No. 637,454. Patented Nov. 21, 1899.

F. I. GETTY.

ELECTRIC CLOCK.

(Application filed Sept. 26, 1898.)

(No Model.) 4 Sheets—Sheet 1.

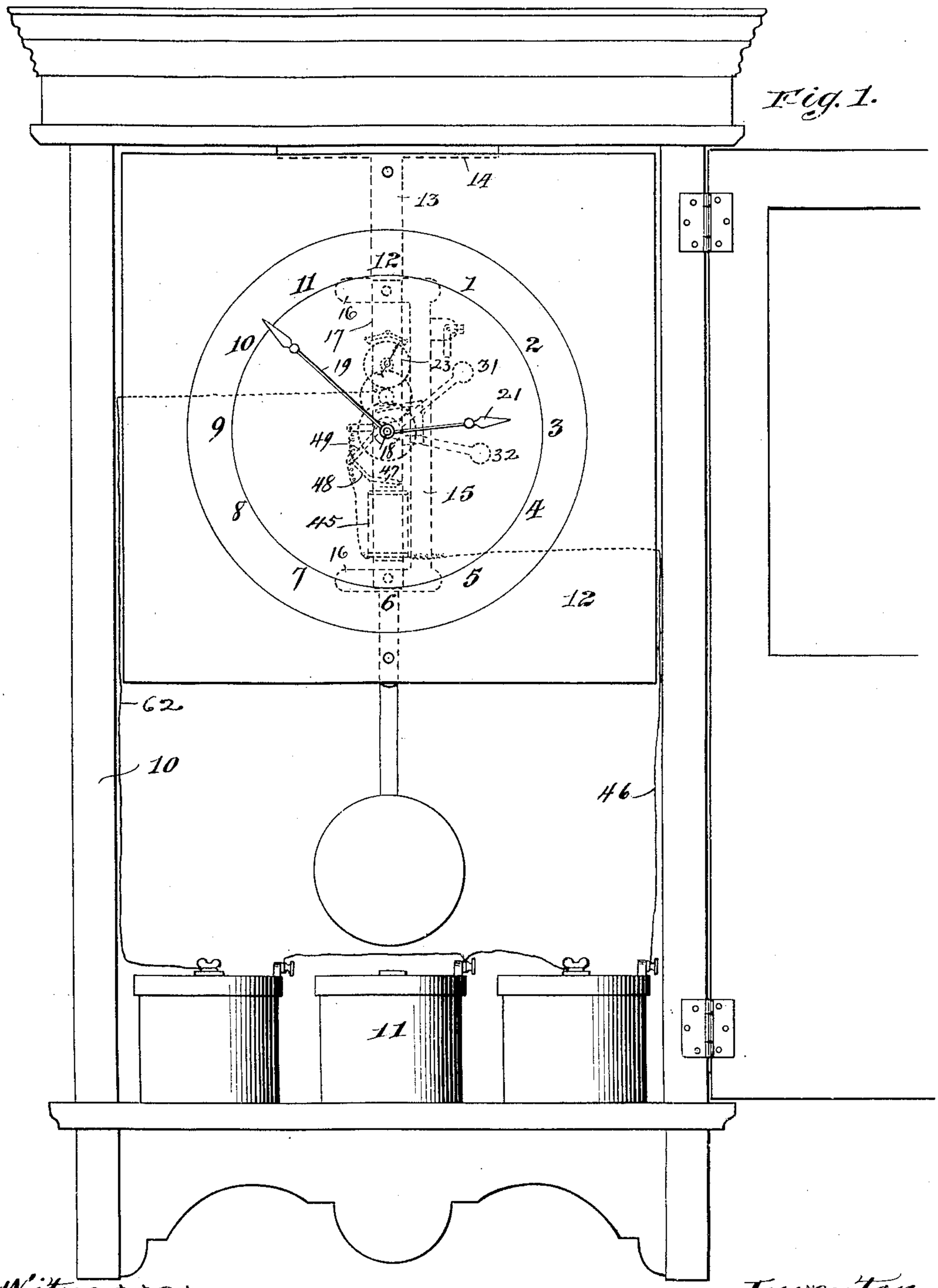

Fig. 1.

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Fig. 2.

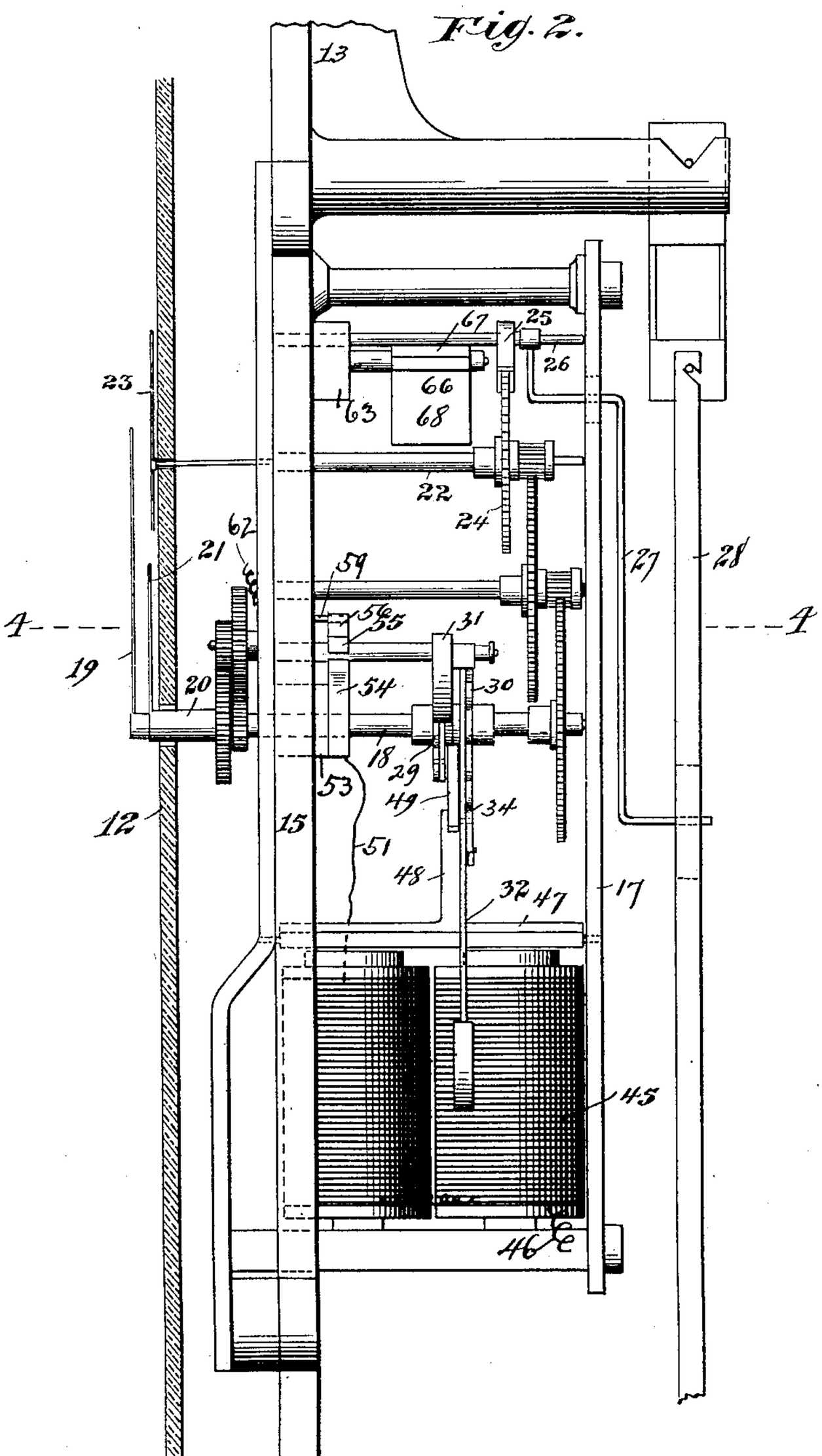

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Fig. 3.

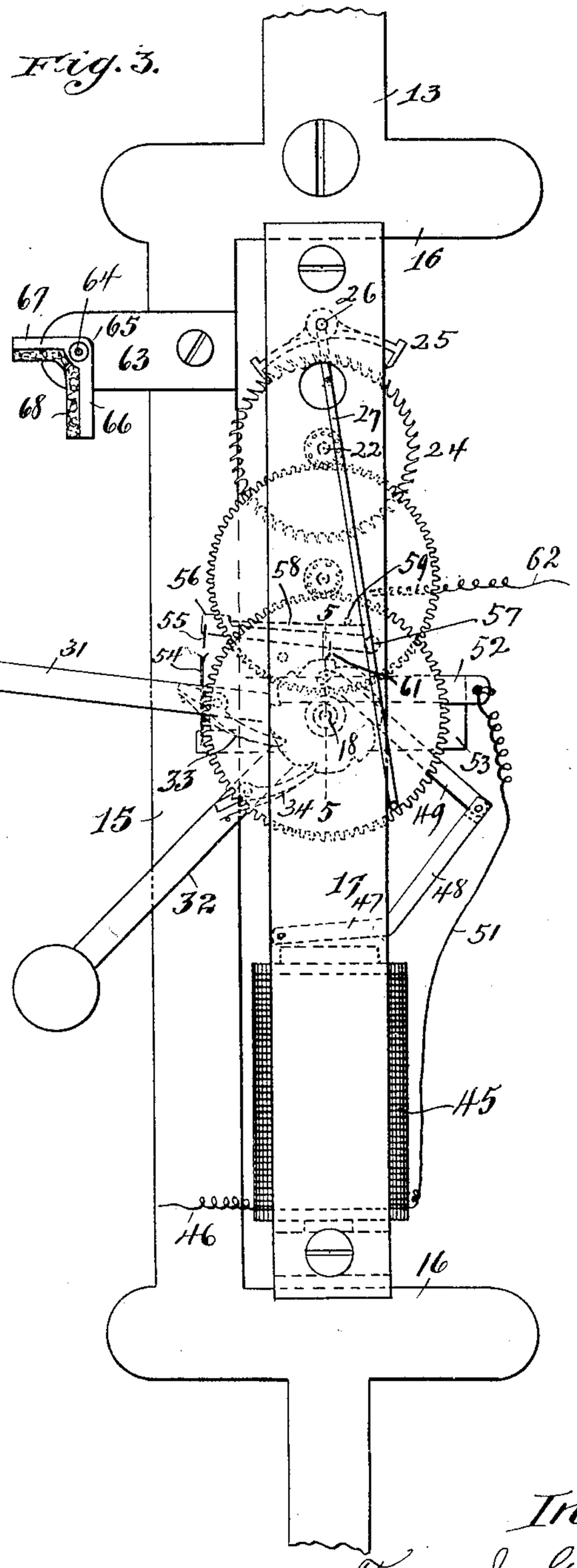

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Fig. 4.

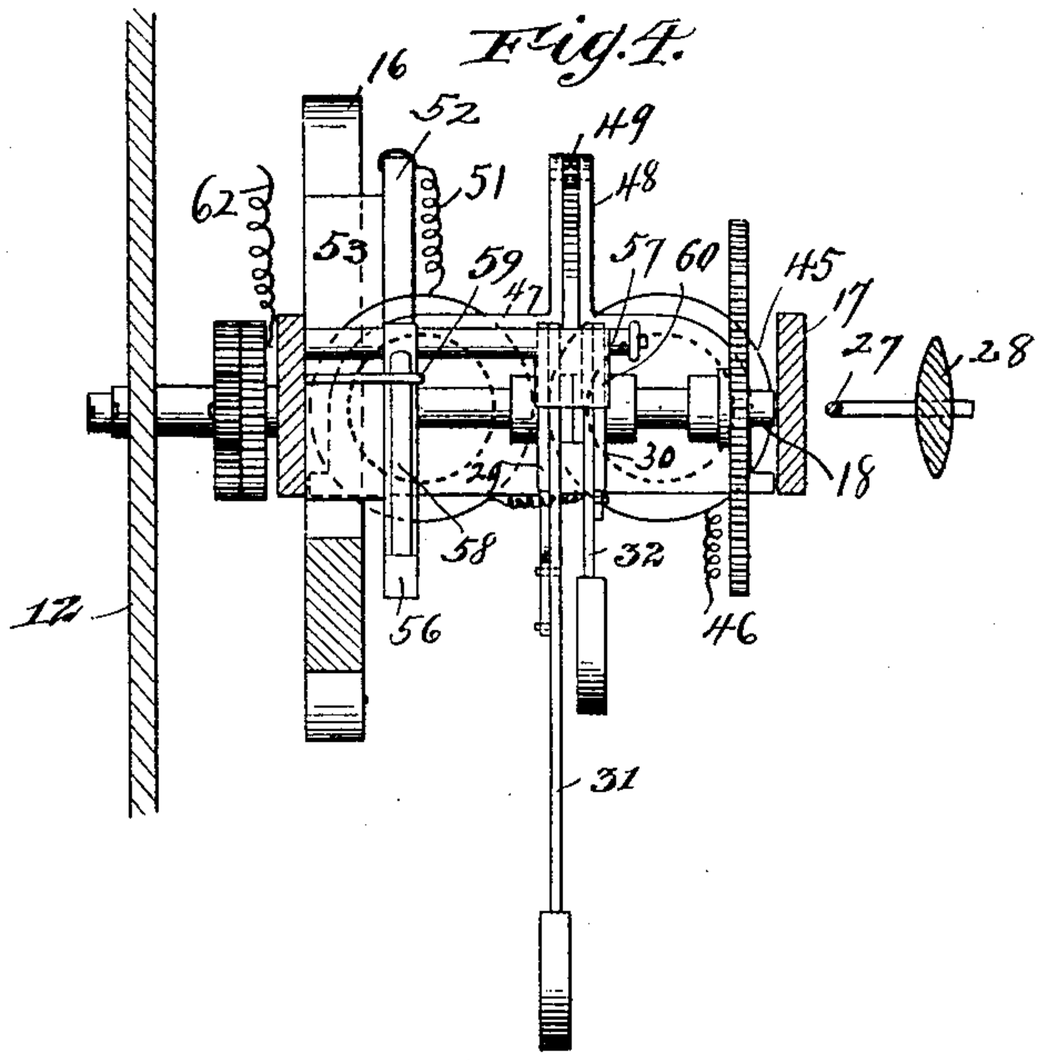

Fig. 6.

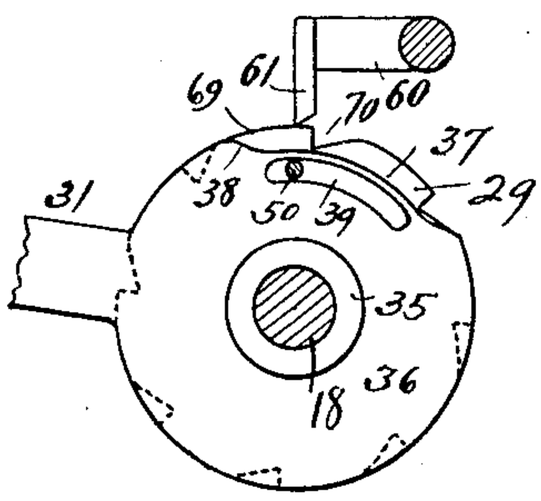

Fig. 5.

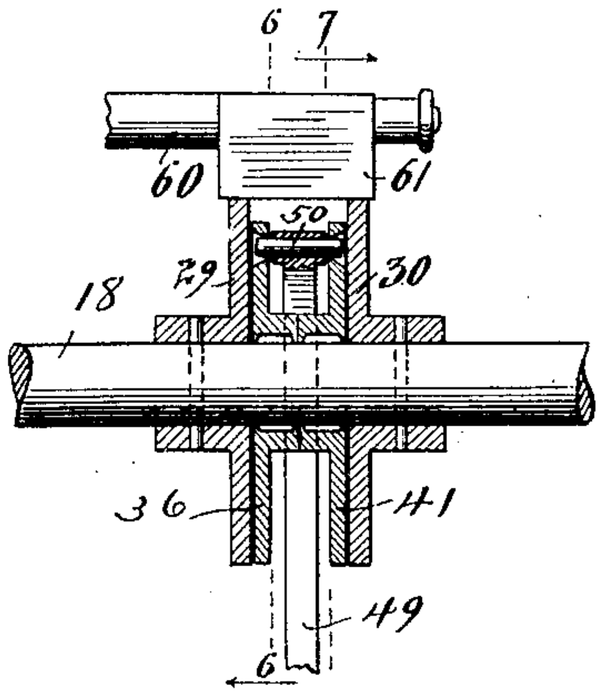

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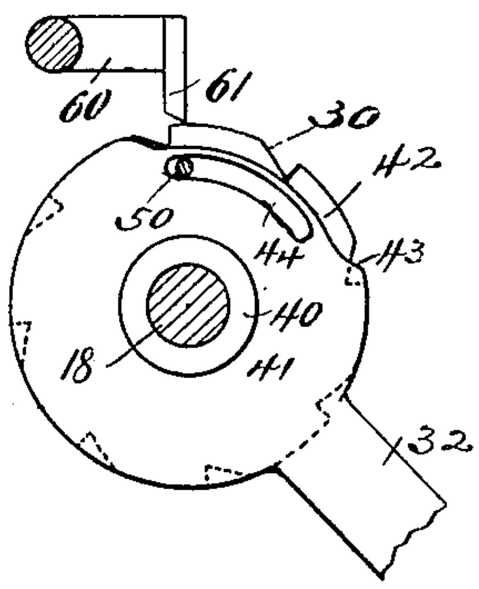
Fig. 7.



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UNITED STATES PATENT OFFICE.

FRED I. GETTY, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE AUTOMATIC ELECTRIC CLOCK COMPANY, OF KANSAS CITY, MISSOURI.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 637,454, dated November 21, 1899.

Application filed September 26, 1898. Serial No. 691,886. (No model.)

To all whom it may concern:

Be it known that I, FRED I. GETTY, of Chicago, in the county of Cook 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, and more particularly to that class of independent clocks wherein the power which actuates the clock mechanism is furnished by weights and electricity is employed for the purpose of lifting the weights after their descent, and thus practically rewinding the clock.

The object of the invention is to produce a clock of superior accuracy combined with simplicity of construction and a reduced expenditure of electrical energy; and to these ends the invention consists in certain novel features which I will now proceed to describe and will then particularly point out in the claims.

In the accompanying drawings, Figure 1 is a front elevation of a clock embodying my invention, the door of the case being open. Fig. 2 is a side elevation, on an enlarged scale, of the clock mechanism proper, a portion of the dial being shown in section. Fig. 3 is a rear elevation, on the same enlarged scale as Fig. 2, of the clock mechanism proper. Fig. 4 is a plan section taken on the line 4 4 of Fig. 2. Fig. 5 is a detail sectional view, on a still larger scale, taken on the line 5 5 of Fig. 3. Fig. 6 is a similar view taken on the line 6 6 of Fig. 5 and looking in the direction of the arrow; and Fig. 7, a similar view taken on the line 7 7 of Fig. 5 and looking in the opposite direction, as indicated by the arrow at the top of said figure.

In the said drawings, 10 indicates the clock-case, which may be of any suitable construction, and 11 an electric battery of any approved type mounted therein. 12 indicates the dial of the clock, which I prefer to construct of glass or other transparent material, but which may be of any approved construction. 13 indicates a bracket or support upon which the clock mechanism proper is mounted and supported and which in the present instance I have shown as depending from the top of the clock-case, to which it is secured by an enlarged head 14. The body portion of this bracket is laterally offset, as indicated at 15 in Figs. 1 and 3, and in the space thus formed between the shoulders 16 of the bracket is mounted the frame 17, which supports the clockwork. 18 represents the minute-hand shaft or arbor, which rotates once in an hour and which carries the minute-hand 19. This shaft is connected by the usual gearing to the hour-hand sleeve 20, carrying the hour-hand 21, and is also connected by a suitable train of gearing of any approved type with the seconds-hand shaft 22, which carries the seconds-hand 23 and an escapement-wheel 24. 25 indicates the escape-lever, the arbor 26 of which is connected by the arm 27 with the pendulum 28. All these parts may be of any approved construction or any approved type of clock-train may be substituted therefor.

Upon the minute-hand shaft or arbor 18 are secured two ratchet-wheels 29 and 30, and in the space between said ratchet-wheels, which are separated a sufficient distance for the purpose, are mounted two levers 31 and 32, provided with suitable actuating-weights at their outer ends. These levers are loosely mounted upon the shaft 18, and the lever 31 is provided with a spring-pawl 33 to engage the ratchet-wheel 29, while the lever 32 carries a similar spring-pawl 34, which engages the ratchet-wheel 30. The ratchet-wheels 29 and 30 are constructed, as shown in detail in the drawings, so as to have circular portions 69 intervening between the notches 70, with which the spring-pawls engage. The lever 31 has a hub 35 and an enlarged disk-shaped portion 36 connected therewith, said disk-shaped portion being for the greater portion of its body of a radius equal to or greater than the adjacent ratchet-wheel 29, but a portion of its periphery being cut away, as shown at 37, said cut-away portion terminating in a cam-incline 38, which connects the cut-away portion 37 with the periphery of the body of the disk. The disk 36 is also provided with a slot or groove 39, concentric with the disk and lying inward toward the center from the cut-away portion 37, with which it is substantially coextensive. The lever 32 has a hub 40 and disk 41, similar to the hub and disk 35 and 36, the disk 41 having a cut-away portion 42, cam-incline 43, and slot or groove 44,

corresponding to the similar parts 37, 38, and 39 of the disk 36.

45 indicates an electromagnet of any approved construction, having its coils connected at one end with one terminal of the battery by a wire 46, said magnet having its coils suitably insulated from the frame 17. The electromagnet 45 is provided with an armature 47, pivotally mounted in the frame above the poles of the electromagnet and having an arm 48 extending upward on that side of the shaft 18 opposite the side on which the levers 31 and 32 are located. The arm 48 has pivoted to it a link 49, which extends inward between the disk-shaped portions of the hubs of the levers 31 and 32, as indicated in detail in Fig. 5 of the drawings. This link is provided at this point with a pin 50, which projects beyond the link at each side thereof, one projecting end entering the slot 39, while the other projecting end enters the slot 44. The other end of the coils of the electromagnet 45 is connected by a wire 51 with a contact-arm 52, supported on the frame 17 and suitably insulated therefrom by a block 53 of insulating material. This contact-arm carries at its other extremity two contact-leaves 54 of a yielding or elastic material and having diverging ends to receive between them a contact-finger 55 on a contact-lever 56, pivoted on an axis 57, projecting from the frame 17. The lever 56 tends to engage its finger 55 with the leaves or brush 54 by gravity; but in order to insure and give quickness to its operation I provide a spring 58 to aid in depressing said lever. This spring may be of any approved form, and, as shown, it consists of a leaf-spring secured at one end to the moving end of the lever and having its other free end extended under a pin 59, projecting from the frame 17. Mounted on the axis 57 and connected to and moving in unison with the contact-lever 56 is a detent-lever 60, having a tooth 61, which extends across and reaches upon the upper edges of the disks 36 and 41 and the ratchet-wheels 29 and 30, as clearly shown in Fig. 5.

The contact-lever 56 is in electrical connection with the terminal of the battery opposite to that with which the electromagnet 45 is connected. This connection may be effected in any suitable manner, and in the construction shown it is accomplished by having the lever 56 in electrical connection with the frame 17 through the medium of its axis, while the said frame is connected with the proper terminal of the battery 11 by means of a wire 62.

A suitable stop is provided to limit the upward movement of the levers 31 and 32, and for this purpose I have devised and prefer to employ the construction shown, in which the bracket 13 is provided with an arm 63, from which there projects in the path of the levers a pin or axis 64, having loosely mounted thereon a stop 65, comprising two arms 66 and 67, arranged at right angles to each other to form an open jaw, which is provided with a cushion 68 of cloth or other soft material. One of the arms 66 and 67 is made heavier than the other—as, for instance, in the construction shown, by making the arm 66 of greater length than the arm 67, so that the stop when free will always hang in such a position as to present its open jaw to the terminal weights on the ends of the levers 31 and 32.

The mechanism thus constructed operates in the following manner: The weighted levers 31 and 32 by means of the engagement of their spring-pawls with the ratchet-wheels 29 and 30 impart a rotary movement to the shaft 18, which movement, being regulated by the escapement and pendulum, causes said shaft to make a complete rotation once in an hour, and thereby causes the clock to indicate the proper time upon the dial. While the levers 31 and 32 operate simultaneously upon the clock-train throughout all of their movement, except for a brief instant, said levers are not arranged parallel to each other, but substantially at an angle of forty-five degrees, as indicated in Fig. 3 of the drawings, so that when one of said levers shall have reached the limit of its downward motion the other lever will have about completed one-half of its descent. When the lower lever—for instance, the lever 32—approaches the downward limit of its motion, the tooth 61 of the detent-lever 60 is riding upon the circular portions 69 of the ratchet-wheels 29 and 30 and is supported thereby, as shown in Figs. 5, 6, and 7, while the cut-away portions 37 and 42 of the hubs of the actuating-levers lie beneath said tooth and do not prevent its downward motion. When the tooth 61 passes clear of the circular portions 69 of the ratchet-wheels and drops into the notches 70 thereof, it permits the detent-lever 60 and the contact-arm 56 to drop and to make an electrical contact between the finger 55 and the leaves 54, which completes or closes the circuit. As soon as this contact is made the electromagnet 45 is energized and its armature 47 is attracted, causing a downward movement of the arm 48 and link 49. The pin 50 then engages the upper end of the slot 44, and thereby rotates the disk 41 upon the shaft 18 and moves the lever 32 quickly upward. This upward movement of the lever brings the cam-incline 43 into contact with the tooth 61, and thereby raises the detent-lever and contact-arm and breaks the circuit. This breaking of the circuit occurs when the lever 32 has accomplished about one-half of its upward movement; but its momentum is sufficient to cause the lever to continue to move upward until it engages with the notch upon its ratchet-wheel 30 above the notch corresponding to that of the ratchet-wheel 29 with which the pawl of the lever 31 is engaged. In other words, the lever 32 is moved upward two notches at each upward movement and the battery-current is cut off at about one-half of this upward movement, the momentum of

the lever serving to complete said movement. The stop 65 by means of its cushion serves to arrest the lever should it tend to move too far upward. It will be observed that during this upward movement of the lever 32 the lever 31 has been continually acting upon the shaft 18 to cause it to rotate in the proper direction, and thereby keep the movement of the clock mechanism normal and accurate. By reason of this action the upward motion of the lever 32 has no tendency to delay or move backward the shaft 18, and thereby retard the clock and cause it to lose time. When the lever 32 has reached its uppermost position, it reëngages its ratchet-wheel in the manner thus described, and the two levers continue to operate in unison to drive the clock until the other lever 31 has reached its lowest position. At this time the notches of the two ratchet and the cut-away portions of the two hubs or disks again coincide and the detent-lever falls, permitting the contact-lever to make its contact, and thereby close the circuit and energize the magnet. The movement of the armature and the link connected thereto at this time has no effect upon the lever 32, as the pin 50 moves freely in the slot 44 thereof; but said pin engages with the end of the slot 39 in the disk or hub of the lever 31 and raises said lever in the manner described with relation to the lever 32. The cam-incline 38 raises the detent-lever and breaks the circuit in the manner already described in connection with the cam-incline 43, and the lever 31 completes its upward movement by reason of its momentum.

It will thus be seen that at all times the clock mechanism is being actuated by at least one of the weighted levers, and it results from this that there is no retardation of the said mechanism due to the ceasing of the impelling force or to the reverse movement imparted by the rewinding thereof, which retardation occurs where only a single lever is used, as in such clocks as ordinarily constructed. It will be observed that the drain upon the battery is extremely slight, as the contact is made only to be almost instantly broken and is not even continued during the entire upward movement of the lever which is being raised, but is cut off after a portion only of that movement is accomplished, relying upon momentum to complete the same.

In the particular construction of clocks shown the battery is called upon only eight times in an hour, and then only for a space of time so brief as to be difficult of calculation, the contact being practically instantaneous. Of course the number of times the arms are raised and the battery called upon to accomplish this work may be varied by correspondingly varying the range of movement of the arms and the number of notches in the ratchet-wheel.

It will be observed that the clock is exceedingly simple in construction and composed of few working parts, so that the cost of constructing the same is comparatively small. The cost of operating is also reduced to a minimum by reason of the very small call upon the battery. Superior accuracy of the clock is obtained by reason of the movement of the two weighted arms, one of which is constantly actuating the clock mechanism, and thereby preventing any retardation during the winding of the clock.

I claim—

1. In an independent electric clock, the combination, with a driven shaft or arbor of the clock-train, of two levers having pawl-and-ratchet connections with said arbor to actuate the same by gravity, an electromagnet having an armature operatively connected with said levers to alternately lift the same, an energizing-circuit for said magnet, and means for making and breaking said circuit at the termination of the downward movement of each lever, substantially as described.

2. In an independent electric clock, the combination, with a driven shaft or arbor of the clock-train, of two weighted levers having pawl-and-ratchet connections with said arbor, said levers being so arranged that one has about half completed its descent when the other is at the beginning of its descent, an electromagnet having an armature operatively connected with said levers to alternately lift the same, an energizing-circuit for said magnet, and means for making and breaking said circuit at the termination of the downward movement of each lever, substantially as described.

3. In an independent electric clock, the combination, with a driven shaft or arbor of the clock-train, of a ratchet-wheel secured thereon, the said ratchet-wheel having notches in its periphery equal in number to the times the magnet is energized during a single rotation of the said shaft, a weighted lever loosely mounted on said shaft and having a pawl to successively engage each of the notches of said ratchet-wheel, an electromagnet provided with an armature having a lost-motion connection with said lever to lift the same, an energizing-circuit for said magnet, means for closing said circuit at the termination of the downward movement of said lever, and means for breaking said circuit before the said lever reaches the limit of its upward movement, substantially as described.

4. In an independent electric clock, the combination, with a driven shaft or arbor of the clock-train, of a ratchet-wheel mounted thereon and having its periphery alternately circular and notched, a weighted lever loosely mounted on said arbor and having a hub-disk of a diameter equal to that of the ratchet-wheel but partly cut away and terminating in a cam-incline, an electromagnet having an armature operatively connected with said lever to lift the same, an energizing-circuit for said magnet, means for making and breaking said circuit, and a detent-lever bearing upon the peripheries of the ratchet-wheel and

hub-disk and connected with and controlling the circuit making and breaking means, substantially as described.

5. In an independent electric clock, the combination, with a driven shaft or arbor of the clock-train, of two ratchet-wheels mounted thereon, two levers having slotted hub-disks loosely mounted on said arbor between the ratchet-wheels, an electromagnet having a vibrating armature, a link pivoted on said armature at one end and engaging the slots of the lever hub-disks at its other end, an energizing-circuit for the magnet, and means for making and breaking said circuit at the termination of the downward movement of each lever, substantially as described.

6. In an independent electric clock, the combination, with a weighted actuating-lever, and means for imparting to said lever an upward movement with excess momentum, of a pivoted stop located in the path of the lever and comprising two arms at an angle to each other, the jaw thus formed being cushioned, substantially as described.

7. In an independent electric clock, the combination, with a driven shaft or arbor of the clock-train, of a ratchet-wheel connected with said shaft or arbor, an electromagnet, an energizing-circuit for the magnet, a weighted actuating-lever having a pawl engaging the ratchet-wheel to rotate the same on the downward movement of the latter, an armature arranged in proximity to the electromagnet, a link pivoted to the armature and having a pin-and-slot connection with the actuating-lever, and a circuit maker and breaker actuated by the descending weight to close the circuit after energizing the electromagnet and thereby raising the weight, substantially as described.

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