(No Model.)

V. HIMMER.

SECONDARY ELECTRIC CLOCK.

No. 294,131. Patented Feb. 26, 1884.

Fig. 3,

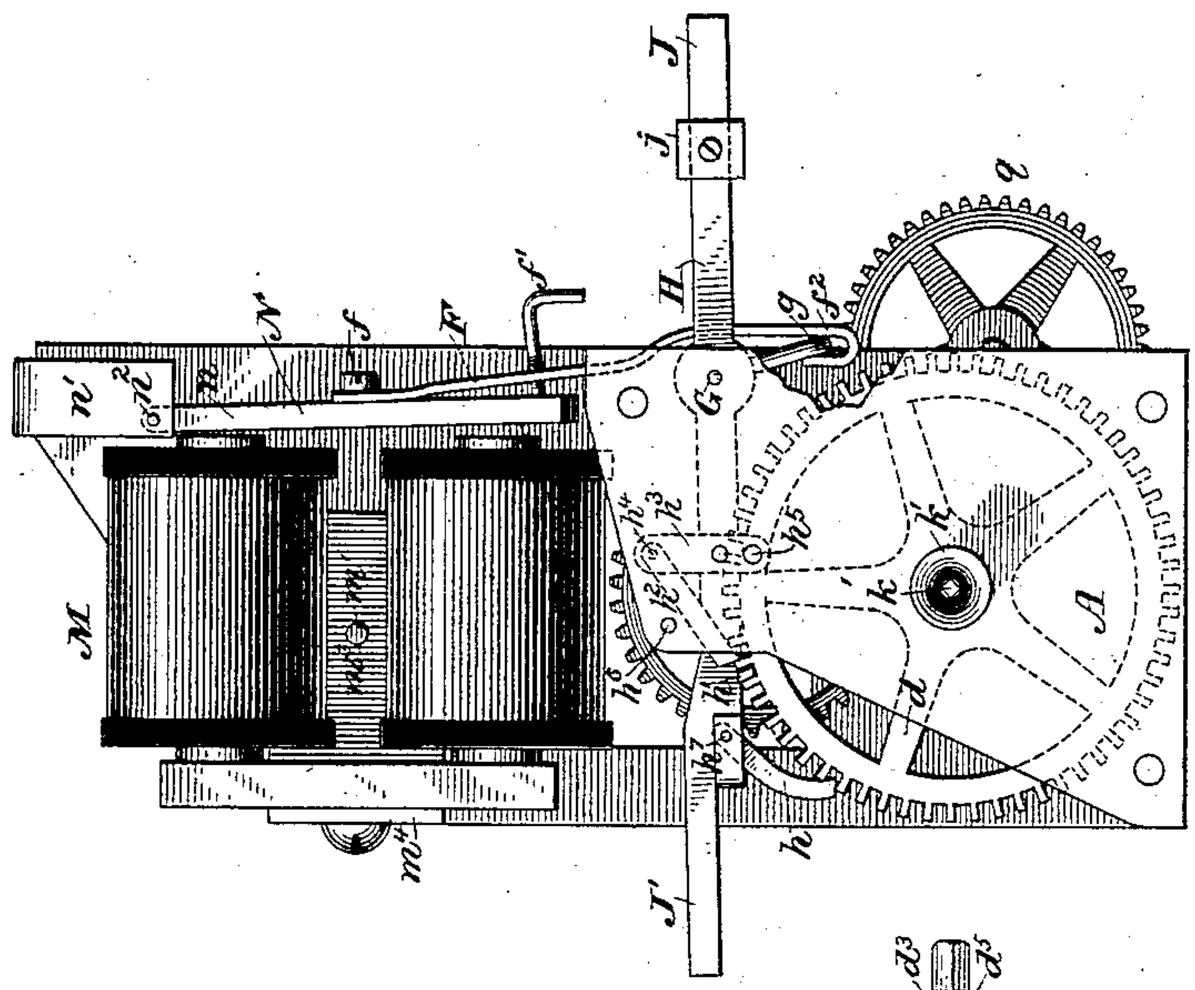


Fig. 2,

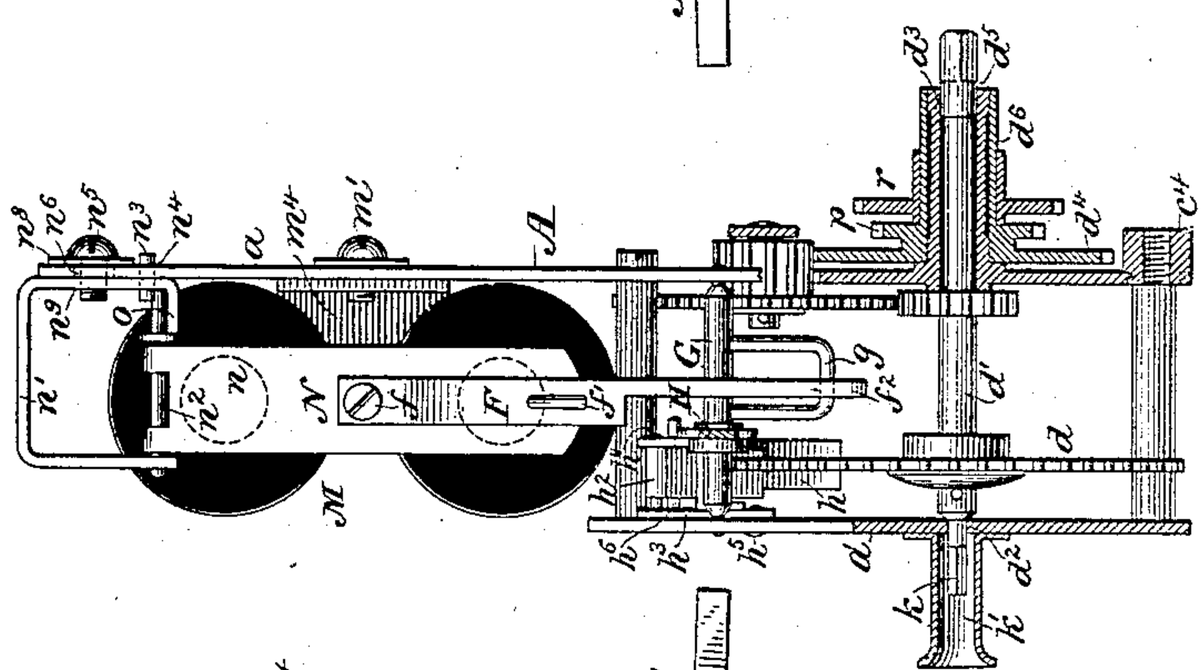
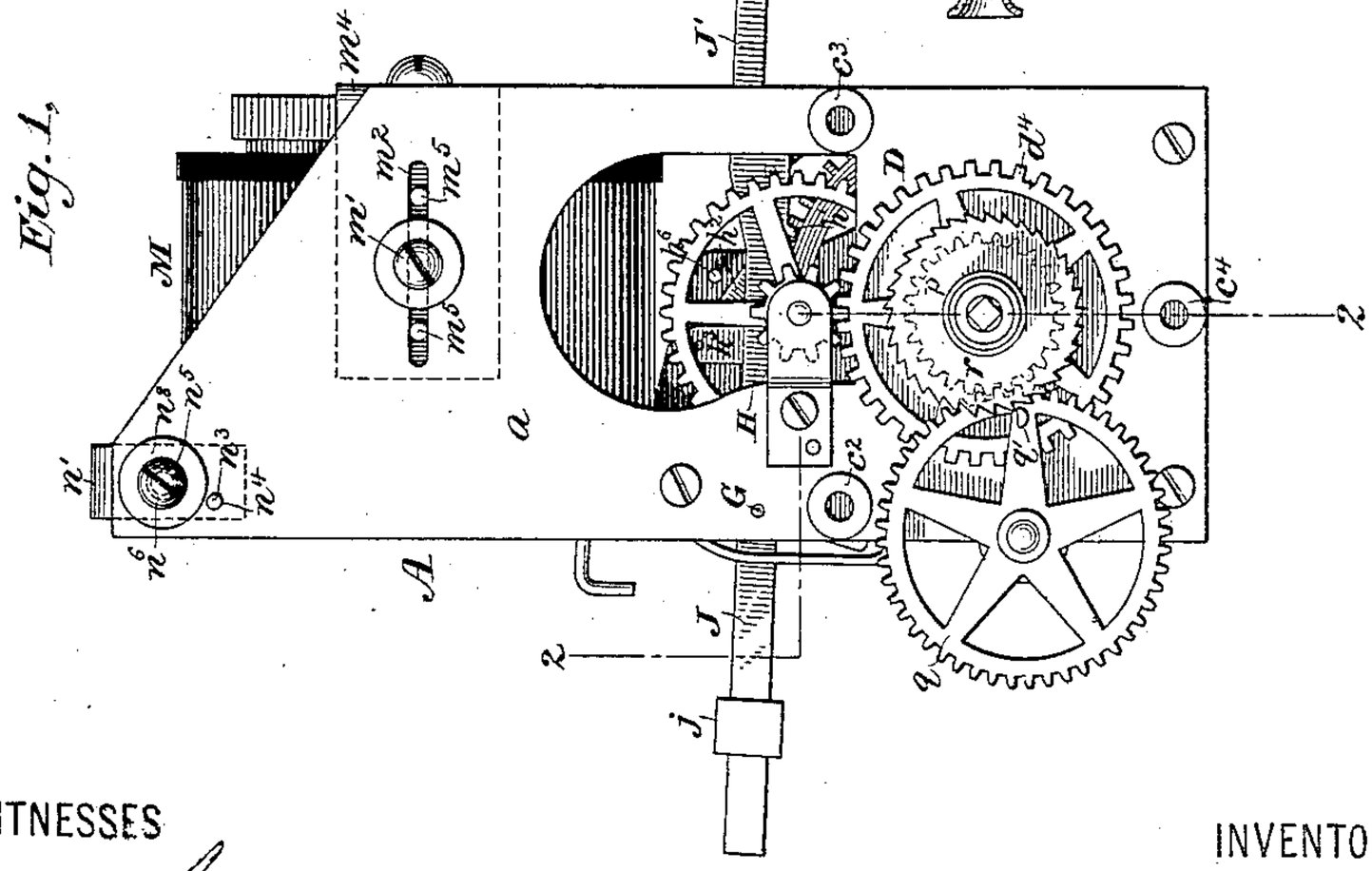


Fig. 1,



WITNESSES

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UNITED STATES PATENT OFFICE.

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SECONDARY ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 294,131, dated February 26, 1884.

Application filed April 6, 1883. (No model.)

To all whom it may concern:

Be it known that I, VITALIS HIMMER, a citizen of the United States, and a resident of New York, in the county and State of New York, have invented certain new and useful Improvements in Secondary Electric Clocks, of which the following is a specification.

My invention relates to certain improvements in the construction of clock mechanisms the movements of which are controlled through the action of electro-magnets periodically vitalized by electric currents automatically transmitted therethrough.

The object of the invention is to simplify the construction of secondary clocks of this character, and to secure accuracy and reliability in the movements of the same.

The invention comprises certain means for adjusting the positions of the electro-magnet and its armature relative to each other, and devices for communicating the movements of the armature to a system of wheels for actuating the hands of the clock, and for reducing to a minimum the friction of the moving parts, thereby decreasing the motive power required for actuating the same.

The invention also comprises certain details of construction, which will be hereinafter fully described.

In the accompanying drawings, which illustrate my invention, Figure 1 is a front elevation of a secondary clock embodying the features of my invention. Fig. 2 is a side elevation, partly in section; and Fig. 3 is a rear elevation of the same.

Referring to the drawings, A represents a supporting-frame for the various parts of the mechanism. The minute and hour hand wheels d and d^4 are revolved in their proper relative periods through the intervention of a system of wheels actuated by an electro-magnet, M, in a manner hereinafter described. The electro-magnet M is adjustably supported upon a plate, a, of the frame A by means of a set-screw, m', extending through an elongated aperture, m^2, in the plate, and into a nut, m^3, formed in a bracket, m^4, rigidly attached to the electro-magnet. Two pins, m^5 m^5, project from the bracket m^4 through the slot m^2 in the plate a, and prevent any other than a longitudinal movement of the electro-magnet for the purpose of adjustment.

In front of the poles of the electro-magnet M is placed an armature, N, which is pivoted at one extremity, n, in a suitable bracket, n', embracing the extremity of the armature. A right-angled extension, o, of the bracket prevents a lateral movement of the armature upon its pivot n^2. The pivot n^2, which supports the armature N, extends through the bracket upon both sides of the armature, and is securely headed over, to prevent its displacement. The bracket n' is itself adjustably supported upon the plate a of the frame A by means of a pin, n^3, projecting from the face of the bracket adjacent to the plate, and extending through an aperture, n^4, formed therein. The aperture n^4 is of such size as to permit the entrance of the pin n^3, and at the same time prevent any lateral movement of the bracket with reference to the plate a. A set-screw, n^5, is provided for binding the bracket in any required angular position. The screw n^5 screws into a nut, n^9, formed in the adjacent face of the bracket n', after passing through an aperture, n^6, in the plate a, which aperture is of greater diameter than the shank of the screw. A washer, n^8, is preferably placed between the head of the screw and the outer face of the plate a, for the purpose of preventing the latter from entering the aperture.

It will be understood from an inspection of the drawings that if the bracket n' be turned upon the pin n^3 as a center the pivoted extremity of the armature will be carried toward or away from the confronting pole of the electro-magnet M. When the armature has thus been placed in the desired proximity of the electro-magnet, it is secured in such position by means of the screw n^5. The aperture n^6, instead of being round, may be in the form of an arc of a circle, the center of which coincides with the pin n^3.

A resilient arm, F, is attached to the armature N, preferably by means of a screw, f. An adjusting-screw, f', extends through this arm and abuts the adjacent face of the armature. By turning the screw f' to a greater or less distance through the flexible arm F, the latter may be sprung away from the armature to a

greater or less degree, as required for the purpose of adjustment, as hereinafter rendered apparent. The lower extremity of the arm or armature-lever F is preferably turned back upon itself, as shown at f^2, and the hook thus formed embraces a yoke, g, carried upon an arbor, G. The yoke g preferably consists of a stout wire loop, the extremities of which are securely fastened within the arbor G. It may, however, consist of a solid plate provided with two projections extending through the arbor and riveted in the same manner as the ends of the wire loop.

It will now be understood that each time the electro-magnet M is vitalized and the armature N is drawn into proximity to its poles the arbor G will be rotated through an arc dependent upon the movement of the armature. The armature is normally held away from the poles of the magnet through the influence of gravity, acting through a lever and weight, hereinafter described, to rotate the arbor G in the direction opposite to that in which it is actuated by the vitalization of the electro-magnet. The lever last referred to is employed for communicating the retrograde movements of the armature N to the system of wheels D. The lever consists of an arm, H, rigidly mounted upon the arbor G, and carrying a pawl, h, and stop h'. The pawl h is supported near the extremity of the arm H in a bracket formed by turning a portion of the arm back upon itself, the pawl being pivoted between the body of the arm and the portion thus bent. The pin h^1, which forms the pivot for the pawl, is preferably headed over at both extremities, to prevent it from being accidentally displaced. The movements imparted to the arbor G by the vibrations of the armature N will convey to the pawl h a sufficient movement to cause the end thereof which rests upon the periphery of the first wheel, d, of the system D to advance the same through an arc subtended by a single tooth at each vibration. The number of teeth upon the wheel d is so arranged with reference to the remaining wheels of the system that if the electro-magnet be vitalized at regular intervals of time—for example, once per minute or once per second—the hands of the clock will be caused to move over the dial at the proper rate to indicate the correct time.

The stop or detent h' is provided for preventing the momentum obtained by the wheel d through the action of the pawl h from causing the same to advance more than one tooth at each impulse. For this purpose the stop h' is constructed to enter the space between two adjacent teeth and engage a tooth of the wheel, when the lever H is actuated in the direction opposite to that in which it is impelled through the influence of the electro-magnet M. It will not, however, so enter and engage a tooth until the wheel d has been advanced through the space occupied by a tooth and an intervening space by the action of the pawl. In the drawings I have represented the stop h' as formed by striking out a portion of the arm H and bending it at right angles to the length of the arm. In some instances, however, it may be found desirable to construct this stop of a separate piece of metal secured to the lever in any suitable manner.

For the purpose of preventing a retrograde movement of the wheel d, a dog, h^2, is provided, the extremity of which rests upon the periphery of the wheel d and normally engages the opposite side of the tooth at any time engaged by the stop h'. The dog h^2 is pivoted in a bracket, h^3, by means of a pin, h^4, extending through an arm of the bracket upon each side of the dog, and the extremities of the pin are preferably headed over. The bracket h^3 is secured in the proper position above the wheel d upon the plate a' of the frame A by means of a screw or rivet, h^5, which permits of a lateral adjustment of the pawl. A suitable stop, h^6, is provided for limiting the movement of the lever H. The arm F is made flexible, as before mentioned, and the object of this construction is to permit the armature to slightly approach the electro-magnet independently of the movement of the arm H, when the movement of the latter has been arrested. This movement of the armature will cause the arm F to bend slightly, and the resilience of the same will act to impel the armature away from the poles of the electro-magnet immediately upon the cessation of the current traversing its coils.

For the purpose of adjusting the mechanism as may be necessary to compensate for the weight of the hands and similar contingencies, an extension, J, is provided for the lever H, upon which is placed a movable weight, j. This extension and weight act as a counterpoise for the lever and its pawl, and by means of it the parts may be nicely adjusted for effecting the retraction of the armature N and the advance movement of the hands. A similar extension, J′, may be provided at the opposite extremity, which extension is to be employed when considerable force is required to actuate the mechanism. In employing this extension J′, the weight j is to be removed from the extension J and placed in the required position upon the extension J′, the essential feature of the adjustment being that the effect of the counterbalancing-weight be sufficient to occasion an advance movement of the hands of the clock.

For the purpose of rendering the friction between the moving parts as slight as possible, the contact-surface of the arbor d' of the wheel d is reduced in the following manner: One extremity of the arbor is provided with a bearing, d^2, in the plate a', in the usual manner. The opposite extremity extends through the hollow axle d^3 of the hour-hand wheel d^4. Instead, however, of bearing upon the interior of this axle throughout its entire length, in the usual manner, I form the greater portion of the arbor of such size that it will not touch the inner surface of the hollow axle d^3 at any point

other than near its outer extremity, the arbor being there provided with an annular enlargement, d^5, of such size as to afford it a suitable bearing. This construction not only greatly reduces the friction, but affords a firm support for the wheel d at each extremity of the arbor, and renders it much easier to oil the same when necessary. The extremity k of the arbor d', projecting through the plate a', is preferably made square, for receiving a suitable key when it is desired to set the hands of the clock. For the purpose of more readily applying the key to the post k thus formed, a guide, k', surrounds the same, and extends outward to such a distance as may be necessary. The guide k' preferably consists of a tube, the inner end of which is secured to the plate a', while the outer end is cut open any required distance and the sections bent away from each other, forming a funnel-shaped guide.

The dial of the clock is secured to the plate a of the frame A by means of screws entering three equidistant hollow nuts, c^2, c^3, and c^4, formed upon the face of the plate. These nuts are made equidistant, for the purpose of rendering it less difficult to determine the points at which the apertures for receiving the screws are to be formed in the dial than in the ordinary construction, in which the nuts are not placed at regular distances.

In the drawings I have represented a train of wheels, $p\ q\ r$, for revolving a calendar-hand (not shown) in front of the dial for indicating the days of the month. The wheel p is for this purpose rigidly mounted upon the quill d^6 of the hour-hand wheel d^4, and carries twenty-four teeth. These teeth engage the teeth of the wheel q, which are forty-eight in number, causing it to revolve once in twenty-four hours. From the face of the wheel q projects a pin, q', which once in each revolution engages the wheel r, causing it to advance one tooth. The number of teeth on the wheel r is thirty-one, and the step-by-step motion thus imparted is employed for indicating upon a dial the successive days of the month, in a manner well understood.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of the toothed wheel, the pawl and lever for actuating the same through the influence of gravity, the electro-magnet, its armature and armature-lever, for actuating said pawl and lever in the direction opposite to that in which they are actuated by gravity, and one or more pins, and the set-screw for adjusting the position of said electro-magnet with reference to said armature.

2. The combination, substantially as hereinbefore set forth, of the electro-magnet, the adjustably-supported armature, the flexible armature-lever, the train of wheels, the lever and pawl for actuating said train of wheels, the arbor for supporting said lever, and a mechanical connection between said arbor and armature-lever, comprising a yoke or plate secured to said arbor and an extension of said armature-lever embracing both sides of said yoke or plate.

3. The combination, substantially as hereinbefore set forth, of an armature and armature-lever, an electro-magnet for actuating said armature and armature-lever, a lever supported independently of said armature-lever and actuated in one direction by the movements of said armature-lever and in the opposite direction by the force of gravity, an arm and an adjustable weight supported thereon for modifying the active influence of gravity upon said lever, a pawl carried upon said lever, and a train of wheels actuated by said pawl and lever when the latter responds to the action of gravity.

4. The combination, substantially as hereinbefore set forth, of the train of wheels, the pawl and lever acting, when actuated in a given direction by force of gravity, to advance said train of wheels, means, substantially such as described, for actuating said lever in the opposite direction, an adjustable weight for modifying the active influence exerted by gravity upon said lever, and two arms or extensions, respectively extending upon opposite sides of the supporting-arbor of said lever, each of which arms is adapted to receive said adjustable weight.

5. The combination, substantially as hereinbefore set forth, with a toothed wheel, of a propelling-lever constructed from a single piece of metal and provided with a bracket for supporting a pawl, a stop or detent for engaging the teeth of said wheel, and an arm for receiving an adjustable weight, said bracket, stop, and arm being each integral with said lever.

In testimony whereof I have hereunto subscribed my name this 5th day of April, A. D. 1883.

VITALIS HIMMER.

Witnesses:

DANIEL W. EDGECOMB,

CHARLES A. TERRY.