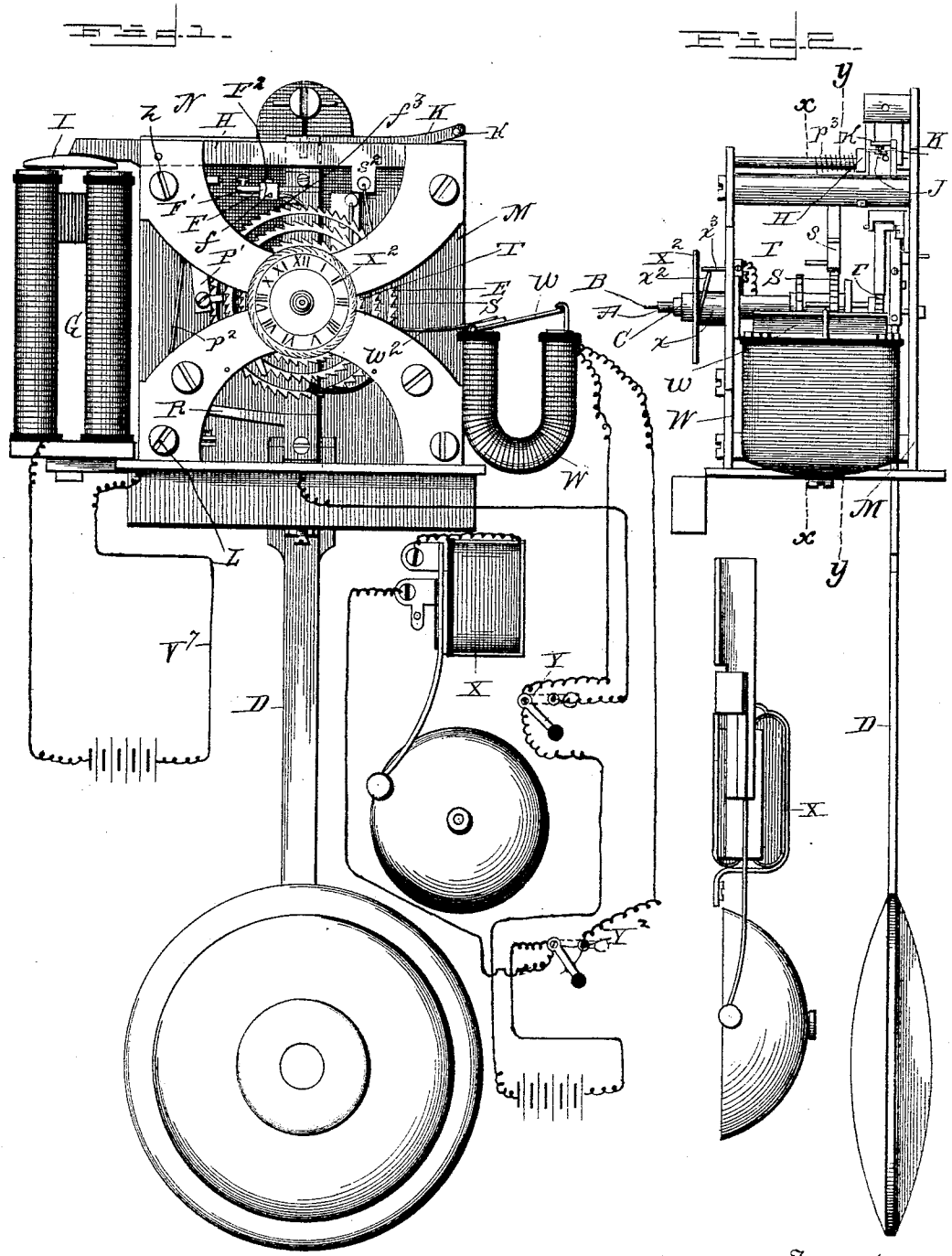
(No Model.) 4 Sheets—Sheet 1.

H. WUBBELER.

ELECTRIC CLOCK.

No. 494,832. Patented Apr. 4, 1893.



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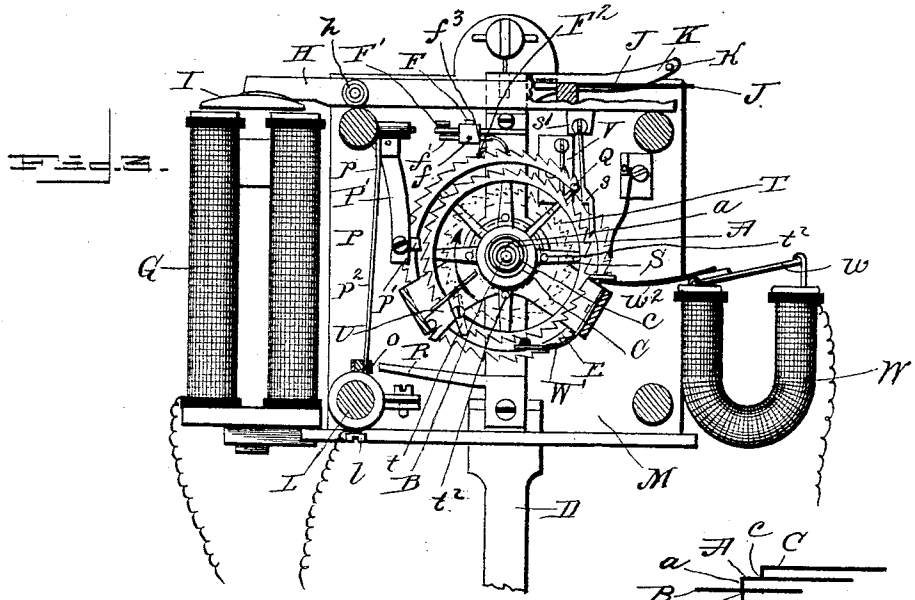
(No Model.)

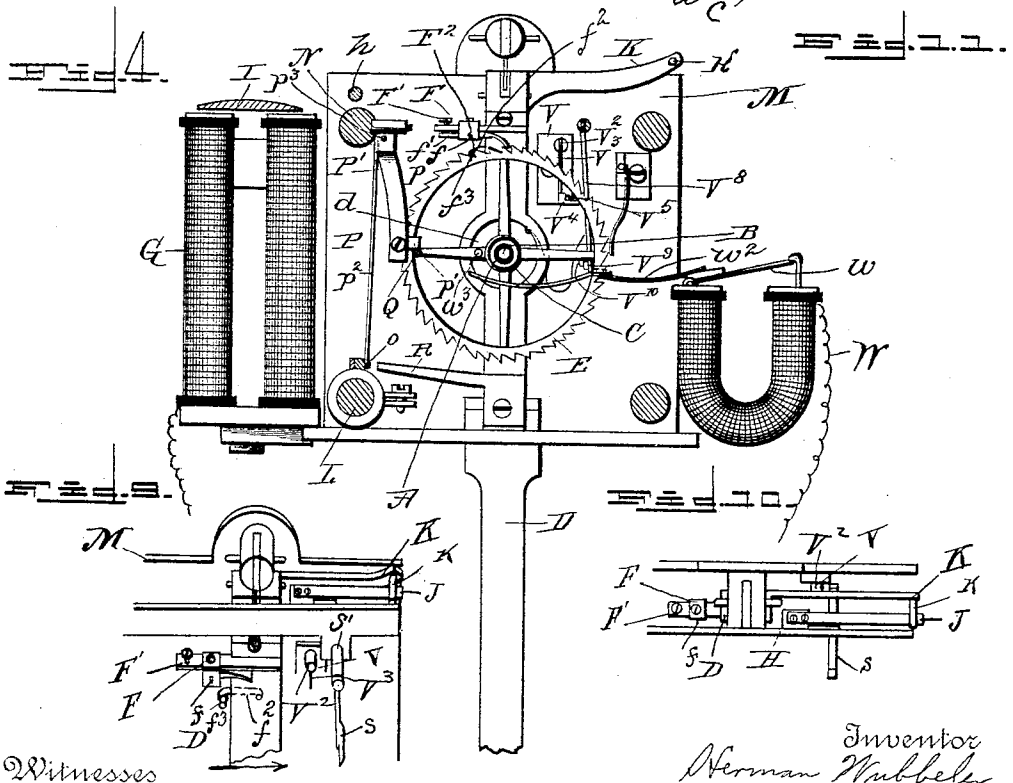
4 Sheets—Sheet 2.

H. WUBBELER.

ELECTRIC CLOCK.

No. 494,832. Patented Apr. 4, 1893.





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(No Model.) 4 Sheets—Sheet 3.

H. WUBBELER.

ELECTRIC CLOCK.

No. 494,832. Patented Apr. 4, 1893.

Fig. 5.

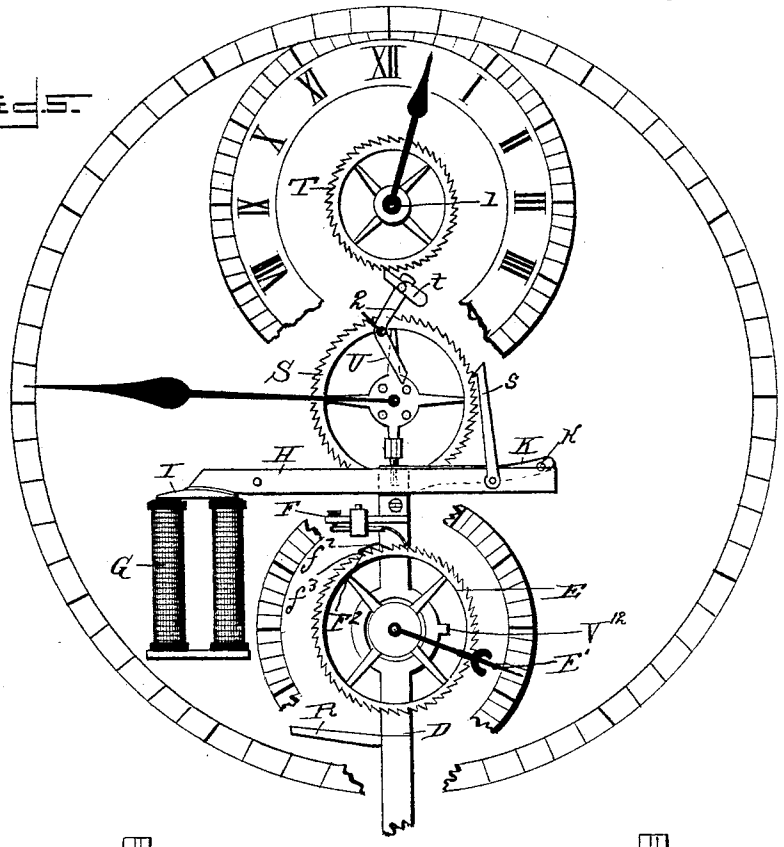


Fig. 6.

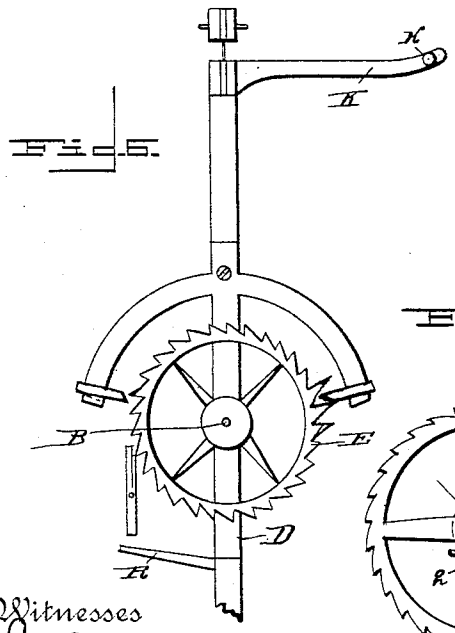


Fig. 7.

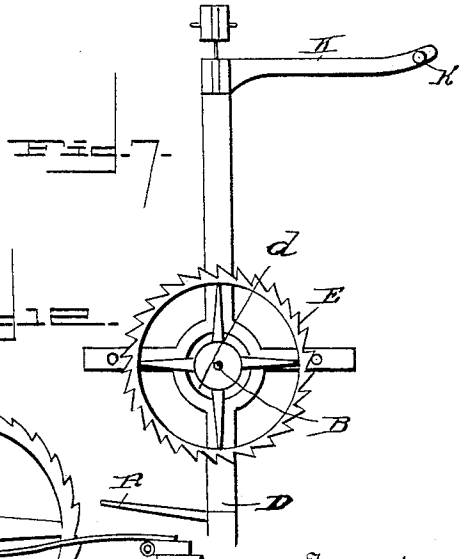
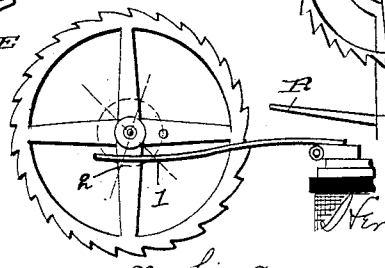


Fig. 12.



Witnesses

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(No Model.) 4 Sheets—Sheet 4.

H. WUBBELER.

ELECTRIC CLOCK.

No. 494,832. Patented Apr. 4, 1893.

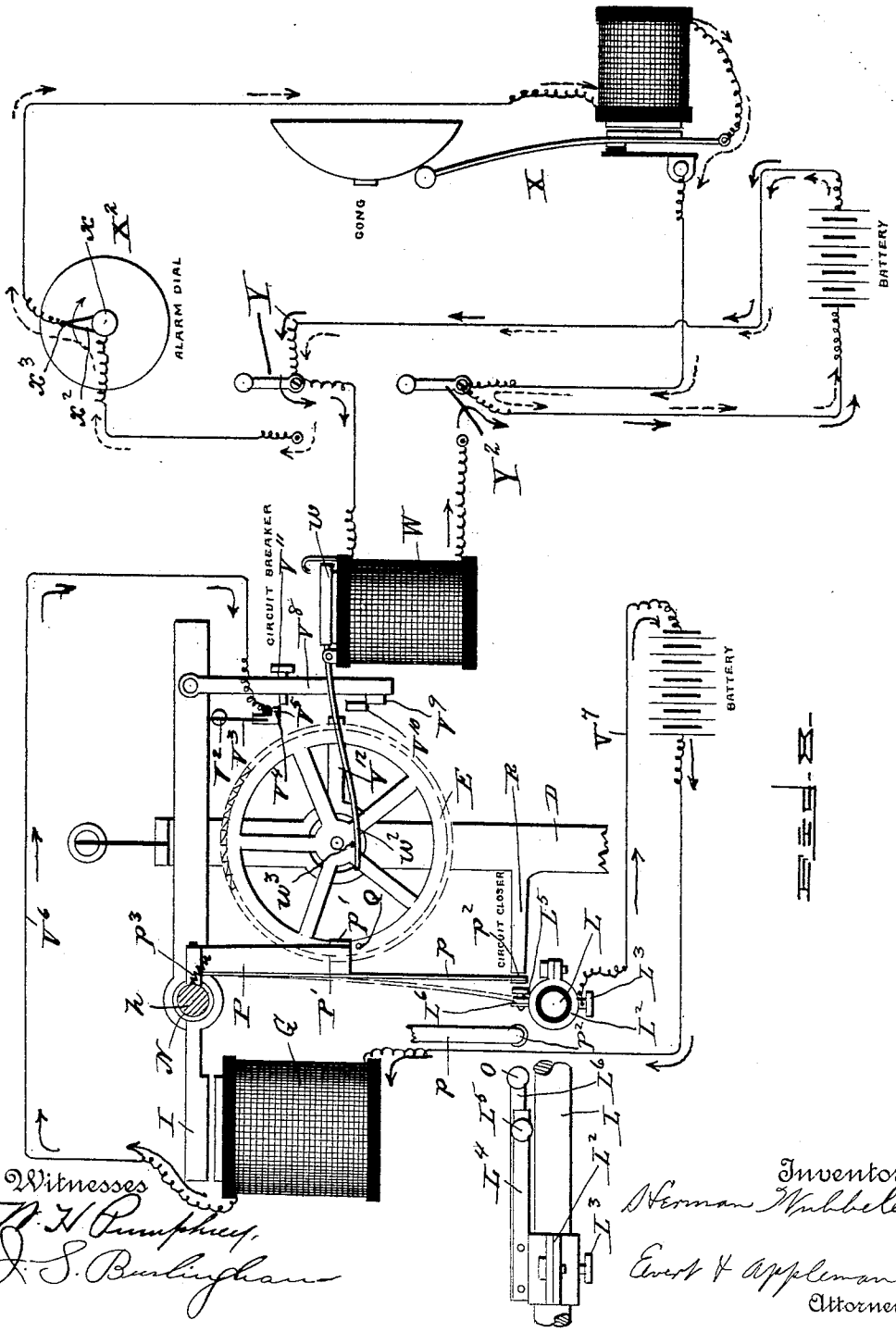

FIG. 3.

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UNITED STATES PATENT OFFICE.

HERMAN WUBBELER, OF BEAVER FALLS, PENNSYLVANIA.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 494,832, dated April 4, 1893.

Application filed May 21, 1892. Serial No. 433,905. (No model.)

To all whom it may concern:

Be it known that I, HERMAN WUBBELER, a citizen of the United States of America, residing at Beaver Falls, in the county of Beaver and State of Pennsylvania, have invented certain new and useful Improvements in Electric Clocks, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to an improvement in the adaptation of electricity to apply the power to drive clock work, the primary object being to provide a simple device for automatically applying the power to maintain the clock work in a constant and a continuous movement.

A further object of my invention is to produce an electric motor for the time registering machinery of clocks, in which the pendulum receives all the impulse directly and at regular intervals, and imparting no impulse except to an accurately balanced ratchet wheel which carries an indicator to register the seconds of time.

A further object of my invention is to provide a clock movement of a minimum number of parts, only one of which, namely, an accurately balanced ratchet wheel, is directly operated by the oscillation of the time measuring pendulum, and the other parts being operated directly by the electro magnet which is controlled by the pendulum.

A further object of my invention is to employ in combination with the clock movement as above set forth, an alarm mechanism arranged in a second circuit and controlled by suitable circuit closing devices actuated by the movement proper.

A further object of my invention is to employ such a novel construction and arrangement of parts whereby the clock may be automatically set, by throwing into circuit suitable mechanism.

My invention relates particularly to an electric clock in which the time measuring pendulum controls in its vibration the circuit of an electro-magnet, which in turn actuates an impelling device by which an impulse is given to the pendulum at regular intervals and its oscillating movement thus maintained for an indefinite period. The impulse is herein shown as derived from the force of a leaf spring which is carried by a pivoted arm which also supports the armature, said spring being adapted, when the circuit is complete and the armature is attracted, to bear against an arm on the pendulum, the parts of the device shown, being arranged to close the circuit at intervals of one minute. A gravity pawl which is carried by the pendulum engages a balanced ratchet and advances it to the distance of one tooth, during one complete vibration. The circuit closing device consists of a suspended arm which is normally held by the force of gravity out of contact with a contact point, and is moved into alignment with said contact point at regular intervals by a pin which is carried on the rim of the ratchet wheel. The armature lever carries a gravity pawl which engages a minutes ratchet and advances the latter the distance of one tooth at each time the circuit is closed, the act of rotating the said minutes ratchet being accomplished by the force of gravity upon the release of the armature and the return of the armature lever to its normal position, that arm of the lever which carries the said pawl being weighted or being longer than that arm which carries the armature. The hours ratchet is operated by the means of a gravity pawl carried by a pivoted arm, the free end of which is engaged by pins arranged upon the hub of the minutes ratchet, said arms being moved continuously by means of said pins which successively engage the free end.

The invention consists furthermore, in an electric clock, in combination with suitable mechanism electrically actuated for automatically setting said clock, and comprises, an electro-magnet connected in circuit with the time movement proper, or in a separate circuit; furthermore, an armature suitably pivoted and having secured thereon a spring arm adapted to be engaged by a pin on a spoke of the seconds ratchet whereby, as the said pin is rotated by the ratchet it engages and tends to depress said spring arm until the central point of the axis of the seconds ratchet is passed when, the arm being free to act imparts an impulse to said ratchet, rotating it the distance of fifteen seconds or less.

The invention consists furthermore in an electric clock as set forth, in combination with

an alarm mechanism, comprising an ordinary form of continuously ringing bell which may be, connected in circuit with the time movement or in a separate circuit, and suitably arranged switches whereby said mechanism may be thrown in or out of circuit.

The batteries which are employed in connection with my improved clock and alarm mechanism are preferably of very low potential, thereby avoiding the destructive sparking at the instant of breaking the circuit, but I employ horse-shoe magnets of large size and having a great number of coils, thereby producing the desired power to attract the armatures without the use of a strong electric current.

An important feature of my invention is the arrangement of all the ratchets upon concentric spindles, and the absence of all gearing, and a further feature of importance is the adjustment of all the pawls whereby friction with the peripheries of the ratchets is avoided during the backward movement of said pawls.

My invention is described in detail in connection with the accompanying drawings wherein similar letters and figures of reference indicate corresponding parts in the several views, in which,

Figure 1, is a front elevation of the clock and alarm mechanism, embodying my improvements. Fig. 2, is a view in side elevation of the same. Fig. 3, is a view in sectional elevation of the same on the line of x—x of Fig. 2. Fig. 4, is a similar view on the line y—y. Fig. 5, is a view in front elevation of a modified form showing the ratchets arranged on separate spindles. Figs. 6 and 7, are detail views of modified forms in the construction of the escapements. Fig. 8, is a diagrammatic view of the circuits. Fig. 9, is a detail view in perspective showing the arrangement of the pendulum impelling mechanism, &c. Fig. 10, is a top plan view of the same. Fig. 11, is an enlarged detail sectional view, showing the bearings of the concentric spindles.

In these drawings A, represents the hollow spindle of the minutes ratchet, which is mounted at its ends in suitable bearings in the frame and is provided at one end with interior bearings a, in which the spindle B, of the seconds ratchet is mounted. The spindle B, is smaller than the bore of the spindle A, so as to come in contact with the latter only at the bearings points a. The hours ratchet spindle C, is mounted exteriorly upon the spindle A, and is provided at its extremities with bearings c, whereby the said spindles A, and C, are only in contact at these points. The pendulum D, is suspended in the usual manner and is provided with an opening d, through which the spindle B, extends whereby the pendulum is allowed to swing freely without coming in contact with said spindle. The seconds ratchet E, is secured to and carried by the spindle B, which also carries the seconds hand E′, said ratchet being provided with teeth which are adapted to engage a gravity pawl F, which is mounted upon the pendulum. This pawl is, pivoted at f and is provided with a weighted lever at its rear end f' which counterbalances the front end and rests, in its normal position on the extremity of an adjusting screw F′, whereby the front end of the pawl is held out of contact with the periphery of the ratchet and is prevented from sliding thereon as the pendulum swings toward the left. The pawl merely touches the extremity of the teeth of the ratchet.

To prevent jumping, lagging or unevenness of motion during the revolution of the seconds ratchet, a tension device F^2, is provided and consists of a pin f^3, secured at one end of the small leaf spring f^2, the latter in turn being secured to the pendulum. This pin f^3, is adapted to move in and out of the teeth of said seconds ratchet.

G, represents the electro-magnet, arranged at one side of the pendulum, and H, represents the armature lever pivoted at h, and provided at one end with the armature I, to the opposite end of the armature-lever, is attached a leaf spring J, which extends beyond the extremities of the lever and is adapted, when the circuit is closed through the magnet, to engage a lateral pin or detent k, which is carried by the arm K, secured to the upper end of the pendulum. It will be seen that by elevating or depressing the free end of the arm K, which is rigidly attached to the pendulum at its upper extremity the latter may be oscillated and therefore, when the circuit is closed, and the armature is attracted by the magnet, thereby elevating the spring J, the latter will engage the pin k, and swing the pendulum to the right, as shown in the arrow in Fig. 9.

Suitably secured on a post L, of the frame work and insulated therefrom, is a collar L^2, provided on its under side with a binding screw L^3, to which a wire from the battery is attached, and formed integral with said collar is a projecting arm L^4, running parallel with said post and provided with a set screw L^5, for the purpose of adjusting a leaf spring L^6, which is secured to said projecting arm L^4, and is provided with a contact point O.

The circuit closer P, consists of a spring arm p, which is secured at its upper end to a swinging detent P′, the latter is pivoted at its upper end to the frame work of the clock and is provided at its lower end with a beveled block p', adapted to be engaged with a pin on the seconds ratchet. The circuit closer is arranged to hang loosely from its pivotal point, in which position the bevel block is adjacent to the rim of the seconds ratchet, the latter being provided with a pin Q, which is adapted, at intervals of one minute to engage the beveled surface of the block p', and force the lower end of the circuit-closer forward in line with the pendulum. The arm p, is constructed of spring metal and is provided with

a point p^2, which is adapted to come into contact with the contact-point O. A spring p^3, connected to the upper end of the detent P', normally holds the end of the spring arm out of alignment with the contact-point. The pendulum carries a lateral finger R, which is adapted, when the circuit-closer has been swung forward to touch the latter and cause its lower end to close the circuit by coming in contact with the point O. When the pin on the seconds ratchet releases the circuit closer the latter returns to its normal position wherein the spring arm is out of alignment with the finger. Thus the circuit is closed by the direct action of the pendulum, at the extremity of its movement to the left, and therefore as the spring J, on the extremity of the armature-lever is elevated by the action of the magnet upon the armature it engages the arm K, and gives the pendulum an impulse toward the right or in the direction as indicated by the arrow.

A plate V, secured to back plate M, is provided with a projecting stud or post V^2, the latter being slotted to secure the end of a leaf spring V^3, having secured at the lower end thereof an L-shaped contact piece V^4, which is normally in contact with a post V^5. This post is electrically connected with one end of the coil of the electro-magnet G, and the current passing through said coil enters the connecting wire V^6, and passes through said post V^5, and contact piece V^4, thence through the back plate M, to the post N, to the circuit closer P. As the pin Q, of the seconds ratchet engages the hanging detent and moves the arm p, in alignment with the contact point O, the lateral finger R, of the pendulum completes the circuit and the current passes through the spring arms p, L^6, to the collar L^2, entering the wire V^7, passes to the battery as is clearly shown in Fig. 8.

On the armature-lever is pivotally secured a depending arm or latch V^8, having formed near its lower end a lug V^9, which is adapted when the armature is attracted, and the armature lever elevated, to engage a lug V^{10}, formed on the back plate and lock said lever in an elevated position thereon, at the same time an adjustable circuit-breaker V^{11}, of the depending arm V^8, abuts against the spring arm V^3, and breaks the circuit by forcing the L-shaped contact plate V^4, out of contact with the post V^2, and as the pendulum swings toward the right, a lateral stud V^{12}, formed integral therewith releases said pivoted latch V^8, by forcing it away from the lug V^{10}, thereby allowing the armature-lever to which said arm V^8, is pivoted, to resume its normal position; furthermore, by this movement, the pieces V^3, and V^5, are automatically brought into contact and the circuit again closed. Thus it will at once be seen, that as the pin Q, engages the beveled block of the swinging detent P', the lateral finger R, of the pendulum closes the circuit, the electro-magnet is energized and the armature attracted. As the armature is drawn toward the magnet, the armature-lever will be elevated carrying with it the pawl of the minutes ratchet and the depending arm or latch of the circuit breaker as above stated. After the lug V^9 of the depending arm engages the lug V^{10} on the back plate the armature lever will be retained in an elevated position during the time that the pendulum is moving from the extremity of its movement to the left to the extremity of its movement to the right and at the latter point the circuit-breaker V^{11} of the depending arm, will break the circuit thereby disengaging the latch, and the finger V^{12}, disengaging said depending arm or latch from the lug allows the several parts to fall by gravity into their normal position, which movement actuates the pawl of the minutes ratchet to rotate the same the distance of one tooth. In as much as the circuit is not closed until the pendulum reaches the extremity of its movement to the left, it will be evident that the period of vibration of the pendulum is not shortened by the impulse which it secured from the movement of the armature-lever. The armature-lever does not move until the pendulum has reached the limit of its movement in one direction and is ready to travel in the opposite direction. The impulse is given in the direction of the movement of the pendulum and not in opposition to the same at any point, and therefore the period of vibration remains the same perpetually.

From the above it will be seen that the pendulum receives an impulse at the end of each complete rotation of the seconds wheel or once every minute, the said rotation being controlled, directly, by the oscillation of the pendulum, and the minutes ratchet S, is engaged by a pawl s, which is pivoted to the armature lever, or to a short depending lug s', whereby as the armature lever is elevated at its free end by the attraction of the armature, the said pawl engages a successive tooth of the minutes ratchet, and when the armature is released the free end of the lever descends by its own weight and causes the minutes ratchet to rotate the distance of one tooth. It will be seen that the minutes ratchet is not rotated by the direct action of the magnet upon the armature, but by the return of the lever to its normal position after being released by the magnet, also that the arm of the lever to which the pawl S, is attached, is longer than the arm to which the armature is attached whereby the weight of the former is sufficient to rotate the minutes ratchet.

The hours ratchet T, is operated by means of a gravity pawl t, which is carried by a pivoted arm U, the upper free end of which is engaged by the lateral pins, t^2 on the hub of the minutes-ratchet. Four of these pins are shown in the drawings, and the arm U, is arranged so as to be engaged thereby, successively; as the end of the arm is released by one of the pins it falls, by gravity, against the succeeding pin, which in turn moves its

free end in the direction indicated by the arrow in Fig. 3, thereby causing the hours ratchet to rotate in the same direction. A greater or less number of these pins may be employed to suit the requirements of particular cases.

It will be seen that the minutes ratchet is operated at intervals of one minute, by the operation of the armature-lever, and the hours ratchet, which depends for its operation upon the minutes ratchet, rotates continuously, or advances a portion of the distance necessary to indicate a lapse of an hour, each time the minutes ratchet moves. A locking pawl W′, is also provided with the minutes ratchet, to prevent backward movement of the latter.

The mechanism for setting the clock, comprises the electro-magnet W, suitably supported on the frame work and provided with a hinged armature w, having a spring arm w^2, which latter is adapted to be engaged by a pin or stud w^3, of the seconds ratchet (see Fig. 4) when the said magnet is in circuit. Thus, assuming that the switch Y^2, is in the position as shown in dotted lines Fig. 1, the magnet W, would be energized, the armature w, attracted and the spring arm w^2, elevated to a position where it would be engaged by the pin w^3, on the rotation of the seconds-ratchet. When this pin has reached a point 1, (Fig. 12) in its circular path of travel, such an engagement occurs and the said spring arm is gradually depressed and tensioned until a point 2, is passed and being free to act, it will spring upwardly and drive the seconds ratchet forward a predetermined distance at an accelerated speed. It being understood that the operation of this device in no way interferes with that of the movement proper, also that by retaining the switch in such a position, whereby an engagement is effected as described during each revolution of the seconds ratchet, the seconds, minutes and hours hands may be adjusted as desired.

The alarm mechanism consists of the ordinary form of continuous sounding bell, which may be electrically connected in circuit with the time movement or in a separate circuit. The latter method being here illustrated, wherein the alarm X^2, dial is provided with a collar x, adapted to fit loosely over the projecting spindle of the hours ratchet see Fig. 2 and turn with it, said collar having secured thereon a contact piece x^2, forming one terminal of the alarm circuit and designed to engage a second contact piece or the other terminal x^3, which is insulated from the movement, and constructed in the form of a stud or projecting wire which stands normally in the path of the contact piece x^2, whereby as the hours ratchet spindle revolves the pieces x^2, x^3, are brought into contact, thus making the circuit.

A switch Y, is provided for the purpose of throwing the alarm mechanism in or out of circuit and Y^2, represents a second switch controlling the operation of the clock setting device.

In Fig. 5, a modified form of arranging several ratchets and their respective pawls is shown, wherein the hours ratchet is mounted on a spindle as at 1, and the gravity pawl engaging said ratchet is suitably mounted on a shaft 2. The minutes ratchet being mounted directly below the hours ratchet and provided pins (four in number) which are adapted to engage the lower end of the arm carrying a gravity pawl (as shown) once ever quarter revolution. The seconds ratchet being constructed and arranged substantially as in Fig. 1, with the magnet armature and lever, gravity pawl and pendulum corresponding, the operation will at once be understood.

Fig. 7 illustrates the ordinary form of escapement slightly modified to replace the gravity pawl wherein the pendulum is provided with engaging arms to rotate the seconds ratchet.

The operation of my improved clock mechanism is briefly as follows: The pendulum is suspended loosely, and moves freely in the rear end of the seconds ratchet, the latter being accurately balanced so as to require but a slight touch to turn it upon its pivot, the object being to allow the pendulum to oscillate with as little opposition and friction as possible. The seconds ratchet is provided with teeth, and is advanced the length of one tooth by each vibration of the pendulum. At intervals of one minute the pin which is carried by the seconds ratchet engages the circuit closer and swings the lower end of the latter forwardly until it is in alignment with the contact point and the finger R, on the pendulum. As the pendulum reaches the extremity of its movement to the left, the finger R, touches the spring arm and closes the circuit, the spring which forms the lower portion of said spring arm being so delicate as to require a mere touch to cause the bar p^2, to bear against the contact point. The circuit being closed, the armature is attracted thereby elevating the impulse spring J, which engages the operating arm K, and gives the pendulum an impulse to the right. As the longer arm of the armature lever rises, the pivoted latch engages its supporting pin thereby maintaining the impulse spring in contact with the operating arm throughout the swing of the pendulum toward the right, said latch being disengaged at the extremity of said movement to the right by the lateral detent. As the longer arm of the armature descends by its own weight after being released by the disengagement of the latch, the minutes ratchet is rotated the distance of one tooth, and the successive advances of the minutes ratchet, acting through the pins upon the hub of the latter and the pivoted arm U, causes the hours ratchet to rotate as described. It will be noted that the pendulum is operated directly by the magnet, through the impulse spring, that the pendulum only operates the seconds ratchet and closes the circuit at intervals, and that the minutes and hours ratchets are op-

erated by the return movement of the armature lever.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an electric clock, the pendulum provided with a lateral operating arm, the electro-magnet, the armature-lever, the impulse spring carried by the armature lever and adapted to engage said operating arm, the seconds ratchet engaged by a pawl upon the pendulum, the circuit closer adapted to be engaged by the pendulum and the circuit breaker operated by the armature lever, substantially as described.

2. In an electric clock, the electro-magnet, the contact points, the armature-lever carrying an impulse spring, the pendulum actuated by said impulse spring, and the seconds ratchet engaged by a pawl carried by the pendulum, in combination with a circuit breaker pivotally suspended from said armature-lever and provided with engaging projections adapted to break the circuit when the armature-lever is elevated, substantially as described.

3. In an electric-clock, the electro-magnet, the contact points, the armature-lever carrying an impulse spring, the pendulum actuated by said impulse spring, and the seconds ratchet engaged by a pawl carried by the pendulum, in combination with a circuit closer, pivotally suspended from its upper end and provided with a detent which is adapted to be engaged by a pin on the seconds ratchet, substantially as described.

4. In an electric clock, the combination of the electro-magnet, the contact points, the armature-lever, the impulse spring, the pendulum, the circuit closer engaged by a finger on the pendulum, and the circuit breaker comprising the pivotally suspended arm or latch provided with a lug and a projection adapted to engage the lug and a spring arm of the back plate to break the circuit, the contact pieces and the lateral stud of the pendulum engaging said suspended arm, substantially as described.

5. In an electric clock, in combination, the electro-magnet, the contact points, the armature-lever, the impulse spring, the pendulum, the seconds ratchet operated by the pendulum and the circuit closer comprising a detent P′ which is adapted to be engaged by a pin on said ratchet and a spring arm P, which is adapted to be engaged by a finger on the pendulum to close the circuit, substantially as described.

6. In an electric clock, in combination, the electro magnet, the contact points, the armature-lever, the impulse spring, the pendulum the seconds ratchet operated by the pendulum, the circuit closer the circuit breaker and means substantially as described for automatically setting the clock, comprising the electro-magnet, the armature and the armature-lever, adapted to be engaged by a pin, said pin being secured to the spoke of the seconds wheel, as and for the purpose described.

7. In an electric clock, the combination, with an electro-magnet, the contact points the armature-lever, the impulse spring, the pendulum, the seconds ratchet operated by the pendulum, the circuit closer, the circuit breaker, and mechanism substantially as described for automatically setting the clock, said mechanism adapted to be operated electrically and controlled by a suitable switch as and for the purpose set forth.

8. In an electric clock, in combination, the electro-magnet, the pendulum, the seconds ratchet operated by a pawl on the pendulum, the spring arm and pin carried by the pendulum, the minutes ratchet, the armature-lever carrying an impulse spring to actuate the pendulum and a pawl to operate the minutes ratchet, a circuit closer and a circuit breaker, substantially as described.

9. In an electric clock, the minutes ratchet, the electro-magnet, the armature-lever having one arm extended or weighted and carrying a pawl to engage the minutes ratchet and rotate the same when the armature is released, in combination with the seconds ratchet, the pendulum to operate said ratchet, a circuit closer and a circuit breaker, substantially as described.

10. In combination, the electro-magnet, the pendulum, the circuit-breaker engaged by the pendulum, the armature-lever, the minutes ratchet engaged by a pawl on the armature-lever, the hours ratchet, and the pivoted arm engaging lateral pins on the minutes ratchet and carrying a pawl to operate the hours ratchet, substantially as described.

11. In combination, the electro-magnet, the pendulum, the circuit-closer operated by the pendulum, the armature-lever, the minutes ratchet engaged by a pawl on the armature-lever, the hours ratchet, and the pivoted arm engaging lateral pins on the minutes ratchet, substantially as described.

12. In combination, the electro magnet, the pendulum, the circuit closer operated by the pendulum, the circuit breaker operated by the armature-lever, and engaged by the pendulum to close the circuit, the minutes ratchet engaged by a pawl on the armature lever and provided at its hub with a series of lateral pins, the pivoted arm engaged at its free ends by said lateral pins, and the pawl, carried by the pivoted arm to engage the hours ratchet, substantially as described.

13. In combination, the pendulum provided with an operating arm K, the electro-magnet, the circuit closer, adapted to be operated by the pendulum, the circuit breaker adapted to be operated by the armature-lever (when said magnet is energized) to break the circuit and engaged by the lateral stud of the pendulum simultaneously with the operation of the impelling device, substantially as described.

14. In combination, the pendulum having an operating arm, the electro-magnet, the cir-

cuit closer, the armature-lever, the impulse spring to engage the operating arm and the latch on the armature-lever to hold the impulse spring in contact with the operating arm, substantially as described.

15. In combination, the pendulum, the electro-magnet, the circuit closer operated by the pendulum, the armature-lever, the impulse spring to engage an operating arm on the pendulum and the pivoted latch on the circuit breaker to lock the armature-lever in an elevated position when the circuit is closed, and adapted to be disengaged by a lateral stud on the pendulum, substantially as described.

16. In combination, the electro-magnet, the contact points, the circuit closer adapted to be engaged by the pendulum at one end of its swing, the armature lever carrying an impulse spring to engage the pendulum when the circuit is closed and the engaging latch of the circuit breaker adapted to lock the armature-lever in an elevated position and break the circuit, said latch being engaged by the lateral stud of the pendulum at the opposite end of the swing, substantially as described.

17. In an electric clock, the combination of the hours, minutes and seconds ratchets fixed to concentric spindles, the pendulum to operate the seconds ratchet, the electro-magnet, the armature-lever to operate the hours and minutes ratchets, and having an impulse spring to operate the pendulum, the circuit closer controlled by the pendulum, the circuit breaker actuated by the armature-lever, and devices electrically actuated for automatically setting the clock, substantially as described.

18. In an electric clock, the combination with the electro-magnet, the pendulum, and the armature-lever carrying an impulse spring of a circuit closer controlled by the pendulum, the seconds ratchet to engage the circuit closer at intervals and a gravity pawl mounted on the pendulum to engage the said ratchet and provided with an adjusting screw and a spring arm and pin substantially as specified.

19. In an electric clock, the electro-magnet, the pendulum, the armature lever carrying an impulse spring, the circuit closer controlled by the pendulum, the circuit breaker operated by the armature-lever, the seconds, minutes and hours ratchets mounted on concentric spindles and the pawl of the pendulum engaging said seconds ratchet in combination with an alarm mechanism comprising a continuously ringing bell, the alarm dial, the contact points x, x, the former being suitably insulated and the latter carried by said dial and a suitable switch whereby the alarm may be thrown in or out of circuit, substantially as and for the purpose set forth.

20. In an electric clock, the combination, with the pendulum, the electro-magnet, the armature-lever, the circuit closer controlled by the pendulum, the circuit breaker actuated by the armature-lever, the seconds ratchet, the pawl of the pendulum engaging said seconds ratchet, the pawl of the armature-lever engaging the minutes ratchet, the pawl actuated by said minutes ratchet, engaging the hours ratchets, the electrically operated device as described for setting the clock and the alarm mechanism substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

HERMAN WUBBELER.

Witnesses:

JAMES F. MERRIMAN,

PHILIP DOUGLAS.