No. 765,383. PATENTED JULY 19, 1904.

F. I. GETTY.

ELECTRIC SECONDARY CLOCK.

APPLICATION FILED DEC. 2, 1901.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.

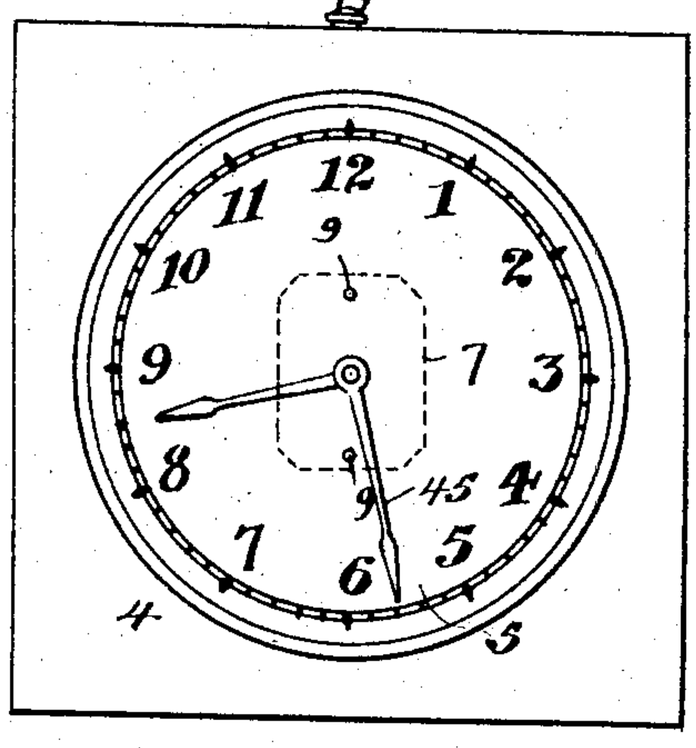


Fig. 2.

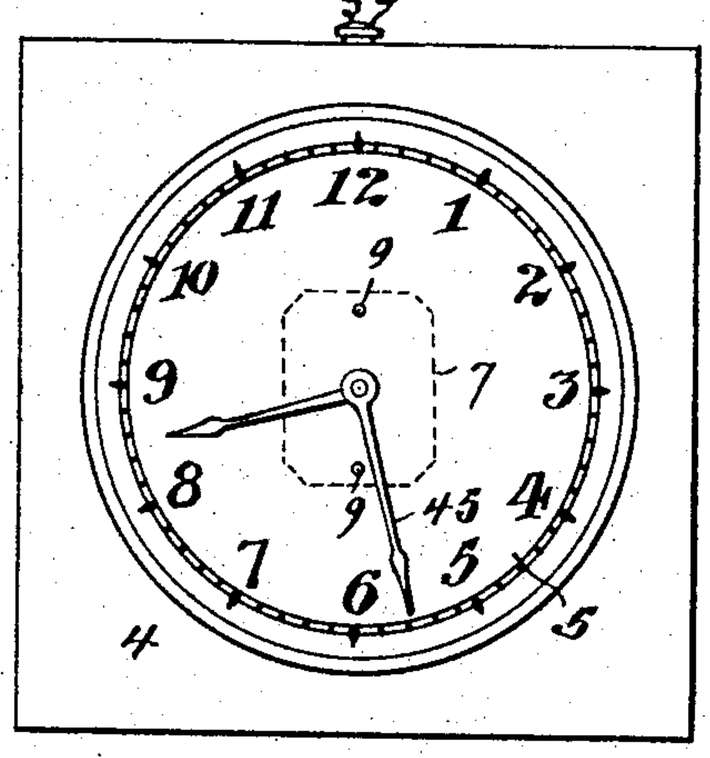
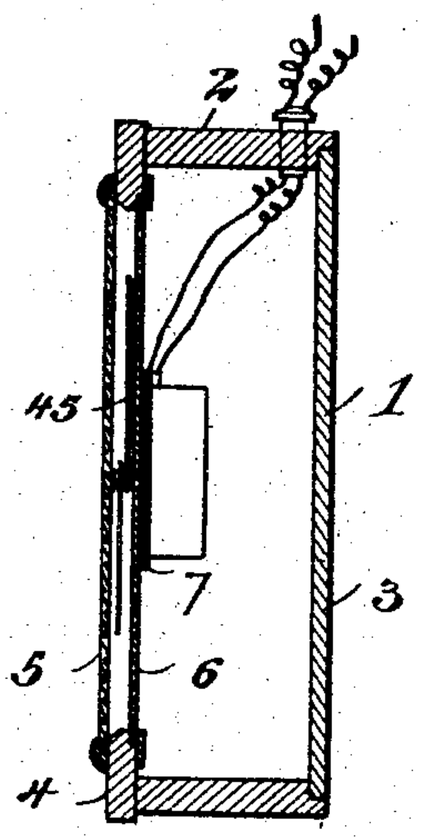


Fig. 3.



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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 3.

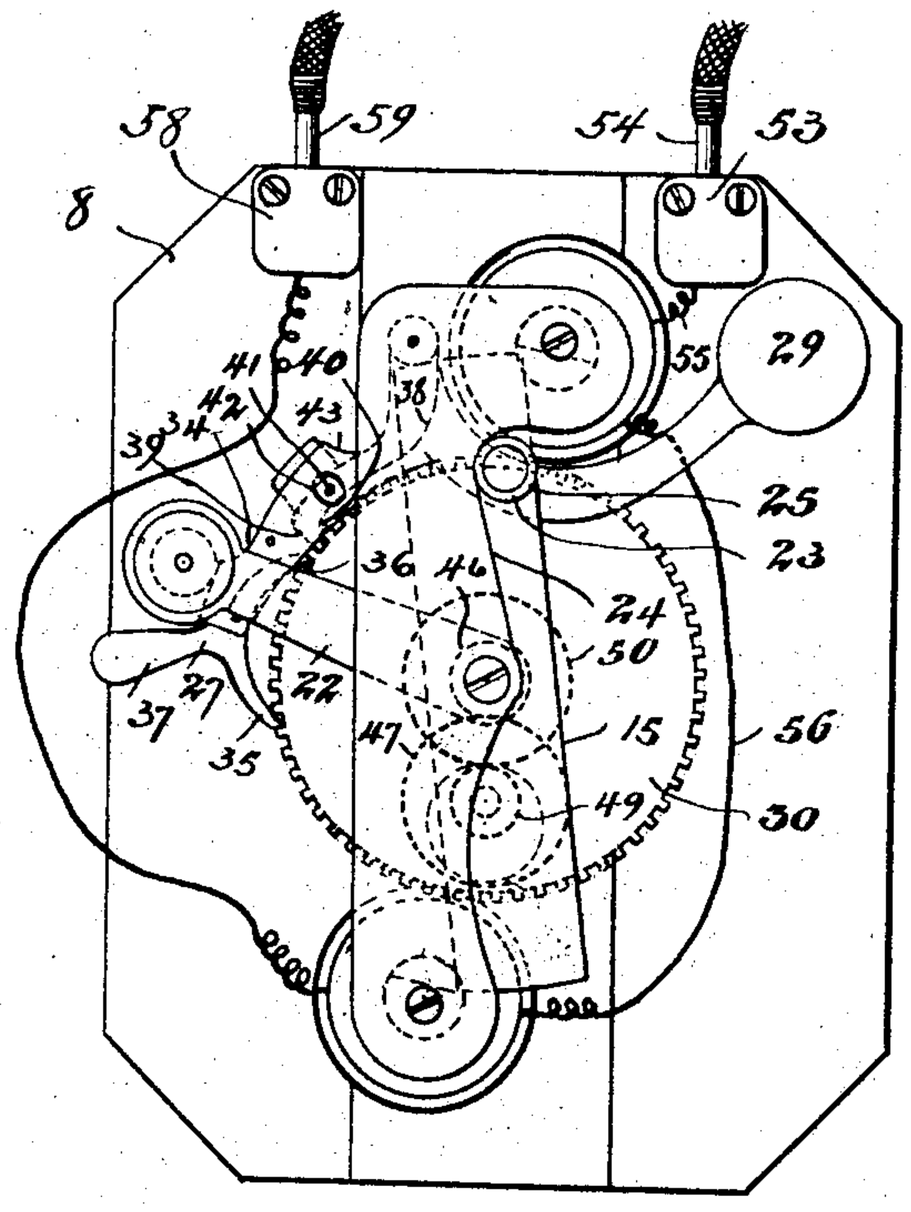


Fig. 4.

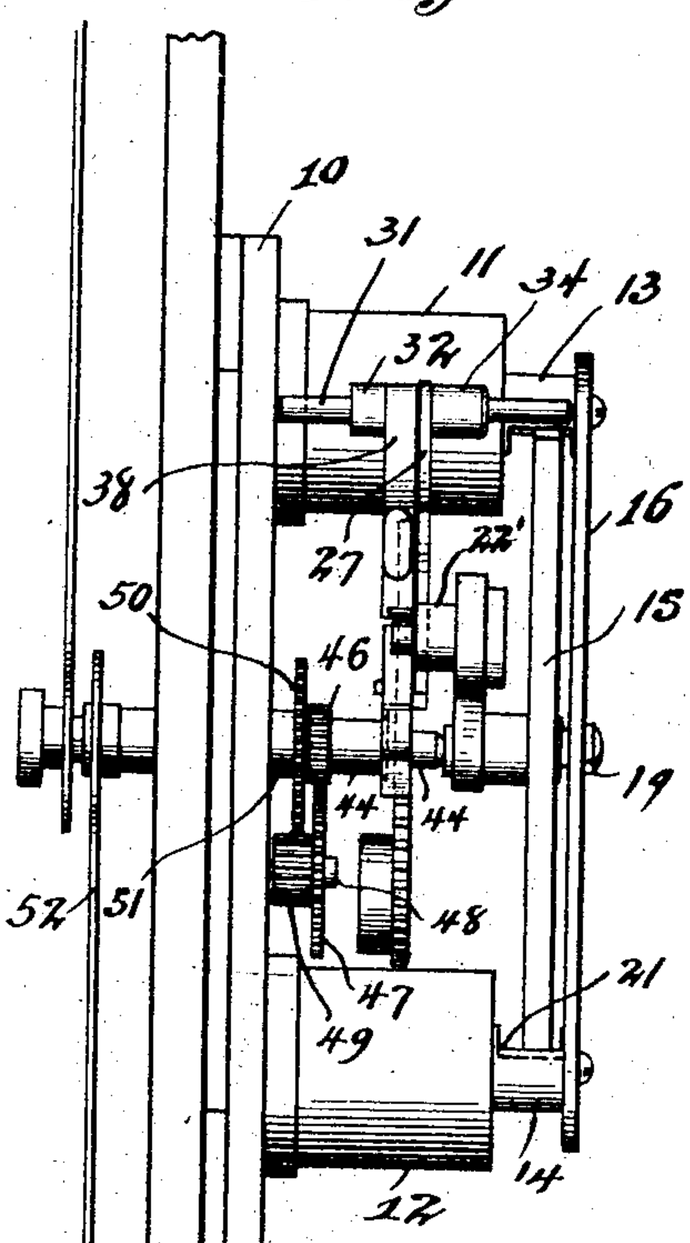


Fig. 6.

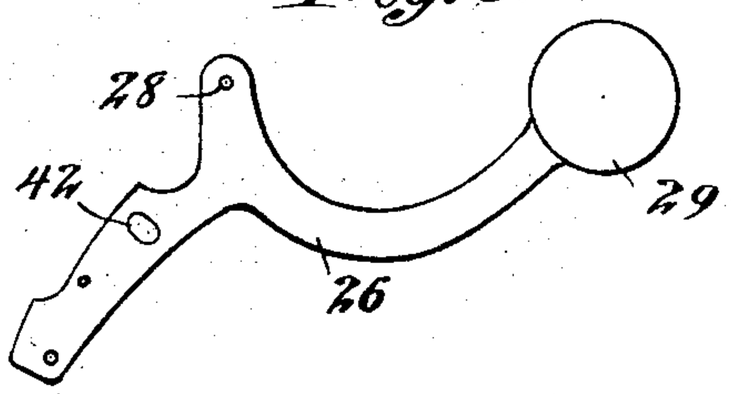
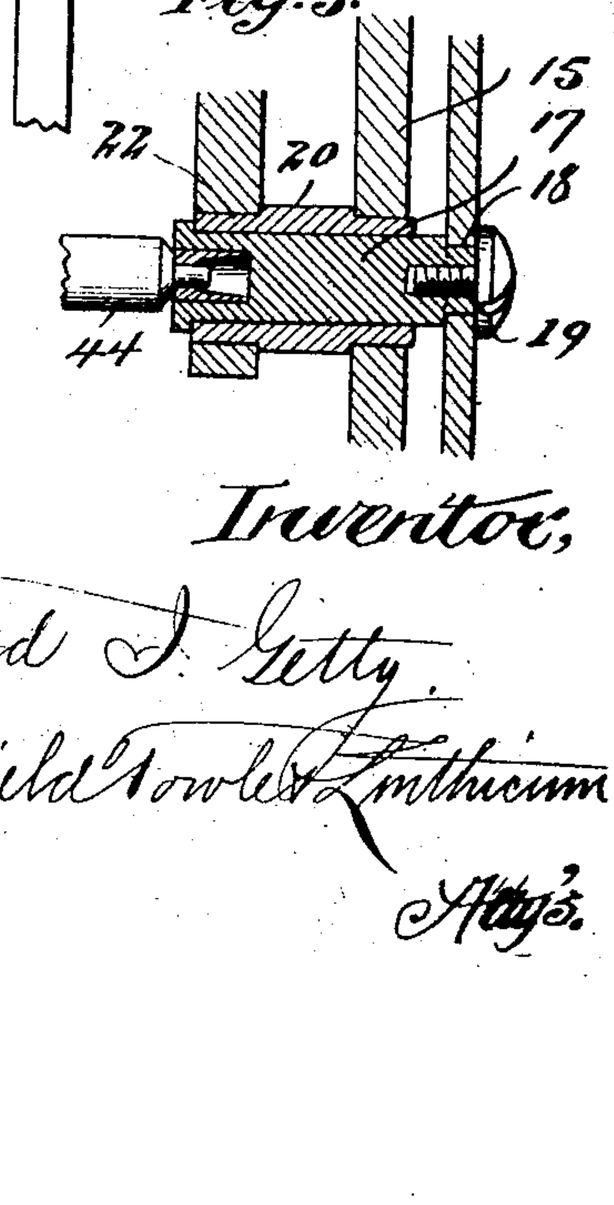


Fig. 5.



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ELECTRIC SECONDARY CLOCK.

APPLICATION FILED DEC. 2, 1901.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 7.

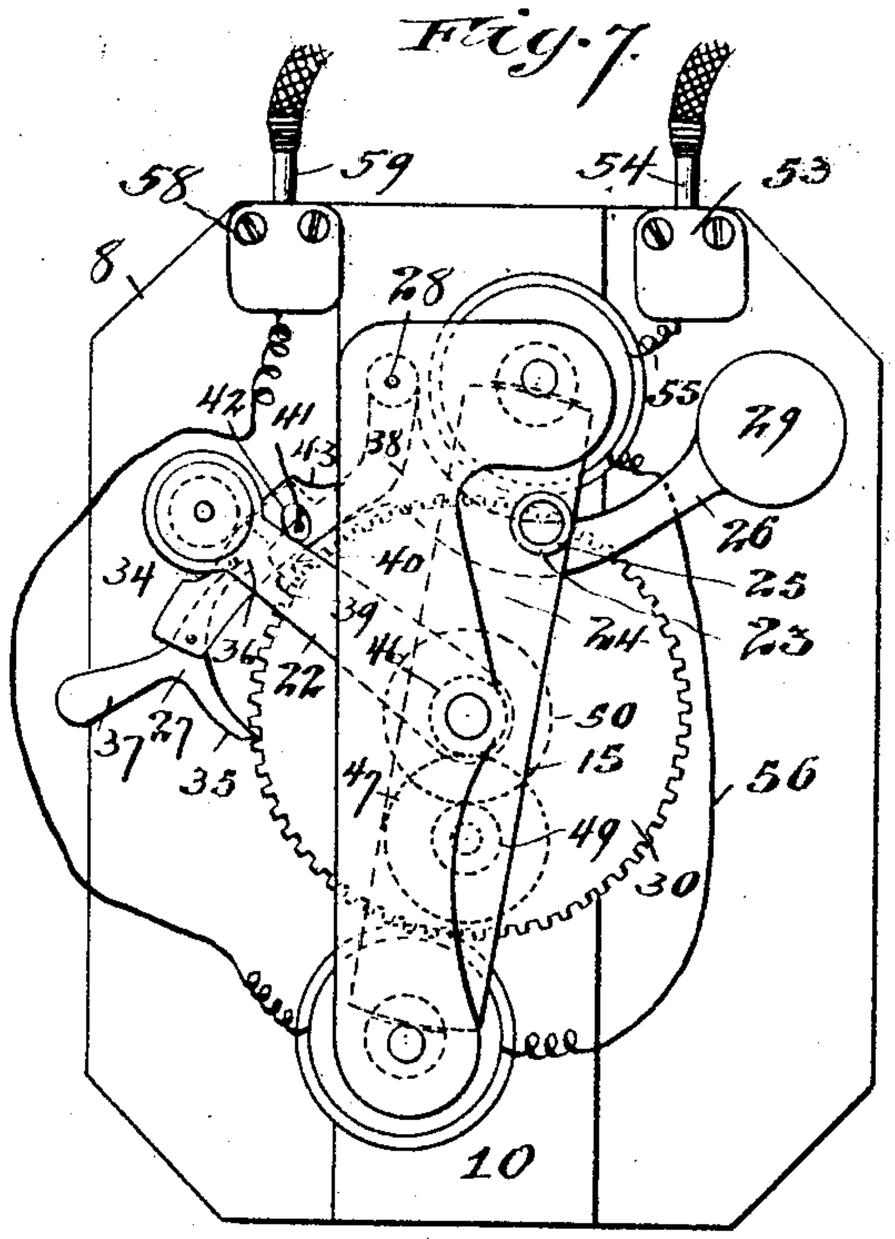
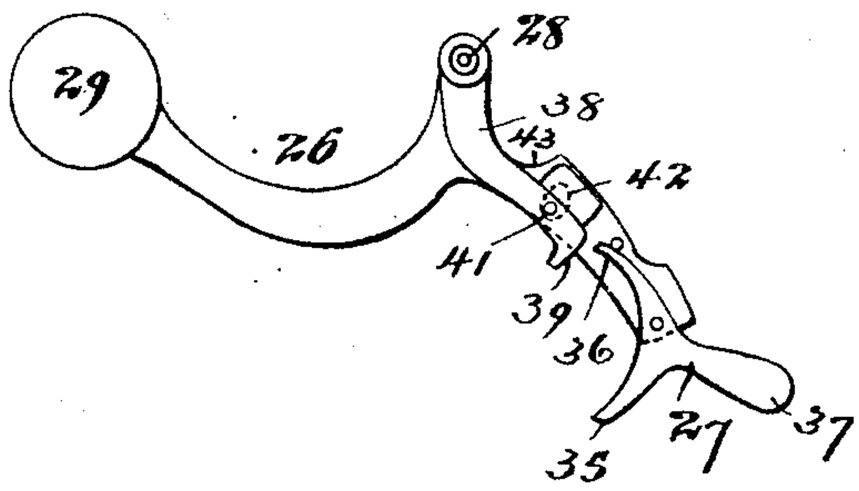


Fig. 8.



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No. 765,383. Patented July 19, 1904.

UNITED STATES PATENT OFFICE.

FRED I. GETTY, OF CHICAGO, ILLINOIS, ASSIGNOR TO AMERICAN CLOCK COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF NEW JERSEY.

ELECTRIC SECONDARY CLOCK.

SPECIFICATION forming part of Letters Patent No. 765,383, dated July 19, 1904.

Application filed December 2, 1901. Serial No. 84,435. (No model.)

To all whom it may concern:

Be it known that I, FRED I. GETTY, of Chicago, Illinois, have invented certain new and useful Improvements in Electric Secondary Clocks, of which the following is a specification.

This invention relates to improvements in clocks, and refers more specifically to improvements in electric secondary clocks or those which depend for their actuation upon a main or master clock connected up in circuit therewith.

Among the objects of the invention are to provide an extremely simple and reliable mechanism which entirely dispenses with use of springs to control the movements of the several parts; to provide a construction in which the actuation or driving of the clock-movement is accomplished solely by parts moved by gravity and unaffected by variations in the power which moves the weights or weighted parts into position to actuate the movement; to provide a construction which is as nearly noiseless as practicable; to provide a simple compact clock-movement which may be conveniently supported upon an insulating-plate which in practice forms the dial of the clock; to so construct and arrange the parts that the actuating and controlling pawl mechanism may be thrown out of engagement with the main ratchet-wheel, and thus release the train of the gears which control the minute and hour hands to enable the latter to be set or readjusted; to provide a simple and powerful magnet construction wherein both pawls of a horseshoe coöperate to impart driving power to the clock mechanism; to provide an improved pawl-and-ratchet mechanism which while releasing the ratchet-wheel during the downward movement of the latter nevertheless operates to positively arrest the latter and prevent overthrow at each stepping-forward movement, and in general to provide an improved mechanism of the character referred to.

To these ends the invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims, and the same will be readily understood from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is a front elevation of two clocks embodying my invention electrically connected in series. Fig. 2 is a vertical sectional view taken on line 2 2 of Fig. 1 and looking in the direction of the arrows. Fig. 3 is an inside elevation of the clock-movement detached from the supporting-plate, and Fig. 4 is a side elevation of the movement applied to the supporting-plate and viewed from the left-hand side considered with reference to Fig. 3. Fig. 5 is a sectional fragmentary detail of the armature-sleeve and the stud upon which the latter is mounted. Fig. 6 is a view of the main gravity-lever detached. Fig. 7 is a view similar to Fig. 3, showing the parts in changed position. Fig. 8 is a view of the reverse side of the parts shown in Fig. 6, including also the pawl and detent members mounted thereon.

Referring to the drawings, 1 designates as a whole a suitable case which may be of any suitable construction, that shown herein being of rectangular form and comprising side walls 2 and back wall 3 and a front casing member 4, (which may be a door,) having an opening provided with an outer crystal 5 conveniently applied to the exterior of the front casing member and an inner dial-plate 6, similarly applied to the inner side of the front casing.

The dial-plate 6 will be preferably made of insulating material, such as ground glass, and made of sufficient strength to support the clock-movement as a whole, which is secured to the central portion thereof, as indicated in dotted lines at 7, Fig. 1.

Desirably I provide a base-plate 8, of insulating material, such as hard rubber or fiber, which is secured rigidly upon the inner surface of the dial-plate by means of suitable screws 9, inserted through the dial and into the base, as shown. Upon the inner surface of the base-plate is mounted a main frame member 10, which also constitutes the base member of a magnet and is to this end made of suitable iron and takes the form of a flat metal

bar arranged to extend vertically across the central portion of the plate, and desirably made rigid with the latter by extending the securing-screws 9 therethrough.

11 and 12 designate the magnet-spools, which are suitably mounted upon the opposite end portions of the bar 10, the core members 13 and 14, respectively, of said spools being arranged to extend beyond the outer ends of the latter, as best indicated in Fig. 4.

The armature (designated as a whole 15) is pivotally mounted between its ends at a point equidistant between the two magnet-spools, so that the latter may act thereon simultaneously. To this end I mount a suitable supporting-plate 16, of non-magnetic material—as, for example, brass—upon the outer ends of the armature-cores 13 and 14, which forms a suitable support upon which to pivot the armature 15. Preferably said pivot-support comprises a stud 17, having a reduced and shouldered portion 18 inserted in a suitable aperture in said supporting-plate and held therein by means of a screw 19, as indicated clearly in detail Fig. 5. Upon said stud 17 is journaled a sleeve 20, upon one end of which the bar-like armature 15 is rigidly mounted, the length of the armature being such as to extend at its ends adjacent to the proximate sides of the armature-cores, but not into contact with the latter. In order to enhance the effectiveness of the magnet, the armature-cores are cut away or erased, as indicated at 21, upon their sides adjacent to the armature, and the ends of the armature-bars are made concentric with the pivotal axis of the latter, as indicated clearly in Figs. 3 and 4.

Upon the end of the sleeve 20 opposite that to which the armature is secured is rigidly mounted a weighted arm 22, which extends obliquely upward and laterally outward with reference to the longitudinal axis of the armature, said weighted arm 22 being likewise made rigid with the sleeve, and therefore tending to normally oscillate the armature out of alinement with a line extending between the armature-cores of the two spools. The extent of oscillation of the armature under the weight of said arm is limited by means of a stop-stud 23, mounted upon the armature and projecting outwardly, so as to engage the adjacent edge 24 of the supporting-plate 16, the stop-stud being desirably surrounded by a cushioning-ring 25, of rubber or the like.

The gravity-arm 22 is arranged to directly engage a gravity-lever 26, which latter carries the actuating-pawl 27, which imparts movement to the clock mechanism. Referring more particularly to Fig. 6, said gravity-lever is shown as of irregular shape, provided at a point intermediate its length with a pivot-aperture 28, at one end with a weight 29, and at its opposite end with the pawl 27. Said gravity-lever is supported above and in operative relation to the main ratchet-wheel (designated as a whole 30) upon a rock-bar or arbor 31, having its opposite ends journaled in the base-bar 10 and supporting-plate 16, respectively, as indicated clearly in Fig. 4, the lever 26 being mounted at a point intermediate the length of said arbor and confined against movement endwise upon said arbor by means of suitable collars 32 and 33.

That end of the gravity-lever which carries the actuating-pawl 27 is provided at its upper side with a curved and downwardly-inclined surface 34, which is engaged by an antifriction-roller 22′, mounted upon the outer end of the weighted arm 22 and tending to force that end of the gravity-lever 26 downwardly against the opposing weight of its opposite end. The actuating-pawl 27, mounted upon the end of the gravity-lever, is provided with two engaging pawl-arms 35 and 36, respectively, one of which engages the ratchet-wheel positively during the downward movement of the end of the gravity-lever to advance said ratchet-wheel and the other of which is oscillated into engagement with the ratchet-wheel as the latter approaches the end of its forward step and is thereby positively arrested after having advanced the distance of one ratchet-tooth. In order to cause said pawl member 27 to automatically oscillate into engagement with the next succeeding notch of the ratchet-wheel as the gravity-lever is permitted to return by the weighted arm being lifted therefrom, said pawl member is provided with a weighted arm 37, which extends outwardly in an approximately horizontal position, as indicated clearly in Fig. 3.

During the upward or return movement of the gravity-lever the detent-arm 36 of the pawl member is withdrawn and at the same time the actuating-arm 35 is drawn upwardly over the next succeeding tooth of the ratchet-wheel, so that momentarily the ratchet-wheel is not held against backward movement by the pawl member. In order, therefore, to provide means for positively locking the ratchet-wheel against said return movement during the retraction of the gravity-lever and pawl member mounted thereon, I provide a gravity-detent, (designated 38,) which is conveniently mounted upon the same arbor 31 which carries the gravity-lever and between the latter and the collar 32. Said detent 38 is provided with an engaging nose or end 39, which normally rests between a pair of the teeth of the ratchet-wheel, and the rear side 40 of this nose is inclined, so that the positive forward movement of the ratchet-wheel lifts said detent and permits the tooth to pass under the same. The opposite side 40, however, of said detent is substantially radial to the ratchet-wheel axis, and therefore serves to lock the latter positively against return movement.

As will hereinafter appear, it is desirable to disengage the gravity-arm and both of the pawl members from the ratchet-wheel at times in order that the movement may be manipulated—as, for example, in properly setting the clock to correct time. In order to facilitate the lifting out of engagement of the two pawl members simultaneously and adjusting them to a position where they will remain at rest, the gravity-detent 38 is provided with a stud 41, which projects through a corresponding opening 42, formed through said lever. The size and shape of the opening 42 are such as to permit the detent and lever to operate independently of each other during the normal operation of the mechanism. As hereinbefore explained, the weighted end of the gravity-lever is heavy enough to overbalance the opposite end of said lever and also to lift both the pawl member 27 and the detent member 38 therewith. The gravity-lever is provided at its upper side, at a point adjacent to the pivotal axis thereof, with a curved recess or depression 43, which is adapted to receive the antifriction roller or stud 22′ of the weighted lever 22 when the latter is lifted far enough to bring its end adjacent to the arbor 31, and the shape of this depression is such as to engage the roller and hold the weighted arm in this position. By reason of the engagement of the stud 41 with the walls of the aperture of the gravity-lever, therefore, whenever the latter lever is oscillated into position to lift its pawl 27 entirely free from the ratchet-wheel the detent 38 will be simultaneously lifted therewith and also held out of engagement with the ratchet-wheel.

Describing now the train of gears whereby the step-by-step movement of the ratchet-wheel is transmitted to the hands of the clock, said ratchet-wheel is in the preferred construction shown provided with an arbor 44, one end of which has bearing in the end of the stud 17, as indicated clearly in Fig. 5, while the opposite end of said arbor extends entirely through the base-bar 10 of the magnet, the insulating-plate 8, and the dial-plate 6, and carries at its extreme outer end the minute-hand 45 of the clock. 46 designates a pinion rigidly mounted upon the arbor 44 and arranged to intermesh with a gear 47, journaled upon a suitable stud 48, seated in the base-bar 10—in the present instance at a point below the main arbor. The gear 47 is rigidly united with a second pinion 49, concentric therewith, and which in turn intermeshes with a second gear 50, rigidly mounted upon the end of a sleeve 51, which is arranged concentrically upon the main arbor 44 and journaled to rotate within the base-bar 10. The sleeve 51 is extended through said base-bar, base-plate, and dial-plate and carries at its outer end the hour-hand 52 in the usual manner.

Describing now the circuit connections, 53 designates a terminal suitably mounted upon the base-plate 8 and adapted to receive the end of one of the main-line conductors 54. From the terminal 53 a conductor 55 extends to and through the adjacent spool 11 of the magnet and from thence through a conductor 56 to the other spool of the magnet, from which latter a return-conductor 57 leads back to a second terminal device 58, similarly mounted upon the base-plate 10. The return main line 59 is connected with the terminal 58. It will be understood that the magnet-circuit thus described of the clock-movement is simply connected in circuit in any suitable source of electrical energy, and it will be obvious that a series of clocks may be thus connected with the same circuit and in use usually will be so connected—as, for example, as indicated in Fig. 1.

The operation of the clock constructed and arranged as described may be briefly described as follows: The particular embodiment shown herein is indicated to be actuated at intervals of one minute apart—that is to say, an electrical impulse is sent over the line once each minute, and the minute-hand is therefore mounted directly upon the ratchet-wheel arbor, as described, and the ratchet-wheel is provided with a series of sixty (60) teeth corresponding to the sixty (60) minutes in an hour. Assuming that the parts are in the position shown in Fig. 3, which is their normal stationary position, an impulse sent through the electrical magnet energizes the latter and draws the armature around into alinement with the cores of the magnet, thereby lifting the weighted arm 22 and permitting the gravity-lever to rise under the overbalancing weight of its opposite end. The gravity-lever is permitted to rise just far enough to withdraw the acting end 35 of the actuating-pawl sufficiently to cause it to engage the next succeeding notch of the ratchet-wheel, it being understood that during this retracted movement said acting end will be held yieldingly in engagement with the ratchet-wheel by the gravity of its weighted arm 37. During this retractive movement the ratchet-wheel is held positively against backward movement by the detent 38, as hereinbefore fully described. The energizing of the magnet will be only momentary, and as soon as the current is interrupted and the magnet deënergized the weighted arm will descend, carrying with it the end of the gravity lever and pawl mounted thereon, thus stepping the ratchet-wheel forward one step. The descent of the arm is arrested by the stop-stud 23, as hereinbefore described, and as the ratchet-wheel approaches the end of its forward step the detent-arm 36 of the pawl is oscillated into position to engage one of the teeth of the ratchet-wheel and positively arrest the forward movement of the latter, there-

by absolutely preventing overthrow of the ratchet-wheel and mechanism geared therewith. These movements are repeated each minute and obviously serve to step the minute-hand around at one-minute intervals and the hour-hand, which is intergeared with the ratchet-wheel, forward the proper relative distance.

When it is desired to set the clock or otherwise manipulate the movement, the armature is simply oscillated beyond its normal throw and far enough to carry the weighted lever upwardly into position to engage with the depression 43 of the gravity-lever, in which position said gravity-lever will hold the weighted arm until it is intentionally released. When thus engaged with the gravity-lever, both the pawl and detent are lifted out of engagement and entirely free from the ratchet-wheel, so that the movement may be manipulated at will.

I claim as my invention—

1. In a secondary electric clock, the combination with a clock-train, of an electromagnet having a pivoted armature, and a weighted projection thereon tending to oscillate the armature out of alinement with the magnet-poles, a gravity-actuated lever pivoted between its ends, a ratchet-wheel forming the driving element of the clock-train, mounted adjacent to said lever, and an actuating-pawl mounted upon one end of said lever, the opposite end of said lever overbalancing the pawl-carrying end and the weighted projection of said armature being arranged to depress the lighter end of said lever during its movement to an open position, as and for the purpose set forth.

2. In an electric secondary clock, the combination with a clock-movement, of an electromagnet having a pivoted armature, and a weighted projection thereon tending to oscillate the armature out of alinement with the magnet-poles, a gravity-lever pivoted between its ends, a ratchet-wheel forming the driving element of the clock-movement mounted adjacent to said gravity-lever, and an actuating-pawl mounted upon one end of said gravity-lever, the opposite end of said lever overbalancing the pawl-carrying end, said actuating-pawl being provided with a weighted arm acting to oscillate the actuating-arm of the pawl into engagement with the ratchet-wheel, and the weighted projection of said armature being arranged to depress the latter end of said gravity-lever during its movement to open position and to permit it to rise during its closing movement whereby the actuation of the clock-movement is accomplished solely by the weight of the parts concerned, as and for the purpose set forth.

3. In an electric clock, the combination with a clock-movement having a ratchet-wheel forming a driving element thereof, of an oscillatory lever mounted adjacent to said ratchet-wheel, a two-armed pallet-shaped actuating-pawl, mounted upon said oscillatory lever and arranged to coöperate with said ratchet-wheel, and means for oscillating said lever, said actuating-pawl being weighted with its advance arm, considered with reference to the direction of movement of the ratchet-wheel, in yielding engagement with the ratchet-wheel, as and for the purpose set forth.

4. In an electric secondary clock, the combination with a clock-movement, of an electromagnet, provided with a movably-supported armature weighted and tending to normally move out of closed position by gravity, a ratchet-wheel forming an element of said clock-movement, a gravity-lever pivotally mounted adjacent to said ratchet-wheel and provided with a pawl arranged to act upon the latter, a part connected with or upon said weighted armature adapted to oscillate said gravity-lever out of its normal position during the return of the armature to its normal open position.

5. In an electric secondary clock, the combination with a clock-movement, of an electromagnet, provided with a movably-supported armature weighted and tending to normally move out of closed position by gravity, a ratchet-wheel forming an element of said clock-movement, a gravity-lever pivotally mounted adjacent to said ratchet-wheel and provided with a pawl arranged to act upon the latter, a part connected with or upon said weighted armature adapted to oscillate said gravity-lever out of its normal position during the return of the armature to its normal open position, a detent arranged to coöperate with said ratchet-wheel to prevent the dragging back of the latter during the retraction of the pawl, and interconnections between said detent and gravity-lever whereby the latter, together with the pawl and said detent may be simultaneously withdrawn from engagement with the ratchet-wheel, for the purpose set forth.

6. In a secondary electric clock, the combination with a clock-movement of a main frame-bar constituting the base member of a horseshoe-electromagnet, and provided with pole-pieces projecting therefrom, said pole-pieces constituting the cores of said magnet, and constituting also pillar-posts of the clock-movement which serves to support the clock mechanism.

7. In an electric secondary clock, the combination with a clock-movement of an electromagnet, provided with a movably-supported armature which tends to move normally out of closed position, a ratchet-wheel forming an element of said clock-movement, a lever provided with a pawl adapted to act upon said

ratchet-wheel, means acting upon said lever to hold it normally withdrawn from operative engagement with the ratchet-wheel, and operative connections between said lever-armature, whereby the lever is actuated to advance the ratchet-wheel during the return of the armature to its normal open position.

8. In an electric secondary clock, the combination with a clock-movement, of an electromagnet provided with a movably-supported armature which tends to normally move out of closed-circuit position, a ratchet-wheel forming an element of said clock-movement, a lever provided with a two-armed pawl arranged to operate the said ratchet-wheel, said lever being arranged to carry the pawl bodily toward the ratchet-wheel in a direction approximately tangential thereto during the actuating movement of the pawl whereby one arm of said pawl first engages and advances the wheel, and the other arm subsequently oscillates into position to arrest the advance movement of the ratchet-wheel, means acting upon said lever to hold it normally retracted from the ratchet-wheel, and operative connections between said lever and armature, whereby the return of the armature to its normal open position forces the lever and pawl carried thereby into actuating engagement with the ratchet-wheel.

9. In an electric secondary clock, the combination with a clock-movement, of an electromagnet provided with a movably-supported armature weighted to normally move out of closed-circuit position, a ratchet-wheel forming an element of said clock-movement, a lever provided with a cam and carrying a pawl adapted to actuate the ratchet-wheel, and an antifriction-roll mounted upon said armature and arranged to engage and actuate said lever, substantially as described.

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