

F. WILLIAMS.
RECORDING CLOCK.

(Application filed Aug. 11, 1899.)

(No Model.)

4 Sheets—Sheet 1.

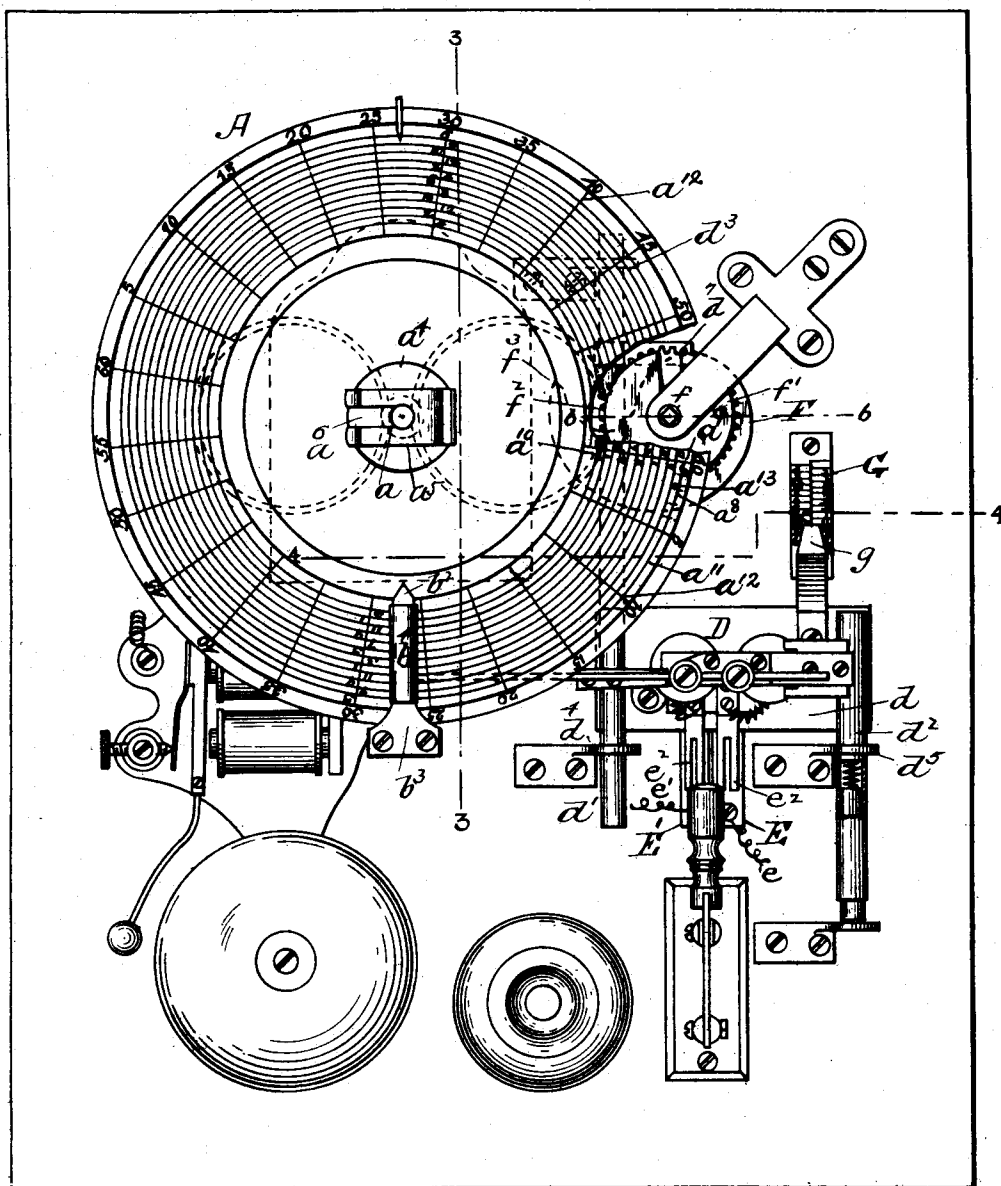


Fig. 1.

WITNESSES

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4 Sheets—Sheet 3.

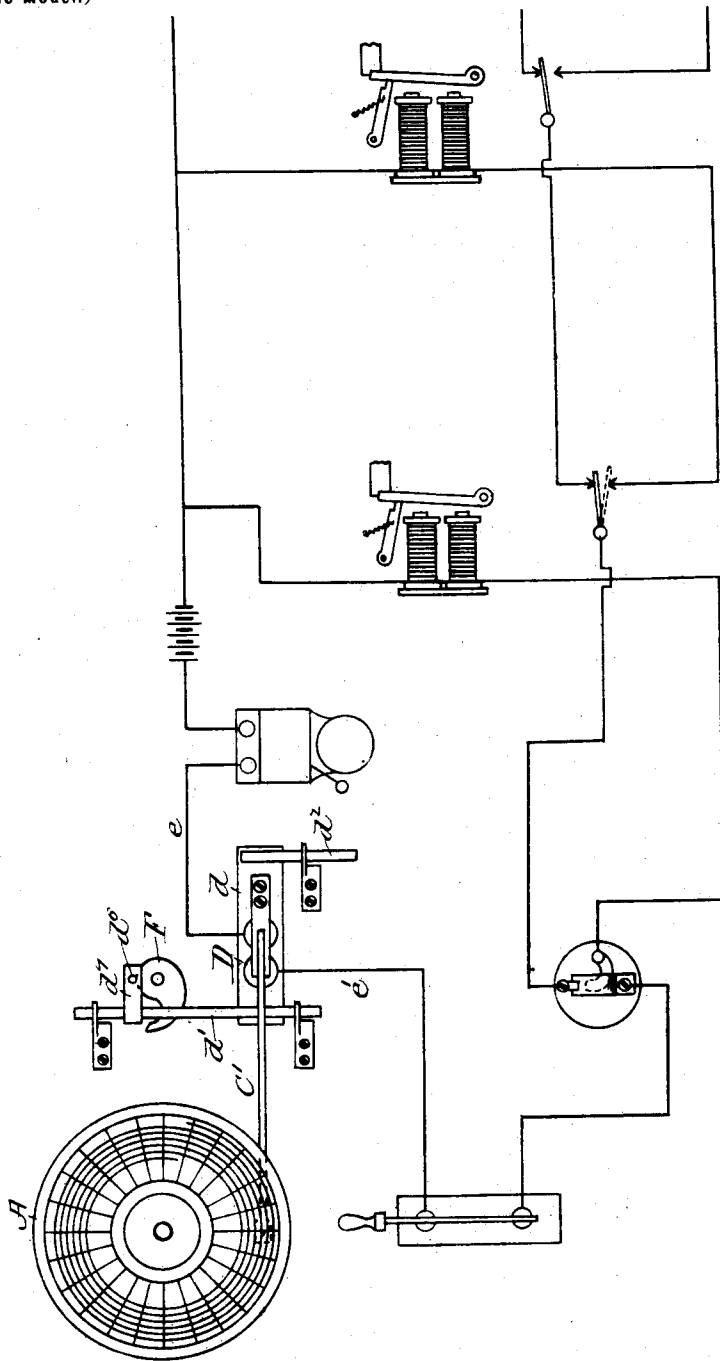


FIG. 3.

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4 Sheets—Sheet 4.

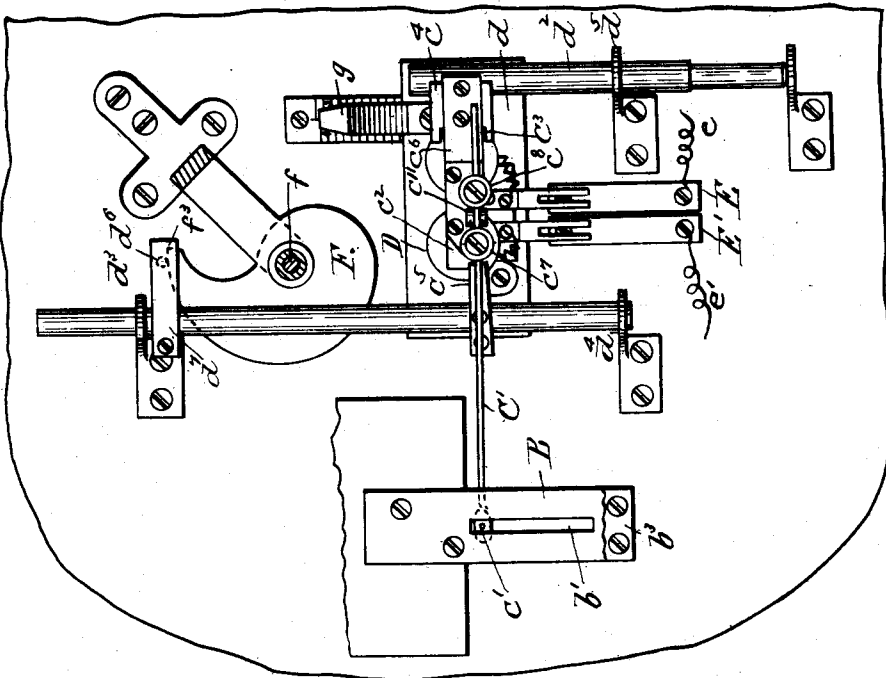


FIG. 10.

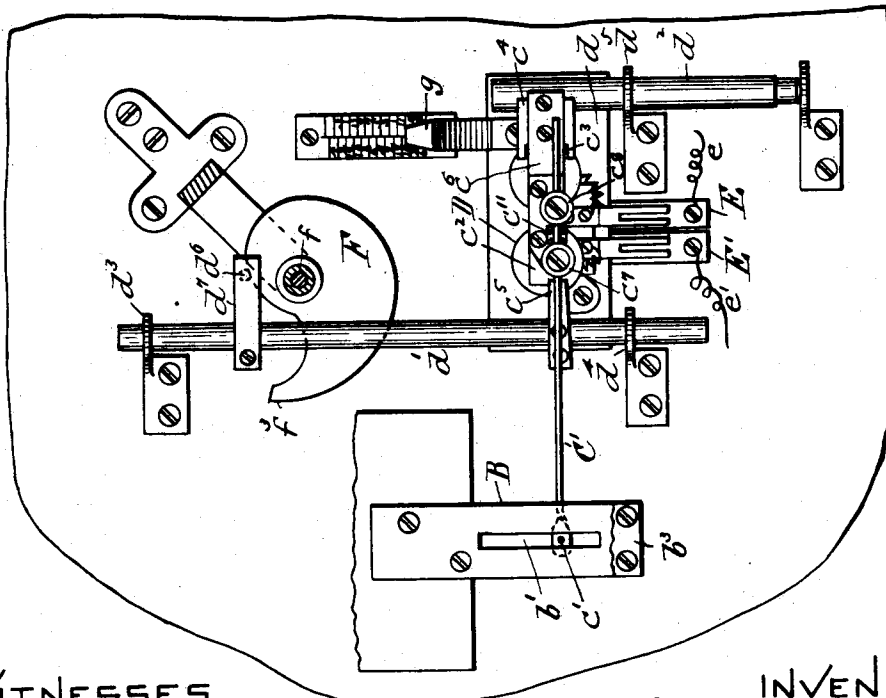


FIG. 9.

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UNITED STATES PATENT OFFICE.

FREDRICK WILLIAMS, OF REVERE, MASSACHUSETTS.

RECORDING-CLOCK.

SPECIFICATION forming part of Letters Patent No. 683,090, dated September 24, 1901.

Application filed August 11, 1899. Serial No. 726,914. (No model.)

To all whom it may concern:

Be it known that I, FREDRICK WILLIAMS, a citizen of the United States, residing at Revere, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Recording-Clocks, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

My invention relates to a recording-clock of that class having a rotary dial upon which a record is made by a recording instrument operated electrically and having a progressive movement from one edge of the dial radially toward its center, or vice versa; and it consists, primarily, in mounting the recording instrument directly upon the armature of the electromagnet which is in circuit with a circuit-closer or circuit-closers which form the stations visited by the watchman.

The invention further consists in the combination, with a dial of the character specified, of a recording instrument which is mounted upon a slide movable or allowed to be moved by mechanism connected with a clock mechanism, whereby the recording instrument is moved radially with respect to the disk to traverse the recording-section thereof from the outer to the inner edge in a given period of time, and which slide has mounted upon it an electromagnet adapted to be energized either automatically or otherwise from points more or less remote from it and which when energized moves the recording instrument and causes it to make an impression or mark upon the dial.

In the drawings, Figure 1 is a view, principally in front elevation, of a recording-clock having the features of my invention. Fig. 2 is a view in plan thereof. Fig. 3 is a view in vertical section upon the dotted line 3 3 of Fig. 1. Fig. 4 is a horizontal section upon the dotted line 4 4 of Fig. 1, showing in plan some of the parts below said line. Fig. 5 is a diagrammatic view representing the recording-clock as combined with the invention described in my application for Letters Patent, filed March 27, 1899, Serial No. 710,562. Fig. 6 is a view in section upon the dotted line 6 6 of Fig. 1. Fig. 7 is a plan view of a gear-clamping spring hereinafter referred to. Fig.

8 is a view in section, enlarged, upon the dotted line 8 8 of Fig. 3. Figs. 9 and 10 are views in elevation representing different positions of the carriage or slide carrying the magnet, the recording instrumentality, and the slide-moving cam, representing them in different positions.

In practicing the invention any clock mechanism may be employed, and I have represented in the drawings one of the usual types employed for recording purposes.

The dial A is preferably made of paper. It has a central hole *a*, which receives the end *a'* of a shaft or arbor *a²*, rotated by the clock mechanism at any desired speed. In the construction represented it makes one complete rotation in an interval of two hours. The dial is fastened to the arbor to be turned therewith by means of an annular support *a³*, fastened to the arbor to turn therewith and upon which a portion of the dial about its hole *a* is pressed or clamped by a removable washer *a⁴*, having a central hole to fit the arbor and which is applied to the outer surface of the dial, and a spring-clip *a⁵*, bent outward between the ends and having a slot *a⁶*, opening from one end of the width of the reduced portion *a⁷* of the arbor outside the removable washer and which clamps the removable washer against the dial and dial-support by being slightly compressed by the shoulder formed by the reduced section of the arbor, the clamp being moved laterally into place over the washer and by such lateral movement being compressed by the shoulder, so that its ends bear with the same pressure upon the washer and cause the washer to clamp the dial against the dial-support. The dial is also provided with the spiral line *a⁸*. This line begins near the outer edge of the dial at any desired point thereon (in the drawings represented at *a⁹*) and extends spirally around the dial for any desired number of complete turns. I have represented it as making twelve and as ending at *a¹⁰*. The pitch of the spiral line may be varied at will, so that the spaces between the lines may be of any desired width. By providing twelve full courses and by rotating the dial once every two hours the entire spiral line, or, what is the same thing, the entire spiral path formed by it, will be entirely traversed once

in every twenty-four hours, so that the single dial as a whole is adapted to receive the impress of all impulses or registering-marks of twenty-four hours. The dial is divided into five-minute sections a^{11} by radial lines a^{12} , which extend across the spiral lines from beyond the outer to beyond the inner, and these radiating lines are numbered, preferably at their outer ends, to indicate portions of an hour. For instance, the first one is numbered "5," the second "10," and so on until "60" is reached, indicating a full hour and a half-rotation of the dial, and this numbering is repeated in the same way for the other half of the dial and the second hour. There is also printed or marked upon the dial, preferably at the half-hour radial lines "30" and "60," numbers indicating the hours of the day, and these numbers represent in one place the beginning of the odd hours of the entire day and in another the beginning of the even hours of the day, and for convenience I have selected the hour five a. m. as the best time for the beginning of a day, the removal of the old dial, and the substitution of a new one. The second line of radial figures will indicate the half-hour of the odd hours. The third line indicates the beginning of the even hours, and the fourth line the half-hour of the even hours. By this means the dial may be easily read either when active in the clock or after it has been removed from it, and there will be used for recording the acts of one hour a line which extends half-way about the dial and which is divided into relatively long sections by twelve radial lines indicating five-minute divisions, and which divisions are in turn divided into minute-spaces by the dotted lines a^{13} . It will be understood that the dial shown in the drawings is but a little more than half the diameter of the actual dial which is used and that these minute-sections upon the actual dial are about one-fourth of an inch long upon the outer line of the spiral, decreasing somewhat as the diameter decreases. The dial is rotated over the plate B, mounted upon posts b , attached to the clock-frame and extending outward therefrom and which has a long slot b' extending lengthwise it and under a bar or platen b^2 , the outer end b^3 of which is attached to the outer end of the plate B. The bar or platen is located over the slot b' and may be clothed with a resilient covering b^4 upon its under side, against which the recording instrument strikes. I have represented this result as obtained by slipping an elastic tube or sleeve slightly less in diameter than the bar over it, as represented in Fig. 3. The recording-section of the dial passes between the plate B and the platen or bed, and the recording instrument C is caused to be moved in line with this slot from its outer to its inner end once in twenty-four hours by the clock mechanism and to be actuated by the magnet to deliver an impression to the dial as often as the magnet may be energized.

I have represented the recording instrument in the shape of a metallic pin c , having a sharp impressing-point c' , but may use in lieu thereof any impressing, marking, or printing device. The pin is mounted upon the outer end of a long arm c' , and this arm is secured to an armature c^2 , which is hinged at c^3 to a support c^4 . The hinge is preferably formed by a flat spring-plate fastened to the support and also to the armature and which is set to move the armature from the magnet and to hold it removed from the magnet and in contact with a stop c^5 . This spring is lettered c^6 . The armature has extending from it the slotted posts c^7 c^8 , through which slots the arm c' extends, the arm being fastened to said posts in a manner to permit of the lateral adjustment thereof by set-screws c^9 c^{10} , respectively, and a bearing-point c^{11} on the edge opposite that against which the set-screws bear. The bearing-point c^{11} serves as a fulcrum about which the arm C' may be adjusted by the screw c^9 c^{10} . I prefer that this bearing-point should be movable, and I have shown in the drawings a small cylindrical piece, upon the upper surface of which the under surface of the arm rests, this form of bearing-point serving not only as a fulcrum, as described, but also being movable renders possible a still more accurate adjustment of the position of the arm.

D is the magnet. It is mounted upon a sliding carriage or plate d , and it is energized from any desired point by an electric circuit established automatically and which circuit is maintained through the fixed contact-plates $E E'$, with which the line-wires $e e'$ connect. The magnet is connected with these fixed contact-plates by spring contact-arms e^2 , which are mounted on the sliding carriage d to move therewith. The sliding carriage is supported by rods d' d^2 , and the rods are mounted in stationary bearings d^3 d^4 d^5 . The rods are movable with the carriage, and one of them—the rod d' —furnishes means by which movement in one direction is communicated to the carriage by the edge cam F , against which a cam-pin d^6 , projecting from the side of a block d^7 , attached to the rod d' , extends. The cam is of spiral shape and is so constructed as to impart a uniform movement in one direction to the slide d , and consequently to the magnet carried thereby, and to the recording instrument during its entire revolution, and it is mounted upon a shaft f , which is connected by a gear f' with a gear f^2 of the clock mechanism to make one full revolution in twenty-four hours and to thus move the recording instrument the full width of the recording-section of the dial in that interval of time. The cam is also constructed to permit the immediate return of the carriage-magnet and recording instrument at the end of the rotation of the cam. This effect is obtained by constructing the cam, as represented at f^3 , so that the cam-pin may drop from said point, which is then the high-

est, to the lowest point of the cam. The slide is automatically actuated to make this dropping movement by gravity or by a spring, and by this movement the recording device

5 is returned to its initial position.

In order that the slide and the recording-point may be set to correspond with the time of the dial, I have connected the gear f' with the shaft f by a slip-friction, which will permit the movement of the cam F independently of it, whereby the cam may be set at any desired place for the purpose of effecting the timing of the recording-pin, and I have provided the outer end of the shaft with a square end for the reception of a turning-key. The friction between the gear and the shaft, as shown, is provided by a spring f^4 (see Figs. 6 and 7) and is sufficient to permit the gear to turn the shaft and the cam and

20 actuate the slide without slipping.

The operation of the device is as follows: The dial is continuously rotated and past the bed or platen. The recording-point is also being moved very slowly radially and behind the bed. The movement of the dial and the movement of the recording-point are in such unison that the recording-point upon being actuated will indicate on the dial the exact time of its impulse in hours, minutes, and in small fractions of minutes, an interval of two or three seconds' duration being recorded. To assist in the setting of the recording slide and pin, there may be used a setting gage or scale G , having the hours marked thereon and upon which a pointer g , attached to the slide, may travel.

My invention may be used with any system requiring a recording instrumentality electrically actuated from a distance. The bell

40 H is in the main-line circuit and is struck or sounded every time that the recording instrument is actuated to make a record on the dial. In Fig. 3 I have represented the application of my recording-clock to my invention described in my application for Letters Patent filed March 27, 1899, Serial No. 710,562, and whereby the act of opening each door or receptacle in successive order energizes the magnets upon the slide and causes the recording device to record the exact time of said opening and the bell to sound to indicate that the opening of the door or receptacle is taking place.

I have shown the recording point or device as actuated to mark or print an impression upon the dial by a magnet for holding it removed from the dial and a spring for forcing it against the dial when the current is broken. This I consider to be the best form of construction; but I do not wish to be understood as not including these parts when operated reversely—that is, when a magnet is used to cause the recording-point to move against the dial in a line parallel with its axis and is de-energized to allow the spring to release it again when the current is broken. I would further say that in lieu of the armature-re-

turning spring an additional magnet may be employed for accomplishing the same purpose—that is, for holding the armature re-

70 moved from the magnet which actuates it in making the record.

It is desirable that the slide carrying the magnet and the recording device shall at the end of the revolution of its actuating-cam drop or return quickly to its zero or starting position. If the clock should be placed in a horizontal position, a spring will be used for returning the slide. It will be understood, however, that it is generally used in a vertical position and that then the slide and its appurtenances will drop by gravity, and I then, to check the drop and prevent concussion, prefer to employ a buffer to receive the slide at the end of its downward movement. Such a buffer may be obtained by the employment of a compression or other spring or by means of a dash-pot or air-cushion. In the drawings I have shown the latter construction, one of the slide-rods entering a hollow guide-sleeve, closed at its bottom, longer than the rod, which is adapted to contain sufficient air to act as a cushion upon the downward movement of the guide-rod, the fit between the guide-rod and sleeve being such that air may enter the chamber upon the upward movement of the slide and may sufficiently escape from it upon the dropping of the slide to permit the slide to at once take its zero position.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In a watchman's clock, a rotary dial, an electromagnet, the cores of which are parallel with the axis of said dial, an armature located in a plane substantially parallel with said dial and operated by said electromagnet, said armature carrying an arm provided at its extremity with a recording device, in combination with one or more circuit-closers in circuit with said electromagnet, whereby the closing of the circuit will cause a movement of said armature in a line parallel with the axis of the dial and cause the recording device to move at right angles to the plane of said dial to make a record thereon, as set forth.

2. In a watchman's clock, a rotary recording-dial and means whereby it is rotated, a carriage and means whereby it is reciprocated, an electromagnet mounted on said carriage, an armature also mounted on said carriage and operated by said electromagnet and carrying a recording device adapted to register on said dial, and one or more circuit-closers each in circuit with said electromagnet, as and for the purposes set forth.

3. The combination with a recording-dial and a recording-marker of a clock of the kind described, an electromagnet, a post carrying an armature hinged thereto, a spring controlling the movements of said armature, said armature lying in a plane substantially parallel with the plane of said dial, and said

electromagnet being located to move said armature in a line parallel with the axis of said dial, said armature being provided with means for adjustably holding said recording-marker
 5 said means consisting of two adjustable points suitably mounted upon the farther side of said recording-marker from said armature, and a point located between said recording-marker and said armature, and also between
 10 said adjustable points, as and for the purposes set forth.

4. The combination with a recording-dial and a recording-marker, of a clock of the kind described, an electromagnet, a post carrying
 15 an armature hinged thereto, a spring controlling the movements of said armature, said armature lying in a plane parallel with the plane of said dial and said electromagnet being located to move said armature in a line
 20 parallel with the axis of said dial, said armature being provided with two slotted posts each having a set-screw, the slots in said posts being adapted to receive and hold said recording-marker, and a movable bearing-point
 25 located on said armature between said slotted posts, whereby said recording-marker is adjustably held in said posts between the screws thereof and said bearing-point, as and for the purposes set forth.

5. In a clock of the kind described, a recording-dial, a carriage, an electromagnet and its armature mounted on said carriage, a recording-tool connected to said armature and located to make record on said dial, means
 35 whereby said carriage is reciprocated in a direction parallel with the plane of said dial and sliding means for maintaining electric connection between said electromagnet and a source of electricity, all as and for the purposes set forth.

6. In a clock of the kind described, a recording-dial, a carriage, an electromagnet and its armature located on said carriage, means for making a record on said dial carried by said
 45 armature, means whereby said carriage is reciprocated, a pair of electric contact-plates located on said carriage and electrically connected with said electromagnet, and a pair of fixed contact-plates connected with a source
 50 of electricity and in sliding contact with the contact-plates mounted on said carriage whereby electrical contact may be maintained between said electromagnet and said source of electricity during the reciprocation
 55 of said carriage, as and for the purposes set forth.

7. The combination in a recording-clock of a recording-dial having a spiral line, mark or course upon it and radial marks or lines
 60 separating the said spiral line, mark or course into divisions, means for holding and rotating it, a slide, an electro magnet or magnets mounted upon the slide to be movable therewith, an armature also mounted upon said
 65 slide to be movable therewith and adapted to be moved by the magnet or magnets when energized in one direction, and by a spring

in the reverse, a recording point or device mounted upon or carried by said armature and adapted to be moved thereby, and means
 70 for continuously and slowly moving said slide in one direction, whereby the recording point or device is maintained in line with said spiral line, mark or course on the dial, and means
 75 for energizing the magnet as desired, whereby the said recording point or device may be actuated to make impressions or imprints upon the dial, as and for the purposes set forth.

8. In a recording-clock a recording-dial, means for holding and rotating it, a slide,
 80 means for moving it slowly and continuously in one direction for any desired interval of time and for returning it at the end of such interval to its initial position, one or more
 85 magnets mounted upon said slide to be movable therewith, an armature also mounted upon said slide to be movable therewith, and adapted to be moved by the magnet or magnets when energized in one direction, and by
 90 a spring in the reverse direction, and a recording point or device attached to said armature to be moved thereby, as and for the purposes described.

9. In a recording-clock, a recording-dial, means for holding and rotating it, a slide,
 95 means for moving it slowly and continuously in one direction for any desired interval of time and for returning it at the end of such interval to its initial position, one or more
 100 magnets mounted upon said slide to be movable therewith, an armature also mounted upon said slide to be movable therewith, and adapted to be moved by the magnet or magnets when energized in one direction, and
 105 by a spring in the reverse direction, a recording point or device attached to said armature to be moved thereby, a plate past which the dial is moved adjacent to the striking end of the recording point or device and
 110 a platen to support the dial when struck by the recording point or device and at a point opposite the same, as and for the purposes set forth.

10. The combination of a clock-movement, a dial-arbor, turned thereby, a dial mounted
 115 on the arbor, a cam also turned by the clock-movement at the same rate of rotation as the arbor constructed to impart a continuous movement in one direction during its complete
 120 rotation and to then permit the immediate return to initial position of the thing moved, a slide or carriage connected with said cam to be moved thereby and to be returned as specified, a recording point or device carried
 125 by said slide and movable therewith having electrically-actuated devices carried by said slide for actuating said recording point or device, line-wires connected therewith and a platen to support the dial during the
 130 recording action of the recording point or device.

11. The combination in a recording-clock of a carriage, a cam for continuously moving

it for a given period of time in one direction and for then permitting it to be immediately moved backward to its initial position, means connecting the slide, with the cam comprising a slide-rod upon which the carriage is mounted, and which has a cam-pin to engage the cam, an electrically-actuated recording point or device mounted on said slide to be movable therewith, as and for the purposes described.

12. The combination in a recording-clock of a carriage, a cam for continuously moving it for a given period of time in one direction and for then permitting it to be immediately moved backward to its initial position, means connecting the slide with the cam comprising a slide-rod upon which the carriage is mounted, and which has a cam-pin to engage the cam, an electrically-actuated recording point or device mounted on said slide to be movable therewith, and means for maintaining an electric connection with said electrically-operated devices during the movement of the slide.

13. In a clock of the character specified, the slide, means for moving it as described, the recording point or device mounted on said slide to be moved therewith, a stationary scale and an indicator extending from the slide to cooperate with the scale in the setting of the recording device.

14. The combination in a recording-clock of a rotating recording-dial, a slide, a recording point or device mounted thereon, means for electrically actuating it also mounted upon the slide, a cam for slowly moving the slide in one direction, means for recording the cam and devices for setting or adjusting the cam with respect to its operating means and the dial-rotating mechanism.

15. The combination in a recording-clock

of a rotating recording-dial having a spiral line, mark or course upon it, radial marks or lines separating said spiral line, mark or course into divisions, a platen, a slide, a cam for slowly moving it in one direction, means for adjusting the cam, a recording point or device carried by the slide, means for electrically actuating the same mounted upon said slide and adapted to be operated from a distance more or less remote therefrom, means for returning said slide and recording point or device and its actuating mechanism to their initial position, and a bell or alarm actuated simultaneously with the vibration of the said recording point or device.

16. The combination in a recording-clock, of a carriage, a cam for continuously moving it for a given period of time in one direction and for then permitting it to be immediately moved backward to its initial position, means connecting the slide with the cam, an electrically-actuated recording point or device mounted on said slide to be movable therewith and a cushion or buffer for checking the return or backward movement of said carriage, as and for the purposes set forth.

17. In a recording-clock, in combination with a recording-dial and a recording-marker, an electromagnet and an armature located in proximity thereto, said armature being provided with two slotted posts each having a set-screw, and a movable bearing located between said posts upon said armature, said recording-marker being located in the slots in said posts and resting upon said bearing-point and being clamped between it and said set-screws, as and for the purposes set forth.

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