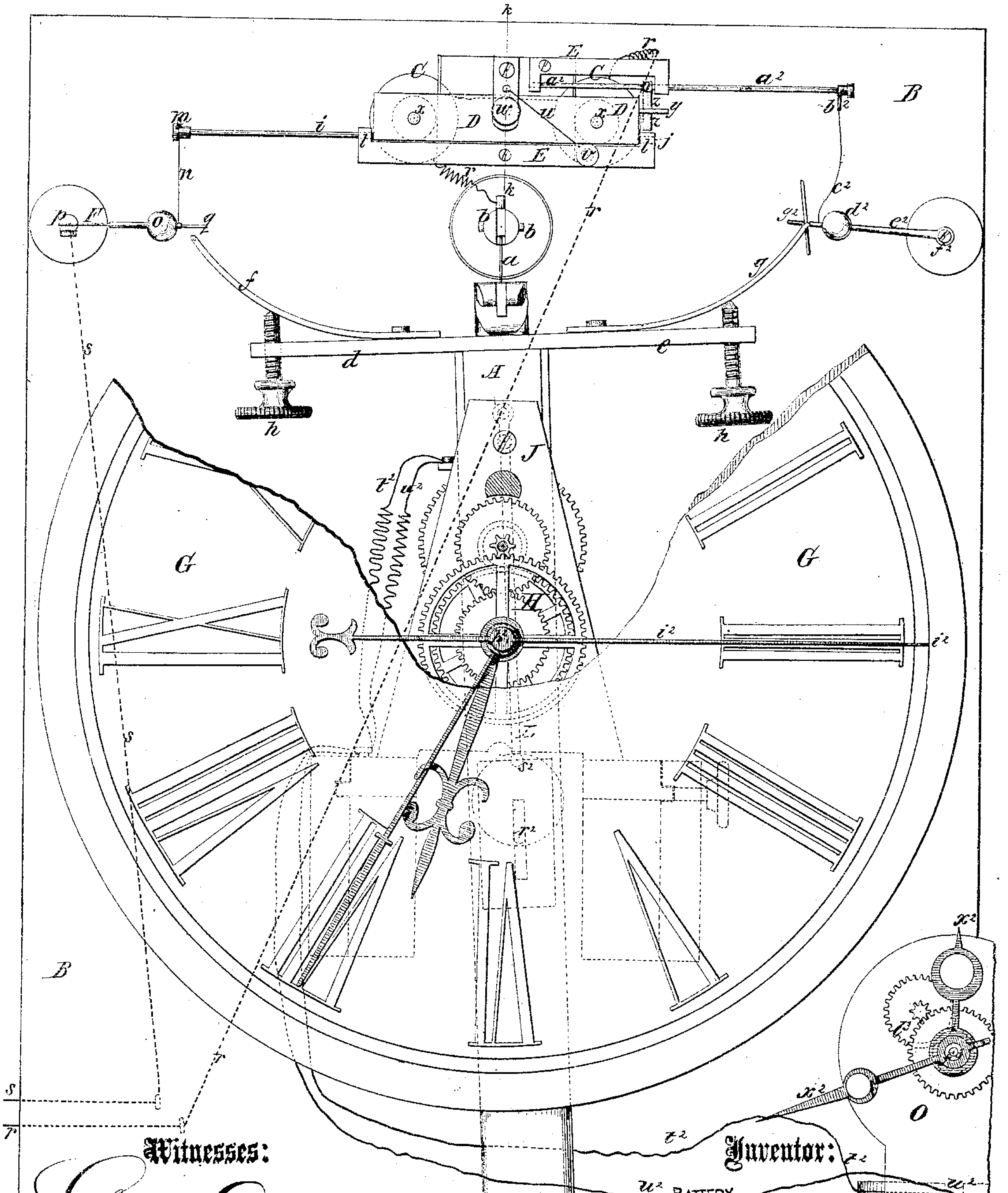
V. HIMMER.

Improvement in Electric-Clocks.

No. 127,483. Patented June 4, 1872.

Fig. 1.



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3 Sheets--Sheet 2.

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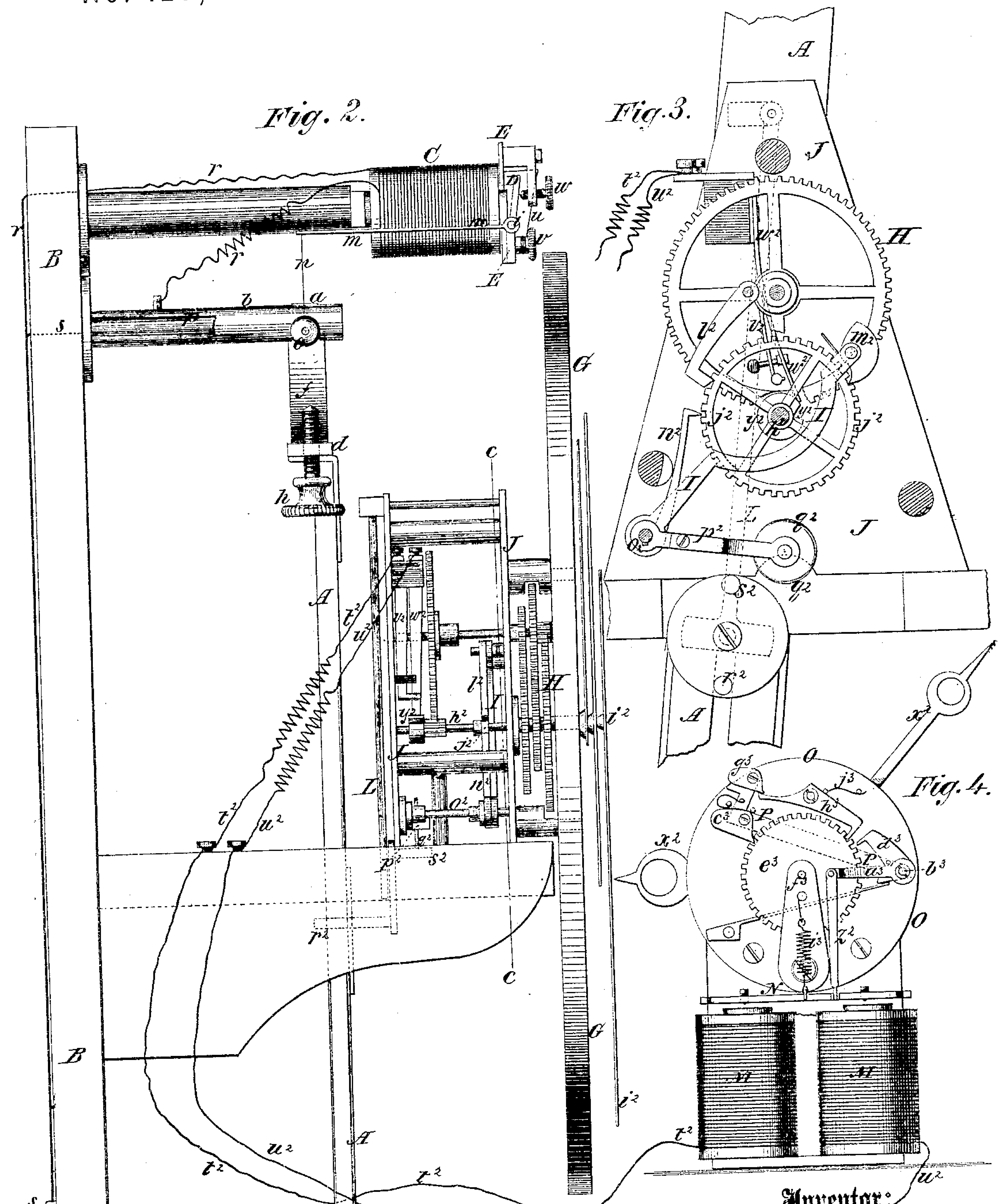

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Fig. 5.

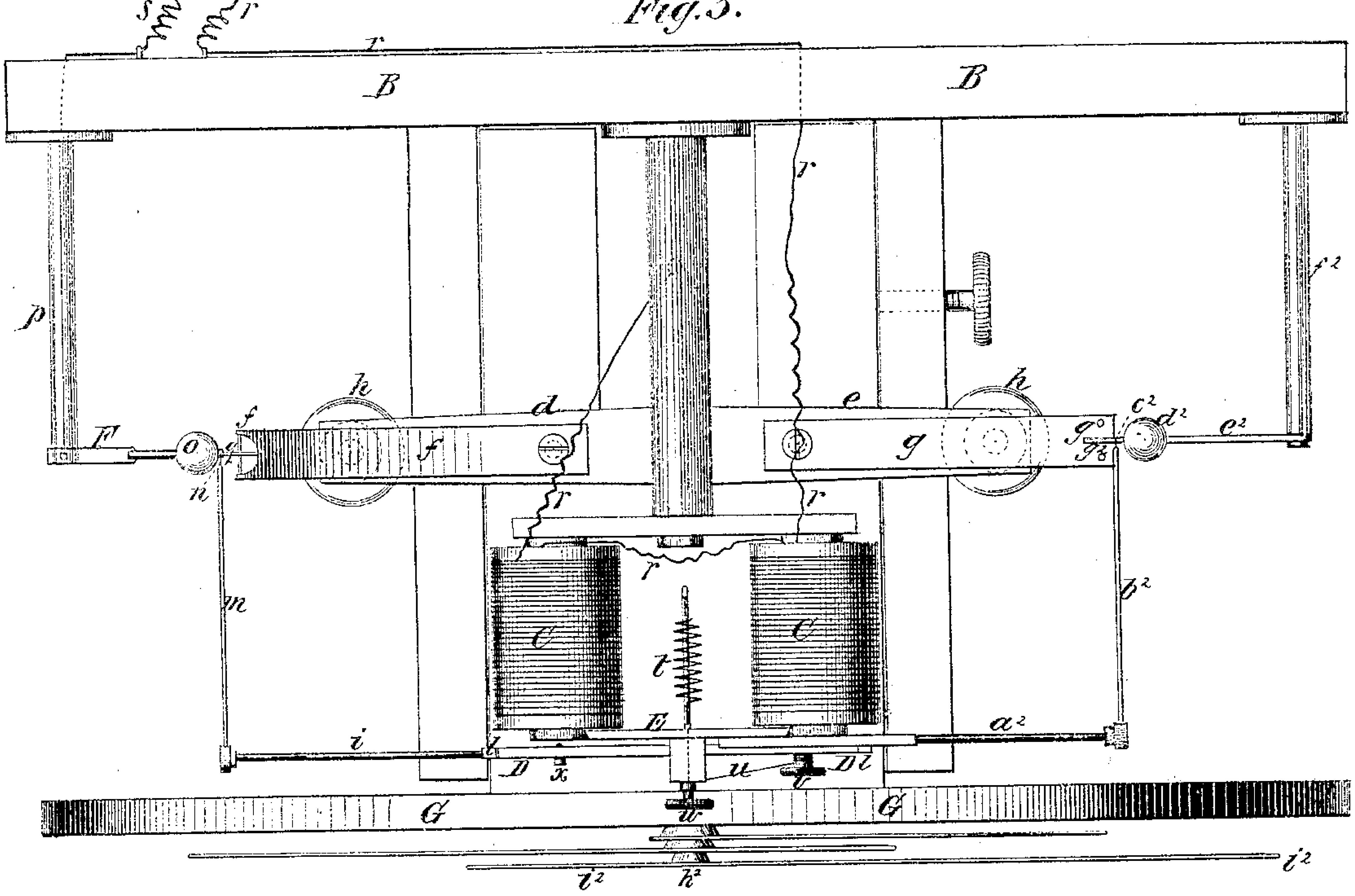


Fig. 6.

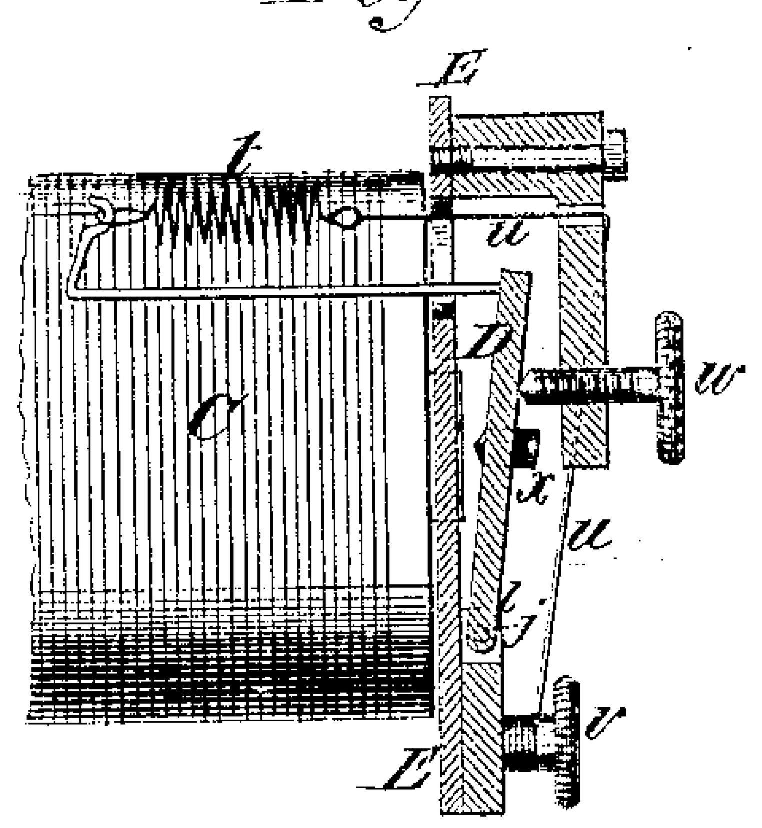
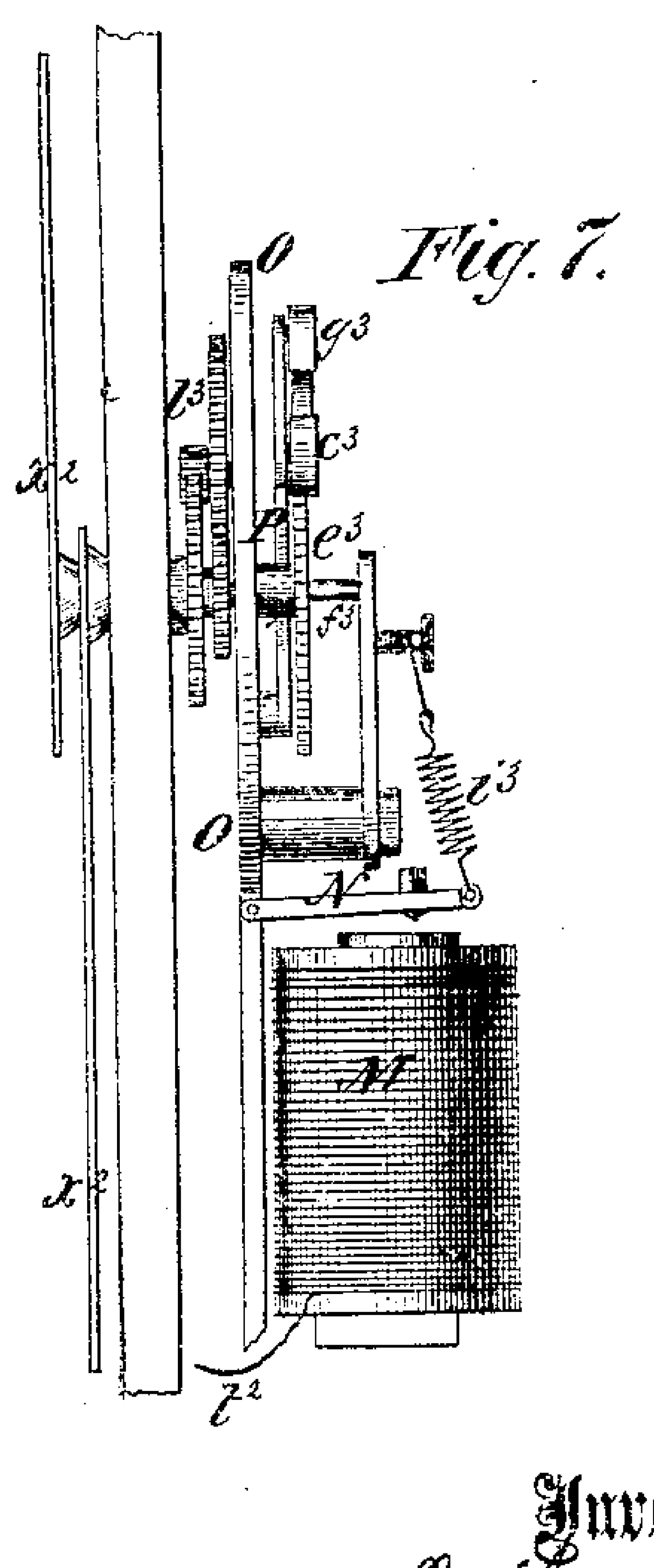


Fig. 7.



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UNITED STATES PATENT OFFICE.

VITALIS HIMMER, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF AND GUSTAVE AUTENRIETH, OF SAME PLACE.

IMPROVEMENT IN ELECTRIC CLOCKS.

Specification forming part of Letters Patent No. 127,483, dated June 4, 1872.

Specification describing a new and Improved Electric Clock, invented by VITALIS HIMMER, of the city, county, and State of New York.

This invention relates to several improvements in the mechanism for actuating clock-work by electricity, and is, in reality, a perfection of the principles developed in the invention for which Letters Patent of the United States were granted to me on the 4th day of January, 1870, and numbered 98,594. The present invention consists, first, in an improvement of the mechanism for regulating and sustaining the pendulum vibration. In this I employ two drop-weights, instead of the one formerly described—one on each side of the pendulum—to give the impetus to the new motion. One of the drop-weights serves to establish a circuit when it is in metallic contact with the pendulum, and while bearing on the same to make it move to break such circuit. The invention consists, secondly, in a new means of converting the vibrating motion of the pendulum into rotary motion of the train of gear-wheels by which the hands of the clock are moved. In this I employ a friction-wheel on the pawl-shank, to be actuated by a pin that is swung by and with the pendulum. A minimum of friction is thereby insured, particularly as the train is really moved by the dropping of the pawl-shank by its own weight, the office of the pendulum being only to raise the pawl-shank while without direct connection with the gear. Thirdly, the invention consists in a new attachment to the arbor of the second-hand of the clock, whereby, once during every revolution of said arbor, or at shorter intervals, metallic connection is established between two conductors of electricity that lead to a second or secondary clock-work, actuating the same when the circuit is established. This attachment consists simply of a notched cam, against whose periphery the end of a spring bears. When said spring drops into a notch it comes also in contact with a metal strap or object, whereby the desired electric connection is established. Finally, the invention consists in the arrangement of the above-mentioned secondary clock, principally in the connection of its armature-lever with the pawl mechanism that moves the train, and in the new pawl mechanism for insuring exactness of motion, all as hereinafter more fully described.

In the acompanying drawing, Figure 1 represents a face view, partly in section, of my improved electric clock, and also of the secondary clock connected therewith. Fig. 2 is a side view of the main clock. Fig. 3 is a vertical section of the same on the line C C, Fig. 2, and Fig. 4 a back view of the secondary clock. Fig. 5 is a top view of the main clock; Fig. 6, a detail vertical section, on an enlarged scale, through the armature-lever of the same, the line K K, Fig. 1, indicating the plane of section. Fig. 7 is a side view of the secondary clock.

Similar letters of reference indicate corresponding parts.

A in the drawing represents the clock-pendulum. Its upper end is, by a flexible spring, *a*, or otherwise, connected with a horizontal pin, *b*, which is firmly secured to the supporting-frame or standard B. At or near the upper end the pendulum is provided with two arms, *d* and *e*, projecting horizontally, or nearly so, in opposite directions. These arms carry on their upper surfaces metallic springs *f* and and *g*, respectively, said springs being bent upward more or less by screws *h*, as clearly shown in Fig. 1. Above the pin *b* is secured to the standard or post B an electro-magnet, C. The armature-lever D of this magnet vibrates on trunnions *i* and *j*, which project from its ends near the lower edge into ears *l* of a plate, E, that is rigidly connected with the electro-magnet. One of the trunnions, *i*, extends beyond the plate E, and has at its end an arm or crank, *m*, whose end is above that of the spring *f*. By means of a hair or thin thread, *n*, the crank *m* is connected with the weighted end or ball *o* of a spring, F, that is attached to a metallic pin, *p*, projecting from the standard B. A pin, *q*, on the ball or weight *o*, is just above the end of the spring *f*. The battery by which the electric power for working the clock is derived is by metallic conductors *r* and *s*, respectively, connected with the electro-magnet C and pin *b*, and with the pin p, as is clearly indicated in Fig. 1. When the pin q of the weight o is in contact with the spring f the circuit is closed—otherwise not; and when the circuit is closed the armature D is attracted toward the magnets C, while otherwise it is withdrawn therefrom by a spring, t. The spring t is, by a cord, u, connected with a screw, v, that is fastened in the plate E. By means of this screw v the tension of the spring t can be regulated. The outward motion of the armature D, which is produced by the spring t, can be more or less reduced by means of a screw, w, fitted into an overhanging arm of the plate E, as is clearly indicated in Figs. 2 and 6. The inward motion of the armature—*i. e.*, that toward the magnets—can be regulated by screws x x, which are fitted through the armature to bear against the magnets, as shown. By these means, therefore, the movement of the armature can be fully controlled, in order to insure the desired effect, one way or the other, upon the pendulum, and bringing the power of the battery into the requisite correspondence with the devices to be kept in motion thereby. That end of the armature D to which the trunnion j is attached has, above said trunnion, a projecting pin, y, which is in contact with a crank, z, of a horizontal arbor, a^2, that hangs in the upper part of the plate E. The outer end of the arbor a^2 has a projecting crank, b^2, whose end is above the end of the spring g, and which is, by a string or hair, c^2, connected with a weight, d^2, that is attached to a rod, e^2, pivoted to the end of a suitable support, f^2. A pin, g^2, on the weight d^2, is just above the upper end of the spring g, and drops upon the same when the thread c^2 is slack, as in Fig. 1. It will be noticed that the cranks m and b^2 are, by the motions of the armature D, swung in opposite directions, one going up when the other descends, and vice versa. This causes the raising of the weight o when the weight d^2 is lowered, and vice versa. When the pendulum swings into the position shown in Fig. 1, raising the arm e, the circuit through the conductors r s is interrupted, and the armature consequently drawn off, the electro-magnets, by the spring t, thereby causing the crank b^2 to be lowered and m raised. The lowering of the crank b^2 allows the weight d^2 to drop its pin g^2 upon the end of the spring g, in the manner clearly shown in Fig. 1. The weight thus applied to one side of the pendulum, which is already about to swing back and beyond the vertical position, gives the impetus necessary to carry the pendulum back to the full extent of its stroke until the spring f comes in contact with the pin q. This will establish metallic connection between the conductors r s, and cause the immediate attraction toward the electro-magnets of the armature, and the consequent lowering of the crank m and slacking of the thread n. The weight o will then fully bear on the spring f, and act on its side of the pendulum in exactly the same manner as the weight d^2 acted on the other side during the former stroke. The return move of the pendulum, to which the impetus was given by the weight o, causes the separation of the spring f from the pin g, and a consequent cessation of the electric circuit and current, as also the subsequent descent of the weight d^2 upon the spring g, with the effect already specified. It is thus evident that the pendulum motion is, with the utmost regularity, kept up by the action of the two weights o and d^2, and that its strokes are, moreover, under complete control by the means specified. The springs f g, applied to the arms d e, as shown, are not necessary there, though convenient and desirable on account of their adjustability by means of the screws h. G is the clock-dial, and H the train of wheels for moving the hands. This train derives its motion entirely from an arbor, h^2, by proper gearing, of course. The arbor h^2 carries also the second-hand i^2 and a ratchet or gear wheel, j^2, with sixty teeth. Into the teeth of this wheel j^2 engage three different pawls l^2, m^2, and n^2, which are shown in Fig. 3. The pawl l^2 is merely a detainer to prevent rotation in the wrong direction. The pawl m^2 is pivoted to the end of the pawl shank or lever I, which hangs on a pin, o^2, of the frame J, that holds the train H. This pawl m^2 is the impelling-pawl. n^2 is a pawl, rigidly connected with the lever I, and serving to lock the wheel j^2, to prevent the impulse from carrying it further round than necessary. p^2 is an arm, projecting nearly in a horizontal direction from the lever I, and carrying a friction-roller, q^2, at its end. This roller q^2 acts also as a weight on the lever I, of such power as to be able to actuate the said lever and its pawls, and turn the hands and the train. Thus, when the arm p^2 is swung up it does not affect the wheel j^2, but drags the impelling-pawl m^2 up into position for taking action, and when then the arm p^2 is released its weight will cause it to drop and to make the pawl m^2 engage the wheel j^2, turning the latter one-sixtieth part of a revolution, and causing the second-hand to move once, while the train H will also be actuated to turn the other hands the space of one second. After the pawl m^2 has turned the wheel the pawl n^2 drops against the same and arrests it promptly, to define its motion. If the wheel j^2 has more or less than sixty teeth the proportion of motion of all parts will vary accordingly. The pendulum A receives, in a slot, the pin r^2, that projects from a diminutive pendulum, L, whose upper end is pivoted to the frame J. A pin, s^2, projecting forward from L, acts on the friction-roller q^2, and serves to set the lever I in motion. When the pendulum A vibrates the small pendulum L will swing with it, and will, in the middle of each stroke, have brought the pin s^2 directly under the middle of the roller q^2, thereby swinging the arm p^2 upward. At the end of each pendulum-swing the pin s^2 will have cleared the roller q^2, so that the arm p^2 will drop and turn the wheel j^2, the second-hand, and the train, in the manner above specified.

This arrangement of converting the oscillating motion of the pendulum into rotary motion of the train of wheels is a very important improvement on those now in use or heretofore proposed, as it is precise, absolute, and occasioning the least loss of power by friction, straining especially the pendulum less than ever before in relieving it from the task of actuating the train by its own direct motion.

Two wires, t^2 u^2, connect a battery, not shown, and an electro-magnet, M, with two spring-plates, v^2 and w^2, that are fastened to the frame J. When these two spring-plates are in metallic connection, the circuit through the wire t^2 u^2 and the electro-magnet is established, so that the armature N will be attracted to the magnet M, to impart motion to the train of a second clock and to its hands x^2 x^2. A disk, y^2, mounted upon the arbor h^2, serves to separate the two plates v^2 w^2, as the latter bears against its edge with its lower end, in the manner shown in Fig. 3. The disk y^2 has a notch in its edge. When, during the rotation of the arbor h^2, the end of the plate w^2 springs into this notch of the disk y^2, the plate w^2 bears against v^2, and closes metallic connection between the conductors t^2 u^2. The arbor h^2 being calculated to make one revolution per minute, it is evident that the armature N will be attracted once a minute. But when the disk y^2 has more notches than one, and the same or a different time of rotation, its effect upon the armature N will be varied accordingly. In this manner the main clock can be connected with a suitable number of secondary clocks, regulating their motions and creating the same by establishing the necessary metallic connections. In fact, the pendulum A can, if desired, only be caused to revolve an arbor, h^2, and thence actuate a series of distant clocks, without necessarily having a train, H, in direct communication with said arbor h^2, or, in other words, without operating a main clock. The armature N of the secondary clock is, by a rod, z^2, connected with an arm, a^3, of a lever, P, that is at b^3 pivoted to the frame O of the secondary clock. The lever P carries two pawls, c^3 and d^3, for contact with a toothed-wheel, e^3, which is mounted upon an arbor, f^3, whence motion is conveyed to the hands of the secondary clock. The lever P also carries above the pawl C^3 a pivoted click, g^3, which acts on a third pawl, h^3, that is pivoted to the frame O. A spring, j^3, throws the pawl h^3 against the edge of the wheel e^3, causing said pawl h^3 to serve as a detent for the wheel e^3, in the manner shown in Fig. 4. When the armature N is drawn down by the electro-magnets being charged, it first draws the click g^3 over the heel of the pawl h^3, and raises the same out of the teeth of the wheel e^3. Next the pawl c^3, which is pivoted to the upper end of the lever P, is drawn against the teeth of the wheel e^3, and turns the same until finally the pawl d^3, rigidly affixed to the heel of the lever P, engages the wheel e^3, and locks it, and at the same time the pawl h^3 springs in for like purpose, thus confining its movement. By this arrangement of triple pawls c^3, d^3, and h^3, the movement of the driving-arbor f^3 of the secondary clock is regulated and made very exact. As soon as the electric circuit through the magnets M is broken, the armature N is raised off the magnets by means of a spring, i^3, and the click g^3 slips over the heel of the pawl h^3 without affecting it in its detaining position; the spring j^3 holding said pawl against the wheel.

Motion is transmitted from the arbor f^3 to the hands x^2 by suitable gear-wheels l^3. If the arbor h^2 makes one revolution per minute, and has one notch in the edge of its disk y^2, the arbor f^3 will receive one impulse every minute, and will, provided the minute-hand is mounted upon it and the wheel E^3 has sixty teeth, move said minute-hand once a minute, and once around every hour.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The armature-lever D, connected with two weights, o and d^2, which are alternately let down upon arms projecting from opposite sides of a pendulum, as specified.

2. The crank m on the trunnions i of the armature D, arranged, in combination with the crank b^2, arbor a^2, and pin y, in such manner that the two cranks are affected in opposite directions by the motion of said armature, as specified.

3. The spring t, cord u, screw v, the screws w and x x, arranged, in combination with the armature D, substantially as and for the purpose herein shown and described.

4. The combination of the springs f g and screws h h with the projecting arms d e of a pendulum, as set forth.

5. The pawl-lever I, provided with the weighted arm p^2, which is raised by the pendulum, but drops by its own weight, to actuate the train of wheels and hands, as set forth.

6. The friction-roller q^2, applied to the arm p^2 of the lever I, to be acted upon by the pin s^2, substantially as herein shown and described.

7. The pawls l^2, m^2, and n^2, arranged, in combination with the lever I and wheel j^2, substantially as herein shown and described.

8. The pendulum A, combined with the diminutive pendulum L, pins r^2 s^2, and lever I, substantially as herein shown and described.

9. The disk y^2, applied to the arbor h^2, and notched at the edge, substantially as herein shown and described.

10. The spring-plates v^2 w^2, arranged on the clock-work, in combination with the conductors t^2 u^2 and notched disk y^2, as set forth.

11. The combination of the electro-magnet M and armature N of the secondary clock, by wires t^2 u^2, with the plates v^2 w^2 on the main clock, as set forth.

12. The combination of the armature-lever N with the lever P, pawls c^3 d^3 h^3, and click g^3, substantially as herein shown and described.

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