a small metal plate or spring in a manner very common and well understood. All such apparatus is, however, more or less defective on account of inequalities in the arcs described by such pendulums in oscillating at different amplitudes.

The purpose of my invention is to remedy such defects and produce an electric clock of great uniformity, regularity, and certainty of action. With this object in view I employ a resilient vibrator which is flexible or elastic in its entire length. A pendulum of this character describes an approximately true cycloidal arc, and is isochronous under such degrees of amplitude as are required for the operation of clock mechanism.

So far as I am aware I am the first to use an electrically-driven pendulum which drives the clock-train and is resilient throughout its length, and consider it a primary feature of my invention. Other novelties in the structure and organization also belong to my invention, and are claimed below.

In the accompanying drawings, Figure 1 is a front view of one form of my invention with the clock-face partly broken away. Fig. 2 is a side elevation of the same. Figs. 3 and 4 are respectively a front view and side elevation, on an enlarged scale, of the switch devices and the mechanism for driving the clock-train by the pendulum; and Figs. 5 and 6 are detail views illustrating another manner of driving the clock-train from the pendulum.

In the particular organization in which I have chosen to illustrate my invention, A represents a vertical frame or back-board, on the face of which a casting or frame, B, preferably of metal, carrying the clock mechanism, is maintained. On the upper end of this frame a block, B′, is carried or formed, in which the pendulum or vibrator C is firmly held.

Near the lower end of the frame are brackets, on which motor-magnets B^2 B^2 are supported. A bob or weight, C′, is preferably carried on the end of the pendulum or vibrator, and may be either a solid mass of metal or other suitable material or a hollow vessel in which shot, sand, or mercury may be placed.

The armature *c* for the motor-magnets B^2 B^2 is preferably secured upon the lower end of the pendulum. The magnet or magnets for driving the pendulum may of course be arranged in any suitable relation to the armature, though they are preferably arranged as shown, so that the faces of their poles are arranged out of the path or line of vibration, whereby the pendulum is permitted to swing freely on either side without coming in contact with the magnets.

B B indicate a battery, one pole of which is connected with the magnets B^2, and from thence with the switch-brushes *s*, the opposite pole being connected with a metal frame or carrying-plate, B, which is in electrical connection with the contact-plates carried by the switch-block S, as clearly seen in Fig. 1. The sliding block S, of non-conducting material, moves laterally upon holding and guiding screws as it is shifted back and forth by the pendulum.

The exact time of movement of the switch may be regulated by means of the adjusting-screws thereon, while the contact of the switch-brush *s* with the contact-plates on the switch-block may be regulated by adjusting the brushes in their supports. (See Fig. 3.)

The switch-brushes which run upon the sliding block S are each movable endwise in a socket-piece mounted on the end of an insulating-post. The outer end of the brush is turned down and formed with an eye through which an adjusting-screw working in the block or insulating-post passes. Between the down-

wardly-turned end of the sliding brush and the socket-block is interposed a coiled spring. On manipulating the screw the brush may be adjusted endwise.

An impulse of vibration having been imparted to the elastic pendulum, the circuit of the battery B B will be alternately completed in the magnets B^2, and the movement of the switch by the pendulum will maintain it automatically in vibration. By adjusting the brushes so that contact will be made on one side before it is broken on the other, a closed circuit-battery may be used.

The clock-train may be of any ordinary construction; but with my improved resilient pendulum, which is exceedingly uniform in action, a train of the simplest character may be employed.

Upon reference to Figs. 3 and 4 the manner of working the train from the elastic pendulum will be plain. A pivoted rocking arm, D, carrying pawls *d*, embraces at its upper end the edge of the pendulum, and the pawls *d* act upon the ratchet-wheel of the train, as clearly apparent. The vibrator may be constructed to make one vibration per second, and in order to facilitate its adjustment to that rate the bob may be made hollow, as before mentioned, and filled with some finely-divided weighting substance, so that it may be regulated with the greatest exactness. The bob may be supported on the pendulum by an adjusting-nut at its bottom, and in order to still further provide for the nice adjustment and rate of the pendulum a sliding weight, F, may be moved thereon and held by a set-screw. Stops *d'* may be provided, against which the ends of the pawls *d* strike when moved a given distance, so as to throw the pawls out of engagement with the driving ratchet-wheel. The effect of this arrangement is that the ratchet is driven a given distance for each vibration irrespective of the amplitude of the vibration.

The pendulum, its magnets, and the other devices constitute a motor having an ample capacity to drive the train, and the motor-magnets, being placed out of the path of vibration, permit the pendulum to have a large amplitude of motion. As the clock-train is driven a given distance for each vibration irrespective of the amplitude of the vibration, a battery of a strength slightly in excess of what is absolutely needed may be employed, and in that case variations in the battery-strength will not be noticeable or cause any variation of the clock-train.

As seen in Figs. 5 and 6, and as described in my prior patent of July 20, 1886, No. 345,721, instead of having the rocking arm D directly embrace the pendulum, an interposed pivoted arm, D', may be employed for the purpose.

By mounting all the parts of the apparatus upon a common frame expansion and contraction, due to changes in temperature, are in a large measure compensated.

Of course any arrangement of circuits other than that shown may be employed, and obviously many details may be varied.

The elastic pendulum may be accurately adjusted so as to have a normal rate of one beat per second at the particular locality where the clock is situated, and having, as before suggested, a surplus of power it will continue to accurately drive the train irrespective of variations in the battery. Any of the ordinary forms of battery may therefore be used for long periods of time. The spring-bar pendulum thus driven will, when the battery-power is removed, continue to vibrate in exact time for a period amply sufficient to permit a change of battery, or the repairing of such slight defects as may arise.

I claim as my invention—

1. The combination, substantially as set forth, of a bar of resilient material forming an elastic vibrating pendulum capable of bending from end to end, a clock-train driven thereby, an armature on the pendulum, and a magnetic pole or poles for driving the pendulum, having their faces located outside of the line or path of vibration.

2. The combination, substantially as set forth, of a pendulum formed of a thin bar of yielding elastic metal rigidly clamped at one end and capable of bending from end to end as it vibrates, a clock-train driven by said pendulum, an armature on the pendulum, an electro-magnet or magnets having their poles located outside of the path of vibration, and switch devices.

3. The combination of the elastic or resilient arm clamped at one end, constituting a spring-pendulum capable of bending from end to end, a clock-train driven thereby, an armature on the end of the pendulum, an adjustable weight on the pendulum, whereby its rate of vibration may be modified, an electric circuit, motor-magnets, and switch devices.

4. The combination of the vibrator, the armature thereon, a motor magnet or magnets, switch devices, a clock-train, the actuating-arm interposed between the vibrator and clock-train, pawls carried by said arm, the ratchet-wheel of the clock-train with which they engage, and devices which throw the pawls out of engagement with the ratchet-wheel when it has been rotated a given distance by the driving-pawls.

5. The combination of the electrically-driven vibrator, the electric circuit and switch devices, a clock-train actuated by the vibrator, and an actuating mechanism interposed between the clock-train and the vibrator, whereby the train is driven a definite distance at each vibration of the vibrator irrespective of the amplitude of vibration.

6. The combination of an electrically-driven spring-bar pendulum clamped at one end, and consisting of a bar of elastic material capable of bending in its entire length, and a clock-train actuated thereby, substantially as and for the purpose set forth.

7. The combination of the electrically-driven

spring-bar pendulum, the clock-train actuated thereby, and the adjustable weight F, for varying the normal rate of vibration.

8. The combination of the electrically-driven spring-bar pendulum, consisting of a flat resilient bar of uniform thickness and resilience throughout its length, and the clock-train actuated thereby, substantially as and for the purpose set forth.

In testimony whereof I have hereunto subscribed my name.

ALBERT L. PARCELLE.

Witnesses:
H. H. TAYLOR,
W. W. WHEELOCK.