No. 682,678. Patented Sept. 17, 1901.

R. J. FLINT.

ELECTRIC CLOCK.

(Application filed May 21, 1901.)

(No Model.) 3 Sheets—Sheet 1.

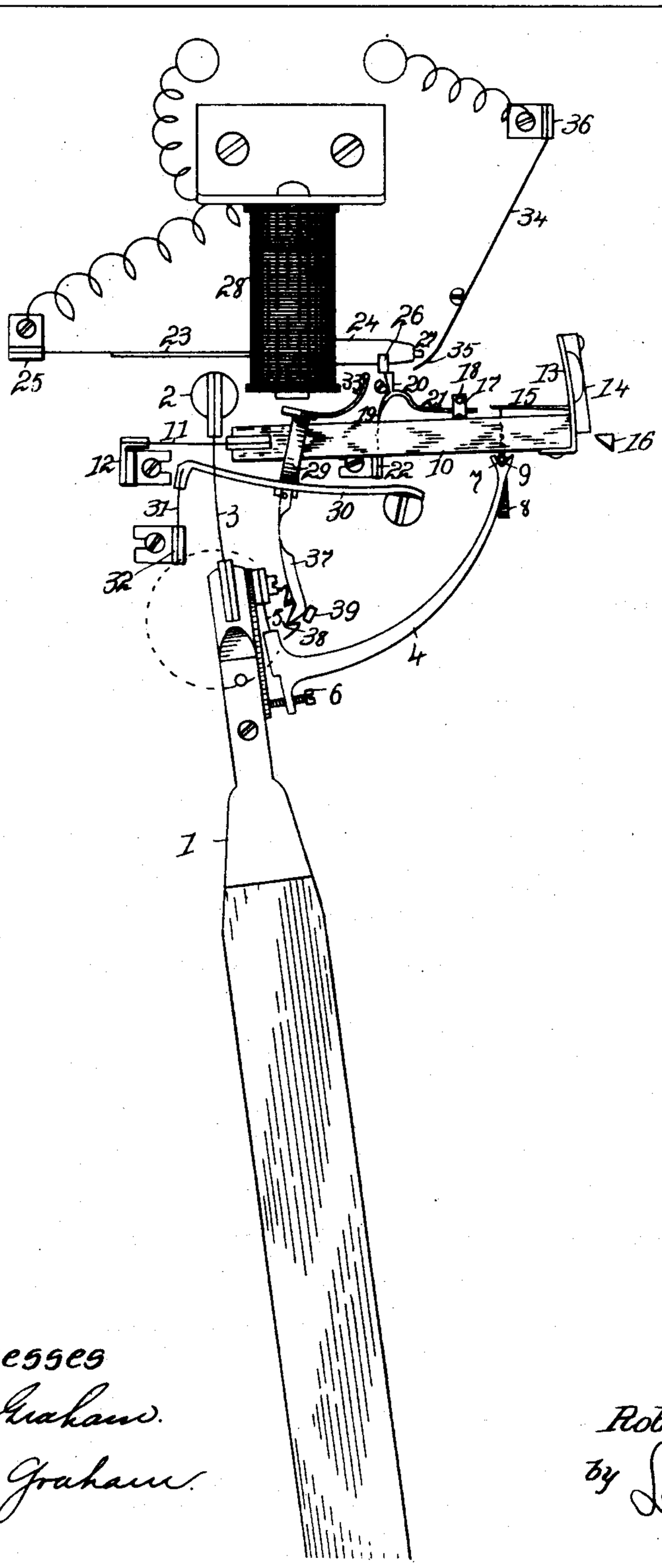

Fig. 1.

Witnesses
Nora Graham.
Sara Graham.

Inventor.
Robert James Flint.
by L. P. Graham,
his attorney.

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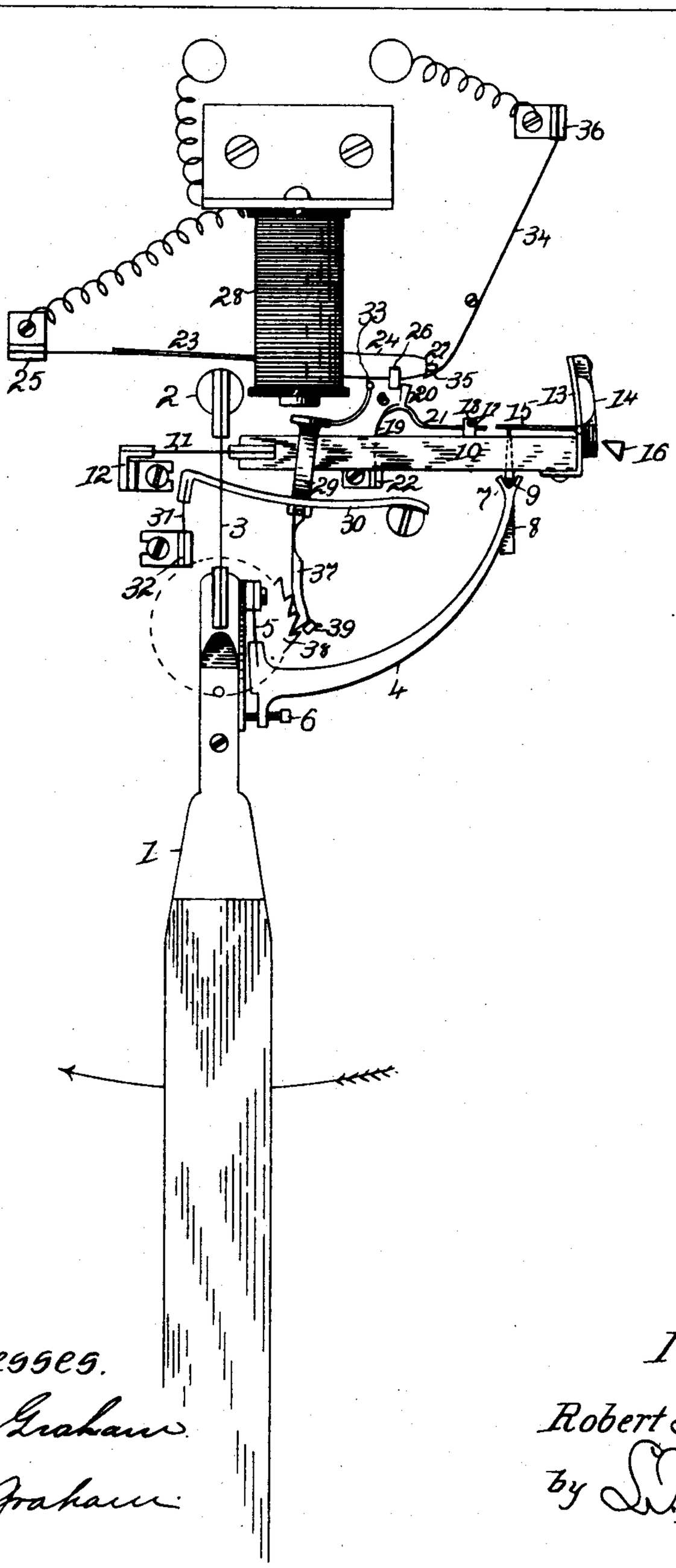

Fig. 2.

Witnesses.
Nora Graham.
Ira Graham.

Inventor,
Robert James Flint,
by S. P. Graham
his attorney.

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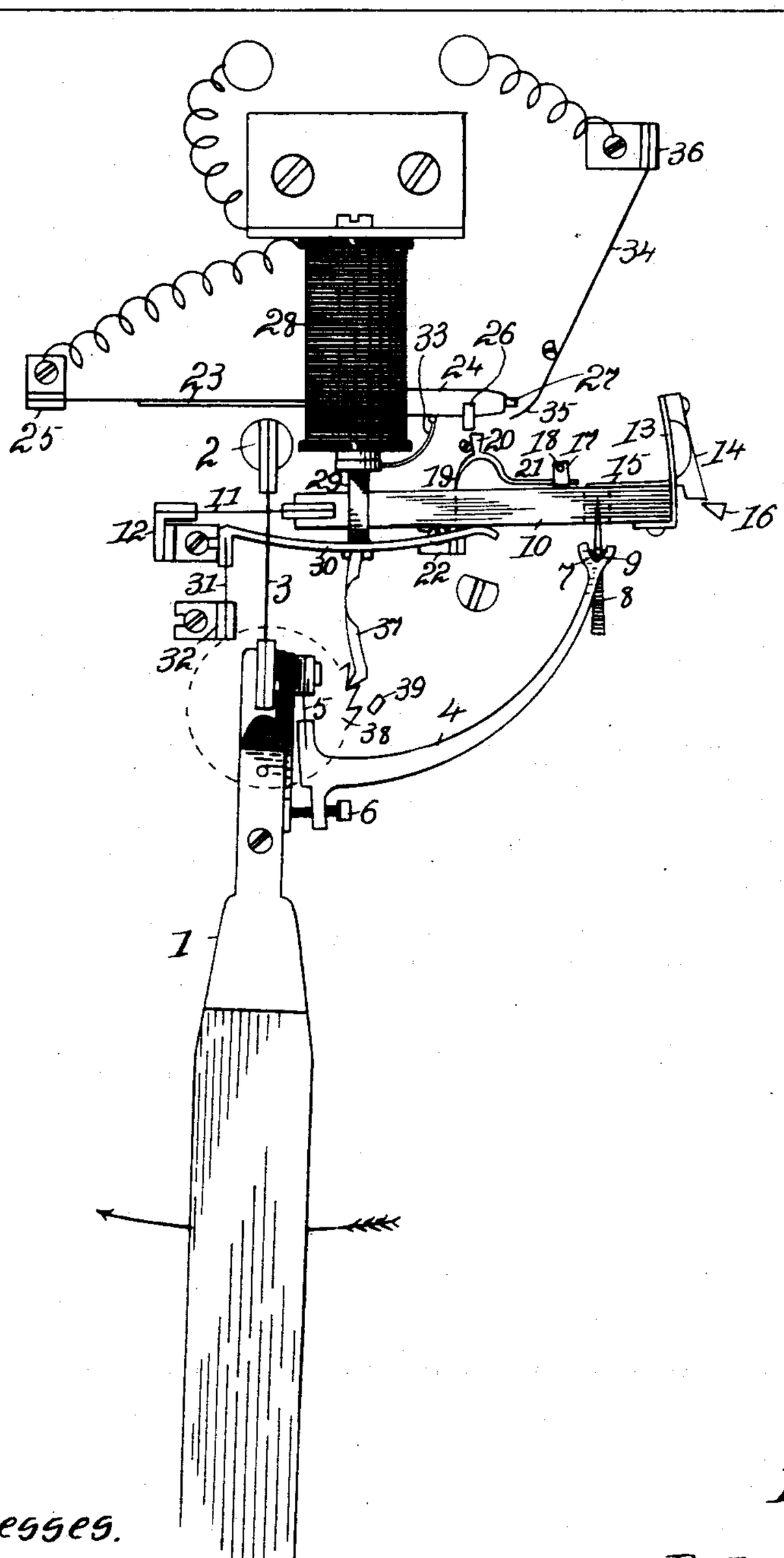

Fig. 3.

Witnesses.

Nora Graham

Sue Graham.

Inventor.

Robert James Flint.

by L. R. Graham

his attorney

UNITED STATES PATENT OFFICE.

ROBERT JAMES FLINT, OF DECATUR, ILLINOIS, ASSIGNOR OF ONE-HALF TO FRANK CURTIS COMPANY, OF SAME PLACE.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 682,678, dated September 17, 1901.

Application filed May 21, 1901. Serial No. 61,226. (No model.)

To all whom it may concern:

Be it known that I, ROBERT JAMES FLINT, of the city of Decatur, county of Macon, and State of Illinois, have invented certain new and useful Improvements in Electric Clocks, of which the following is a specification.

This invention relates to electric clocks in which the pendulum receives impulses from an electrically-raised weight, and the object is to make the oscillations of the pendulum truly isochronal.

The invention is exemplified in the structure hereinafter described, and it is defined in the appended claims.

In the drawings forming part of this specification, Figure 1 is an elevation of mechanism embodying my invention and illustrating the conditions that exist at the time the pendulum receives the weight that gives the impulses. Fig. 2 is an elevation similar to Fig. 1, showing the conditions that exist at the time the weight-raising electrical circuit is established. Fig. 3 is an elevation showing the positions occupied by the different moving parts at the instant the weight is raised.

The pendulum 1 is suspended from post 2 by a flat spring 3. An arm 4 is connected with the pendulum below spring 3 and extended upward and sidewise from a side of the pendulum. The arm is preferably connected with the pendulum by means of a flat spring 5 and a set-screw 6, the spring forming a pivotal or yielding connection and the set-screw providing means for adjusting the arm to vary the relative position of the outer end thereof. The upper outer end of the arm 4 has an upward-presented fork 7, and an impact-pin 8 has knife-edge bearings 9 in the fork of the arm. The impulse-weight 10 is a horizontal bar sustained at one end by a flat spring 11, attached to a fixed foot 12, located in the vicinity of the post of the pendulum. An upward extension 13 is attached to the swinging end of the impulse-bar, and a spring-detent 14 is connected with the upper end of the extension and projected downward. The lower end of the detent is adapted to rest on a fixed stop 16, and it has an arm 15, that extends through the supporting extension 13 and rests above the impulse-bar in position to be raised by the impact-arm when the pendulum is in position to receive the weight. The impulse-bar is slotted to permit the passage of the impact-pin. The spring of the detent 14 tends to press the engaging end of the detent out over the stop 16, and when the pendulum approaches the limit of its swing in one direction—to the right in this instance—the impact-pin strikes the arm of the detent, raises it away from the impulse-bar, carries the detent clear of the stop, and slightly raises the impulse-bar. (See Fig. 1.) The spring of the detent is put under slight tension by the upward pressure of the impact-pin, and such tension tends to lift the impulse-bar. Consequently the sole function performed by the pendulum is to take the impulse-weight yieldingly at the end of its side swing in one direction. The elasticity of the detent forms a yielding cushion against which the pendulum presses through the intervention of the impact arm and pin therefor, the yielding resistance is inconsiderable and uniform, and the result of such yielding resistance is to give the weight of the impulse-bar to the impact-arm without imparting sudden stop or jar to the pendulum. The initial resistance of the detent-spring is infinitesimal as compared with the momentum of the pendulum. The resistance increases as the arm is raised, and as the stress of the resistance of the spring is imparted to the impulse-weight with gradually-increasing force the weight seats itself on the impact-arm without jar or noise. Thus the act of releasing the impulse-weight, which is the only duty imposed on the pendulum, becomes beneficial instead of detrimental. The swing of the impulse-bar is practically concentric with the swing of the pendulum; but to make allowance for the possibility of divergence of the impact-arm from the point of contact with the impulse-weight the impact-pin is adapted to swing vertically on knife-bearings and neutralize any friction that might by any possibility develop. The side pressure of the impact-arm is below the flat spring of the pendulum, and the tendency of side pressure to bend the spring abnormally to one side is practically neutralized by the downward pressure on the extended end of

the impact-arm. The impact-pin may be adjusted to conform to the arc of the pendulum by means of the set-screw 6.

The pendulum is relieved of all mechanical and electrical work, so that nothing may interfere with the uniformity of its oscillations, and the means employed to effect this result are as follows: A magnet 28 has an armature 29. The armature is attached to a swinging bar 30, which connects with foot-post 32. The swinging end of the bar 30 extends under the impulse-weight and raises such weight when the magnet is energized. A contact-arm 23 is supported at one end from foot-post 25 by means of an intervening spring, and the swinging end of the contact-arm has a weight 24, and in the end of the weight is a contact-point 27. A flat spring 34 constitutes the companion contact element. Such spring is sustained at one end in a foot-post 36, and its lower end 35 is extended obliquely under the contact-point 27. An elastic strut-bar 19 has a bearing 20, adapted to normally rest under a projection 26 of weight 24 and hold the point 27 out of contact with spring 34. The strut has an extension 21, that runs parallel with the impulse-weight, and the impulse-weight has a lateral extension 17 18, that projects above the extension of the strut. A spring-pawl 37 on swinging bar 30 engages ratchet-teeth 38 of the primary wheel of a train of clock-gearing, and a stop 39 engages the end of the pawl at the end of its stroke and prevents the ratchet-wheel from moving more than the space of a tooth. The strut 19 is sustained in a foot-post 22.

When the impulse-weight is taken up by the impact-arm, as shown in Fig. 1, the point 27 is held from contact-spring 34, the magnet is cut off from its source of energy, and the armature is held out of contact with the magnet by its own weight and by the weight of bar 30 and pawl 37. By the time the pendulum has swung to the position shown in Fig. 2, for instance, the extension 17 18 of the impulse-weight has struck the arm 21 of strut 19 and carried the stop-bearing 20 clear of the projection of the contact-weight. When this occurs, the point 27 falls in contact with the inclined end 35 of spring 34, as shown in Fig. 2, and establishes an electrical circuit, in which the magnet is included. As soon as the magnet is energized the armature is drawn toward the poles of the magnet, as shown in Fig. 3, the bar 30 raises the impulse-arm, a finger 33 on the armature raises the weighted end of the contact-arm, thus breaking the circuit, and the armature falls back to its original position, leaving the impulse-weight sustained by post 16 through the detent 14 and the contact-arm sustained by the strut. The pendulum then completes its swing to the left and on returning to the limit of its swing to the right again receives the impulse-weight preparatory to a repetition of the described operation. When the armature is raised by the magnet, as shown in Fig. 3, the pawl 37 engages a tooth of the ratchet-wheel preparatory to imparting motion thereto, and when the armature falls after the contact is broken it forces the ratchet-wheel around the space of one tooth. The contact-point 27 strikes the spring 34 glancingly or obliquely and tends to keep the contacts clean by the sliding action.

I claim—

1. In an electric clock, the combination of a pendulum, a horizontal impulse-weight pivoted at one end, a spring-detent on the swinging end of the impulse-weight, a fixed stop to engage the detent and hold the weight raised, and an impact-arm on the pendulum that forces the spring-detent clear of the stop and receives the impulse-weight, substantially as described.

2. In an electric clock, the combination of a pendulum, a horizontal impulse-weight bar pivoted at one end, a spring-detent on the swinging end of the impulse-weight, a fixed stop to engage the detent and hold the weight raised, a lateral extension of the detent in line with the weight and an impact-arm on the pendulum adapted to engage the lateral extension of the detent, force the detent clear of the stop and receive the weight of the impulse-bar through the extension of the detent, substantially as described.

3. In an electric clock, the combination of a pendulum, a horizontal impulse-weight pivoted at one end and having a vertical slot in the opposite end, a spring-detent on the swinging end of the weight, an extension of the detent overlapping the slot in the weight, a stop to engage the detent and hold the weight raised, and an impact-arm on the pendulum adapted to extend through the slot in the weight and engage the extension of the detent, substantially as described.

4. In an electric clock, the combination of a pendulum, a horizontal impulse-weight pivoted at one end and having a vertical slot in the opposite end, a spring-detent on the swinging end of the weight, an extension of the detent overlapping the slot in the weight, a stop to engage the detent and hold the weight raised, an impact-arm on the pendulum and a vertically-swinging pin in the end of the arm adapted to extend through the slot of the weight and engage the extension of the detent, substantially as described.

5. In an electric clock, the combination of a pendulum, a horizontal impulse-weight pivoted at one end, a spring-detent on the swinging end of the impulse-weight, a stop to engage the detent and hold the weight raised, an impact-arm to release the detent and receive the weight, a flat spring connecting the arm with the pendulum, and a set-screw in the arm bearing against the pendulum, substantially as described.

6. Clock-impelling mechanism, comprising a pendulum, an impulse-weight for the pen-

dulum, a magnet and armature to raise the weight, a self-closing electrical contact held open by a detent, a detent to hold the impulse-weight raised, an arm on the pendulum which receives the weight by the act of releasing it, a trip on the weight that releases the detent of the electrical contact as the weight descends, means for breaking the circuit by the act of raising the weight, and clock-gearing actuated by the armature, substantially as described.

In testimony whereof I sign my name in the presence of two subscribing witnesses.

ROBERT JAMES FLINT.

Witnesses:
L. R. GRAHAM,
MABEL A. DURFEE.