No. 759,026. PATENTED MAY 3, 1904.

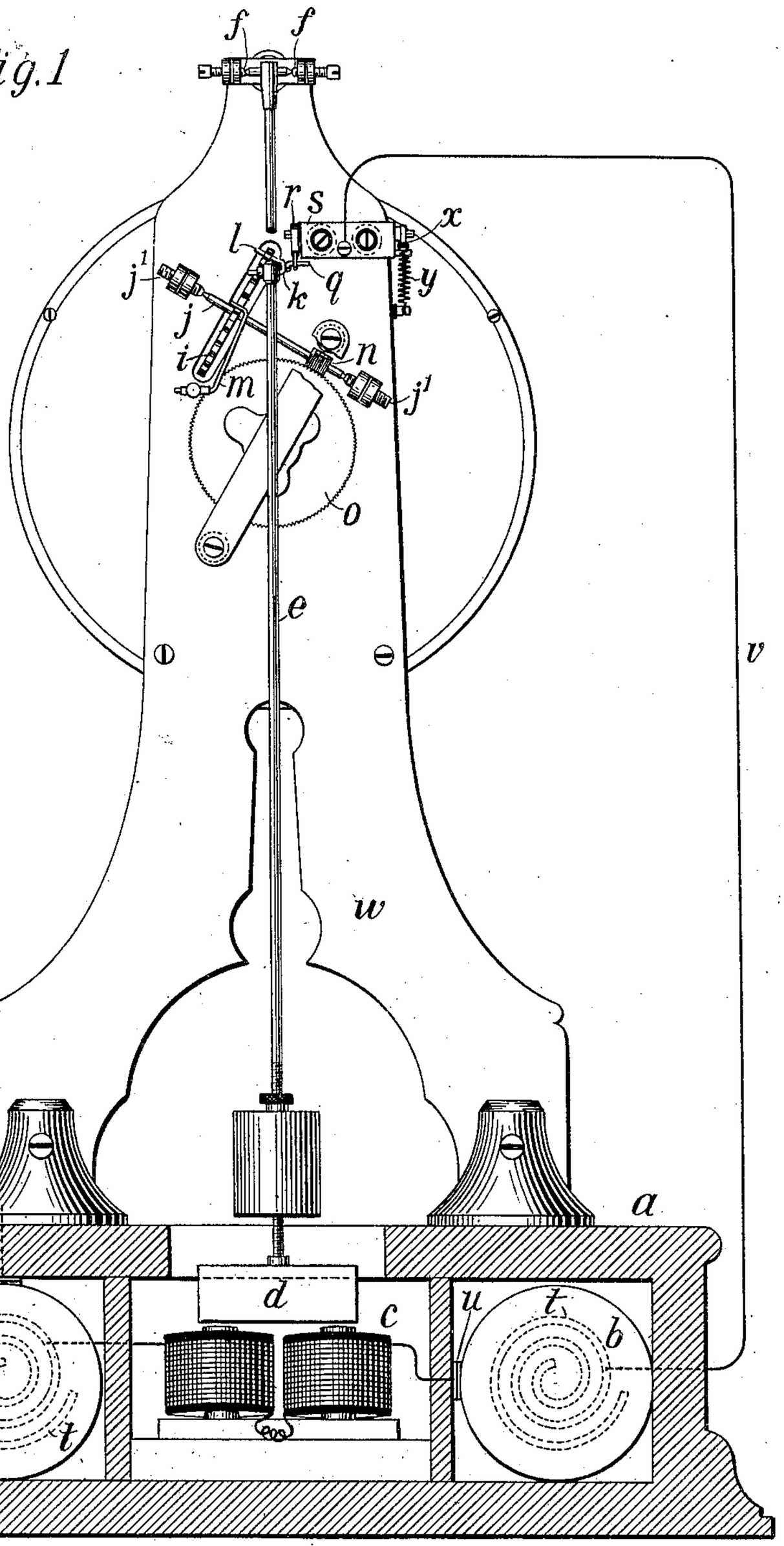
H. SCOTT & A. LOEBL.

ELECTRIC CLOCK.

APPLICATION FILED JUNE 10, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1



Witnesses:
Raphael Netter,
Livingston Gifford

Herbert Scott
Alfred Laebl
Inventors
by Henry D. Williams Atty

No. 759,026. PATENTED MAY 3, 1904.

H. SCOTT & A. LOEBL.

ELECTRIC CLOCK.

APPLICATION FILED JUNE 10, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2

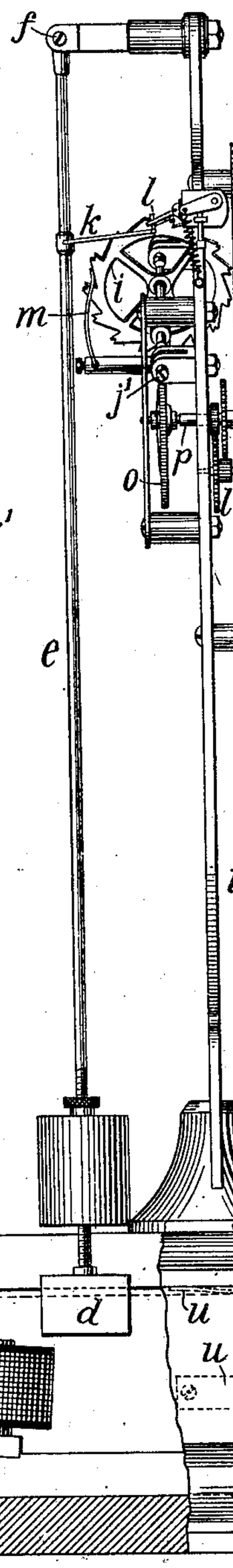


Fig. 3

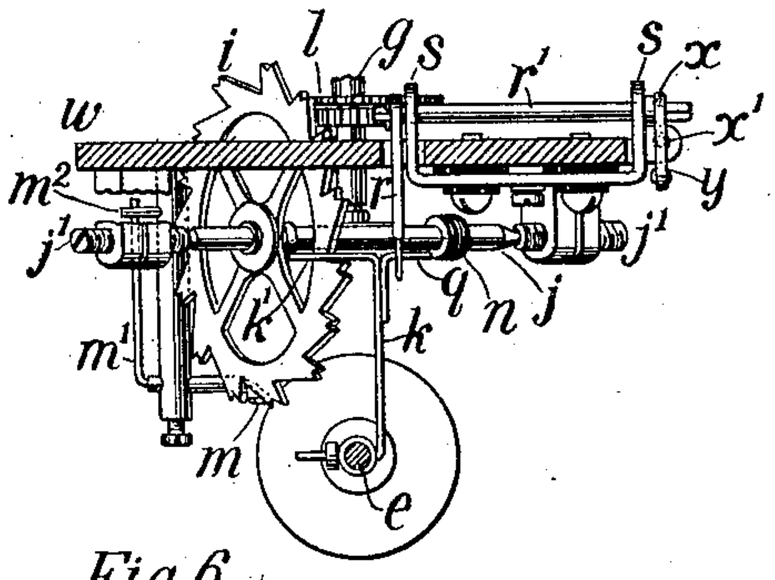


Fig. 4

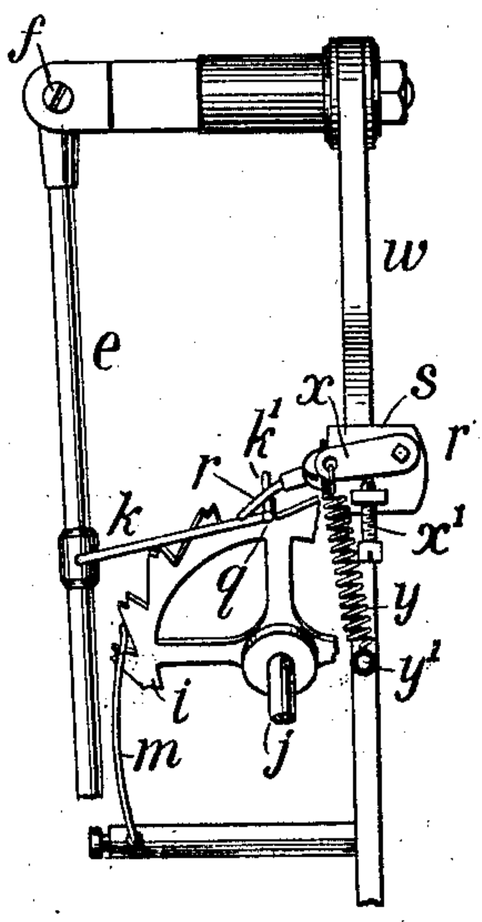


Fig. 6

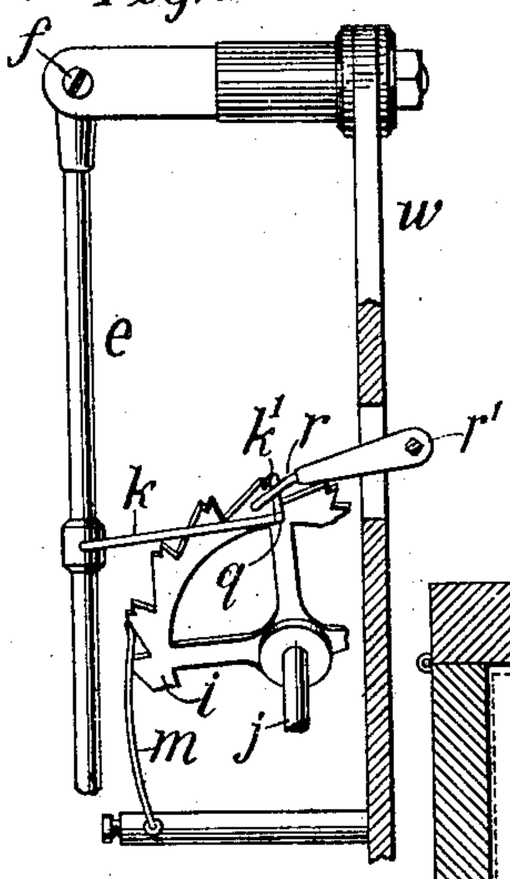
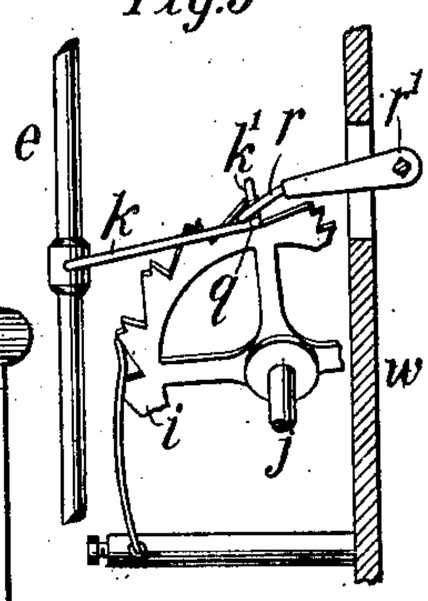
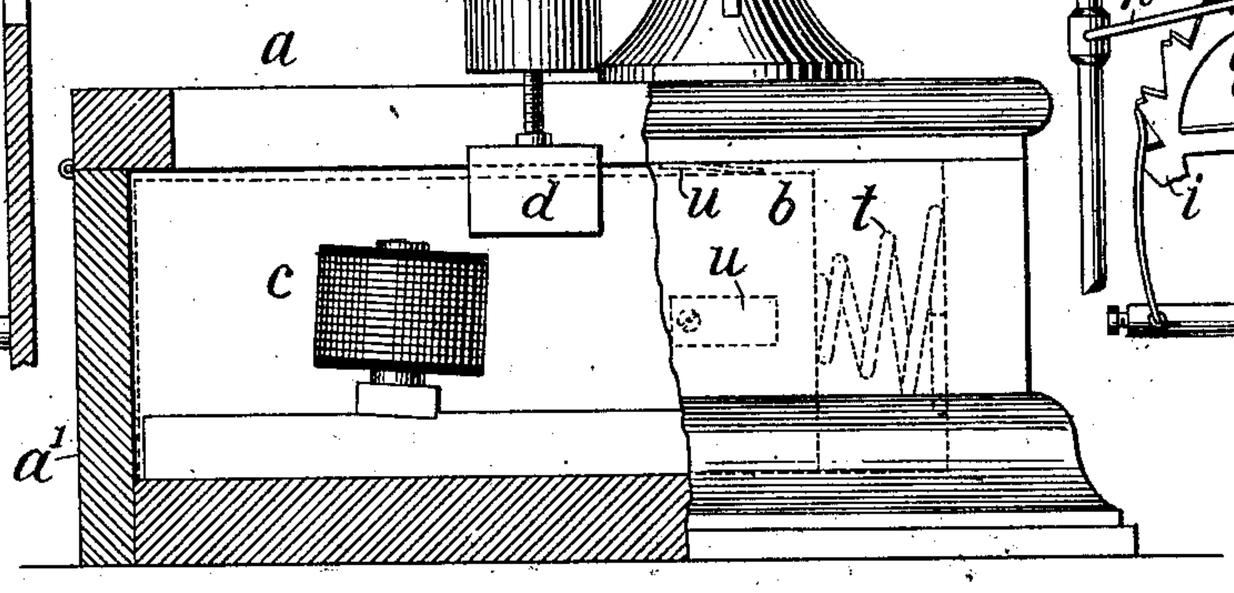


Fig. 5





Witnesses:
Raphaël Netter
Livingston Gurney

Herbert Scott Inventors
Alfred Loebl
by Henry D. Williams Att'y

No. 759,026. Patented May 3, 1904.

UNITED STATES PATENT OFFICE.

HERBERT SCOTT, OF BRADFORD, AND ALFRED LOEBL, OF LONDON, ENGLAND.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 759,026, dated May 3, 1904.

Application filed June 10, 1903. Serial No. 160,934. (No model.)

To all whom it may concern:

Be it known that we, HERBERT SCOTT, of Bradford, Yorkshire, and ALFRED LOEBL, of London, England, both subjects of the King of Great Britain, have invented certain new and useful Improvements in Electrically-Operated Clocks, of which the following is a specification, reference being had therein to the accompanying drawings.

Our invention relates to electrically-operated clocks, and has particular reference to clocks in which a pendulum, balance-wheel, or torsion-wheel receives an impulse from an electromagnet only when the amplitude or extent of its swing or movement is diminished.

Our invention has for its objects the reduction of the number of working parts, simplicity and cheapness of construction, the reduction of the friction of working parts, economy in the power required, and reliability and efficiency of operation.

According to our invention a ratchet-wheel and the oscillating means are obliquely arranged relatively to one another, and the driving-pawl for the ratchet-wheel is carried by the oscillating means, and these several parts are so arranged that the power of the oscillating means is applied by the driving-pawl to the ratchet-wheel in a substantially direct line with the movement of the actuated tooth.

Our invention also includes various improvements in the construction and combination of parts.

We will now describe the construction embodying our invention illustrated in the accompanying drawings and will thereafter point out our invention in claims.

Figure 1 is a rear elevation of a pendulum-clock containing apparatus embodying our invention. Fig. 2 is an end elevation of the same, partly in section. Fig. 3 is an enlarged sectional plan of the working parts. Fig. 4 is an enlarged detail elevation showing the position of parts upon the commencement of a diminished swing of the pendulum. Figs. 5 and 6 are enlarged detail sections showing the position of parts in the middle of a diminished swing and of a normal swing, respectively, of the pendulum.

The framework of the clock shown comprises a base *a* and standard *w*. The battery is located within the base *a* and is shown as comprising two cells *b b*, removably held in pockets and making contacts at their negative poles with helical springs *t* and at their positive poles or casings with springs *u* and held in place by a hinged rear cover *a'*. The actuating or impelling electromagnet *c* is fixed in the base *a* and is adapted to attract an armature *d*, and the armature *d* is carried at the lower end of and constitutes part of a pendulum, of which the rod *e* is pivoted at its upper end between center screws *f f* on a stud projecting rearwardly at the upper part of the standard *w*. The pendulum swings forward and back or in a plane at right angles to the face of the clock.

The pendulum-rod *e* carries a driving-pawl *k*, which is pivoted thereon and which has an oblique arm *k'*, which is the part of the pawl that engages the ratchet-wheel, and a horizontal contact-arm *q*, which engages with a yielding contact-finger *r* to close the circuit of the impelling means upon a diminished swing of the pendulum.

The ratchet-wheel *i* is fixed upon an arbor *j*, which rotates upon center screws *j'' j''*, threaded into studs projecting rearwardly from the standard *w*, and this arbor *j* is obliquely arranged, so that although the tooth operated upon by the arm *k'* of the driving-pawl lies practically in the line of motion of the pendulum-rod *e* and receives a direct pull as the pendulum swings the greater part of the ratchet-wheel is out of the path of movement of the pendulum-rod, and thus a ratchet-wheel of fairly large diameter may be employed in a construction economical of space, and the standard *w* is slotted to allow for the passage of the ratchet-wheel *i*, the arbor *j* of the ratchet-wheel being comparatively close to the standard *w*.

Upon the arbor *j* of the ratchet-wheel *i* is a worm *n*, which gears with a worm-wheel *o*, mounted upon and frictionally connected with the minute-spindle *p*, and the only other gearing required is the usual hour reducing-gearing *l*, connecting the minute-spindle *p* and the hour-sleeve *g*.

A detent or stop-pawl *m* is provided for the

ratchet-wheel *i* and is shown in the form of a bent piece of wire lightly pivoted and having a long horizontal arm *m'*, the weight of which tends to move the stop-pawl forward into engaging position, and thus provides a suitable control by gravity of the movement of the stop-pawl, and a stop-pin *m²* (see Fig. 3) limits the upward movement of the horizontal arm *m'*, so as to prevent the stop-pawl from being moved backward out of operative position.

The ratchet-wheel *i* is shown as having notched or stepped teeth, and the engaging arm *k'* of the driving-pawl *k* engages these teeth and pulls the ratchet-wheel round tooth by tooth as the pendulum swings. When the swing of the pendulum is normal, the pawl passes to the bottom of the teeth; but upon a diminished movement of the pendulum the pawl lodges in the notch or step, and as it moves on the return stroke of the pendulum in a higher plane its contact-arm *q* is brought against the yieldingly-supported contact-piece *r* and completes the circuit of the impelling-electromagnet *c*. This circuit will flow from the positive pole of the battery *b* at the right through the electromagnet *c* to the negative pole of the battery *b* at the left and from the positive pole of the latter battery to the metallic standard *w*. All parts are in metallic connection except the bracket-piece *s*, which is secured to but insulated from the standard *w* and which carries the contact-finger *r*, and the current will flow to the contact-arm *q* of the driving-pawl *k* and when this arm is in contact with the finger *r* will flow from this finger to the bracket *s* and from the bracket *s* by wire *v* to the negative pole of the right battery *b*.

The contact-finger *r* is fixed upon a spindle *r'*, which is pivotally mounted in lugs of the brackets, and another arm, *x*, is fixed upon the spindle *r* at the other end thereof and is held by a light helical spring *y* against an adjustable stop *x'*, the lower end of the helical spring *y* being secured to a pin *y'*, composed of or covered with insulating material. This spring and stop control the movement of the contact-finger *r*, so that it is yieldingly held in position to make contact with the arm *q* of the driving-pawl *k* when the engaging arm *k'* rides on a step of the ratchet-wheel and to make a wiping contact and actuate the impelling electromagnet *c* during the smallest and most effective part of the movement of the pendulum.

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

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

1. The combination of a ratchet-wheel and oscillating means obliquely arranged relatively to one another and a driving-pawl upon the oscillating means, the ratchet-wheel, oscillating means and driving-pawl being arranged so that the power of the oscillating means is applied by the driving-pawl to the ratchet-wheel in a substantially direct line with the movement of the actuated tooth, electrically-controlled impelling means for the oscillating means, and means coacting with the driving-pawl to close the circuit for the impelling means upon a diminished movement of the oscillating means.

2. The combination of a pendulum, a ratchet-wheel mounted with its axis in inclined position, a driving-pawl upon the pendulum-rod, the ratchet-wheel, pendulum-rod and oscillating means being arranged so that the power of the pendulum is applied by the driving-pawl to the ratchet-wheel in a substantially direct line with the movement of the actuated tooth, electrically-controlled impelling means for the pendulum, and means coacting with the driving-pawl to close the circuit for the impelling means upon a diminished swing of the pendulum.

3. The combination of a pendulum, a ratchet-wheel, a rotating part carrying the ratchet-wheel and having an inclined axis, a worm on the rotating part, a minute-spindle and a worm-wheel on the minute-spindle meshing with the worm, a driving-pawl upon the pendulum-rod, such driving-pawl engaging the ratchet-wheel, electrically-controlled impelling means for the pendulum, and means coacting with the driving-pawl to close the circuit for the impelling means upon a diminished swing of the pendulum.

4. The combination of a ratchet-wheel, oscillating means, a driving-pawl upon the oscillating means and a yieldingly-supported pivoted contact-piece, the ratchet-wheel, driving-pawl and contact-piece being arranged so that the driving-pawl moves in circuit-closing position upon a diminished movement of the oscillating means and makes a wiping contact with the contact-piece, and electromagnetic impelling means for the oscillating means included in the circuit closed by the driving-pawl.

5. The combination of a ratchet-wheel, oscillating means, a driving-pawl upon the oscillating means, electrically-controlled impelling means for the oscillating means, and a pivoted contact-piece and a stop and spring controlling the same, the ratchet-wheel, driving-pawl and contact-piece being arranged so that the pawl makes a wiping contact with the contact-piece to close the circuit for the impelling means upon a diminished movement of the oscillating means.

6. The combination of a ratchet-wheel, a pendulum, a driving-pawl upon the pendulum-rod, the ratchet-wheel and driving-pawl having a stepped engagement so that the driving-pawl moves in elevated position upon a diminished swing of the pendulum, electrically-controlled impelling means for the pendulum, and a pivoted contact-piece and a stop and

spring controlling the same, the contact-piece being arranged to make contact with the driving-pawl to close the circuit for the impelling means with the driving-pawl in elevated position.

7. The combination of a pendulum, a ratchet-wheel, a rotating part carrying the ratchet-wheel and having an inclined axis, a driving-pawl pivotally mounted upon the pendulum-rod and having an inclined arm engaging the ratchet-wheel and also having a contact-arm, the ratchet-wheel and engaging arm of the pawl having a stepped engagement, a lightly-pivoted detent for the ratchet-wheel and a pivoted contact-piece and a stop and spring controlling the same, and electromagnetic impelling means for the pendulum, included in a circuit closed by the driving-pawl and contact-piece.

In testimony whereof we affix our signatures in presence of two witnesses.

HERBERT SCOTT.
ALF. LOEBL.

Witnesses to the signature of Herbert Scott:
ROBERT TARR,
WALTER MIRFIELD.

Witnesses to the signature of Alf. Loebl:
WALTER E. ROCHE,
ARTHUR NIBLACK.