No. 648,487. Patented May 1, 1900.

W. J. DUDLEY.

ELECTRIC CLOCK.

(Application filed Jan. 30, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

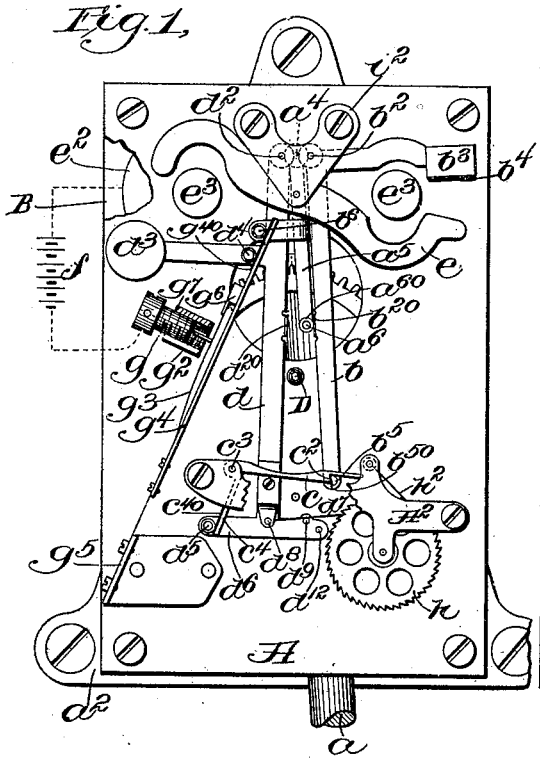

Fig. 2.

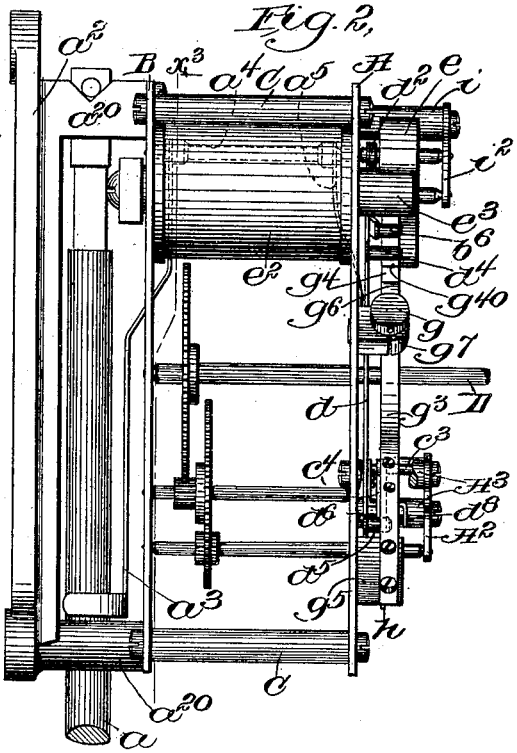

Fig. 3.

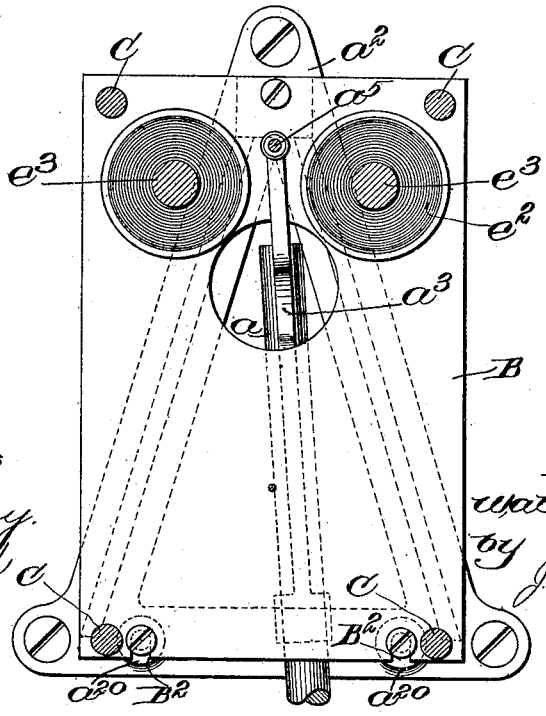

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Fig. 4.

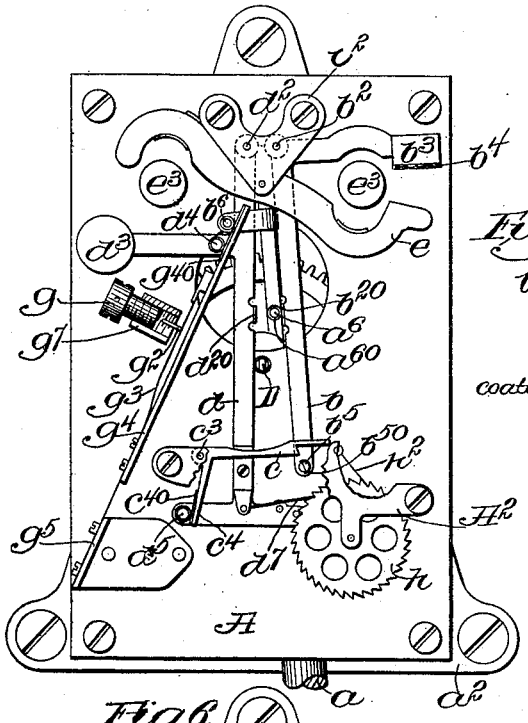


Fig. 5.

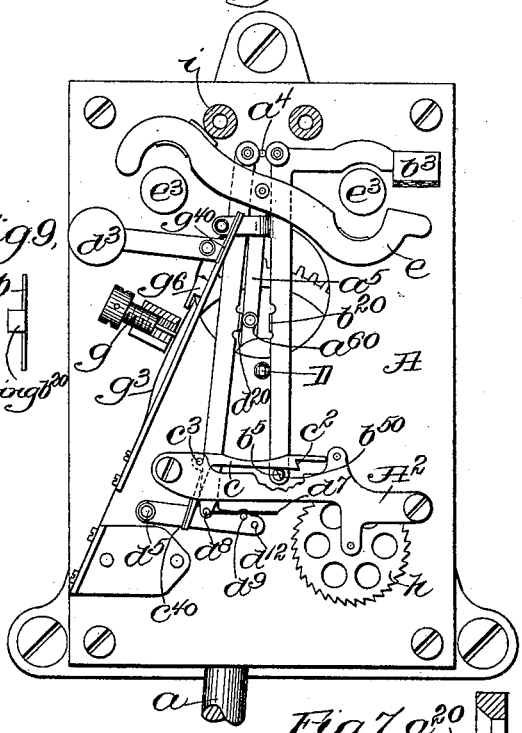


Fig. 9.

Fig. 6.

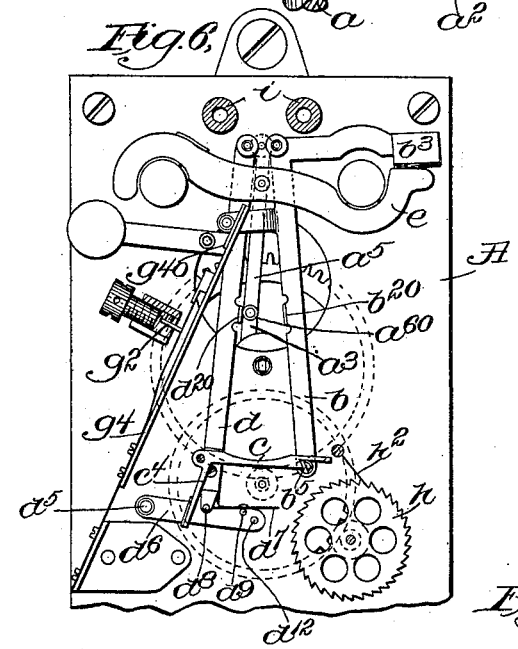


Fig. 7.

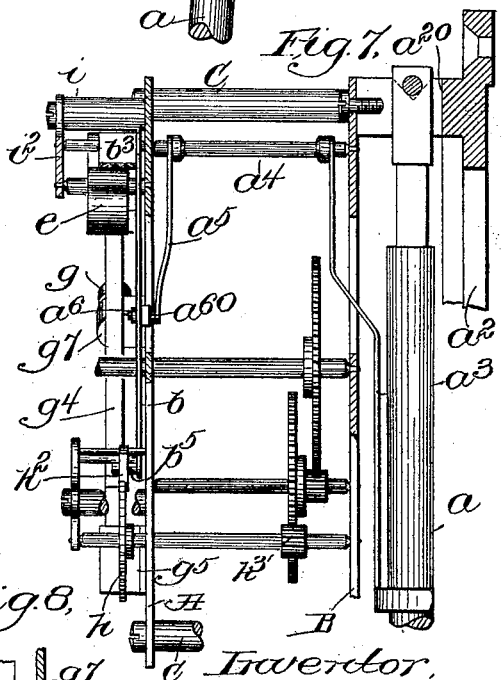
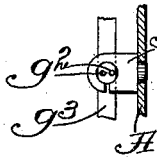


Fig. 8.



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UNITED STATES PATENT OFFICE.

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ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 648,487, dated May 1, 1900.

Application filed January 30, 1899. Serial No. 703,913. (No model.)

To all whom it may concern:

Be it known that I, WALTER J. DUDLEY, of Somerville, county of Middlesex, and State of Massachusetts, have invented an Improvement in Electric Clocks, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The present invention is embodied in a clock operating in substantially the same way as the clock shown and described in Patent No. 447,105, granted to me February 24, 1891, and relates mainly to certain novel details of construction and arrangement whereby the various parts may be more symmetrically arranged and are more durable, while certain other advantages are obtained, as will be more fully described hereinafter.

Figure 1 is a front elevation of the works of the clock embodying the invention, parts being broken away and parts shown in section. Fig. 2 is a side elevation of the same; Fig. 3, a sectional view taken on line x^3 of Fig. 2; Figs. 4, 5, and 6, views similar to Fig. 1, showing the parts in the different positions assumed in the operation of the clock; Fig. 7, a similar view to Fig. 2, but taken from the opposite side of the clock; Fig. 8, a detail of the circuit-breaker with the contact-plug removed, and Fig. 9 a detail to be hereinafter referred to.

The principal operating devices comprise the pendulum and its rod a, the impelling-lever b and its detent c, and the circuit-closing lever d, all of which operate in substantially the manner shown and described in my prior patent above referred to.

The impelling-lever b and the circuit-closing lever d are pivoted at b^2 and d^2 near the point of oscillation of the pendulum, the impelling-lever being provided with a weight b^3, which is arranged to be lifted by the armature e of the electromagnet e^2, which magnet is shown as comprising two coils, each provided with a pole-piece e^3, while the armature e is pivoted between the said coils and adapted to move on its pivot when attracted by the electromagnet which is energized by the current from the battery f, the circuit of which is provided with a circuit-closer g g^2 under the control of the circuit-closing lever d, the said circuit-closer being secondarily controlled by the impelling-lever b, as will be hereinafter described.

The impelling-lever b is a straight arm having a lateral projection which supports the weight b^3, the said weight thus being supported above the armature e, so that it is adapted to be directly lifted when the said armature is attracted, the said weight being shown as provided with a cushioned surface b^4 to deaden the shock when said weight is engaged by the armature and to prevent the sound or click which would otherwise occur.

The pendulum-rod a in accordance with the present invention is supported by a frame a^3, independent of the frame which supports the other working parts of the clock, thus relieving the said clockwork-frame of the weight of the pendulum, so that the said frame is not apt to become strained or out of true, as is the case when the pendulum is supported at the front thereof. In order that the said pendulum may coöperate with the levers b and d to perform the functions described in the prior patent aboved referred to, said pendulum is connected through an arm a^3 with a rock-shaft a^4, which is supported between the front and rear plates A and B of the clockwork-frame, the said rock-shaft having an arm a^5, provided with a projection a^6, extending between the levers b and d, so as to alternately engage the same as the pendulum swings. The circuit-closing lever d, which also actuates the train of clockwork, is shown as provided with a weight d^3, which tends to move it toward the pendulum projection a^6, the said lever also having a projection d^4, arranged to operate upon a spring-supported arm g^4, which carries the contact g^2 of the circuit-closer, so that as the said arm d moves in response to its weight it will tend to keep the circuit open and the magnet deënergized. The levers b and d coöperate with a detent c, which is adapted to hold the lever b in such a position that the weight b^3 is ready to operate upon the pendulum when released, the said detent being shown as provided with an inclined or undercut shoulder c^2, adapted to engage a projection b^5 from the lever b, as shown in Fig. 1, the said detent being pivoted at c^3,

while its under surface normally rests upon the projection b^5, the said detent being so weighted that after the said projection reaches the shoulder c^2 the detent will drop and the shoulder will engage the projection b^5. When, therefore, the magnet is energized, the armature will lift the weight b^3 and the arm b will be caught with the weight thus lifted by the detent c, as shown in Fig. 1. The movement of the arm b to this position results in the breaking of the circuit, the said arm b having a projection b^6 arranged to engage the arm g^4 and move the same out of contact with the contact-piece g. The operation of the magnet, therefore, is only momentary, but results in leaving the weight b^3 supported ready to act upon the pendulum as soon as the arm b is released. The detent c is shown as provided with a projection c^4, adapted to be engaged by a projection d^5, formed on a cross member d^6 at the lower end of the lever d, the tendency of the weight d^3, therefore, being to rock the detent c upon its pivot c^3 and to thereby trip the said detent and release the arm b. The parts are so adjusted, however, that the friction developed by the downward tendency of the weight b^3, acting through the projection b^5, upon the undercut shoulder c^2 is sufficient to overcome the tendency of the weight d^3 to trip the detent c, the tripping being accomplished through the action of the pendulum itself, which in swinging to the right engages the lever b with sufficient force to move the projection b^5 away from the shoulder c^2, so that the action of the weight d^3 is no longer resisted and the detent c is lifted. With the parts in the position shown in Fig. 1 the pendulum is swinging to the right, it being obvious, therefore, that the engagement of the projection a^6 with the lever b will cause the said lever to be tripped, the weight b^3 then falling and giving the necessary impulse to the pendulum, which will then swing to the left, as indicated in Fig. 4, where the lever is shown as tripped and the weight about to fall. The arm g^4 of the circuit-closer is then released by the projection b^6 and remains under the control of the lever d. As the pendulum swings to the left, however, it comes in contact with the said lever d, moving the same to the left, as shown in Fig. 5, so that the spring-arm g^4 follows the projection d^4 until contact is made at the circuit-closer, which results in the movement of the armature e, which lifts the weight b^3, at the same time breaking the circuit through the agency of the projection b^6, as shown in Fig. 6. The armature thus immediately falls from the position shown in Fig. 6 back to its normal position; but the weight b^3 is held up through the agency of the detent c, as above described. The pendulum then swings back, the arm d following the same until it is stopped and held by the engagement of the projection d^5 with the tail c^4 of the detent c, said arm remaining in this position until the arm b is tripped, as hereinbefore described. The lever d then continues its movement in response to its weight d^3 far enough to move the actuating-wheel h of the clock-train the distance between two of the ratchet-teeth shown as formed along the surface thereof. For this purpose the said lever d is shown as provided with a pawl d^7, pivoted at d^8 and supported upon a pin d^9, the said pawl projecting toward the ratchet-wheel h, so as to produce a movement of said ratchet-wheel as the lever d swings. In order to control the movement of the lever d, so that the wheel h will be moved only the distance between two teeth at each operation, the said lever is provided with a stop d^{12}, arranged to engage the periphery of the ratchet-wheel h at the right time, the said lever then remaining stationary until restored by the action of the pendulum, as described. The wheel is also controlled by the detent-pawl h^2, which is adapted to prevent the rearward movement thereof. The pinions for the wheel h and the detent c and the support for the pawl h^2 are at the front of the frame-plate A, and the latter are supported between said plate and the supplemental plate A^2, which is separated from said plate by means of studs A^3, the pinion h^3 of the wheel h, however, extending through the plate A and having one of its bearings in the plate B, as shown in Fig. 7, so as to actuate the clock-train. The circuit-controlling lever d is T-shaped at its lower end, having the cross member d^6, which carries the projections d^5, d^9, and d^{12}, together with the bearing d^8 for the pawl d^7, the parts thus being symmetrically arranged and properly balanced.

In the operation of the clock the circuit is broken at each operation during a very brief interval of time, and the separation of the contacts when properly adjusted is very slight. It is necessary, however, that the operation should be positive, and to this end the movable contact-piece g^3, which consists of a light spring, is provided, in accordance with the present invention, with the rigid member g^4, connected thereto at a point near the supporting-bracket g^5, to which the said spring is connected. The said rigid member g^4 is arranged to be engaged by the projections d^4 and b^6, which operate the circuit-closer, it being obvious, therefore, that the spring g^3 will always bend along that part which is between the bracket g^5 and the rigid member g^4, so that there can be no failure to break the contact through the tendency of the spring to bend indefinitely throughout its entire length. The contact-pins g^2 are connected directly with the spring g^3, so as to partake of the resiliency of the entire spring when the member g^4 is moved to permit the said contact-pins to come in contact with the member g, the said spring, however, being maintained in definite relation to the member g^4 by means of an engaging projection g^6, overlying the free end of the spring g^3, so that as the said member g^4 is moved away from the contact-pieces g the contact-piece g^3 will be car-

ried with it, thus insuring the breaking of the circuit. The member g of the circuit-closer consists of a screw-plug threaded in a socket g^7, so as to be adjustable with relation to the other member of the circuit-closer, the said socket being made slightly smaller than the said plug and split, (see Figs. 2 and 8,) so as to afford an elastic bearing therefor, so that the plug will be held in its adjusted position without the use of lock-nuts or similar devices. As best shown in Fig. 1, the said socket, projecting beyond the plug, surrounds and protects the contact-surfaces from dust and dirt, which would otherwise be likely to settle thereon, with the tendency to form an insulating coating.

A further feature of the invention consists in so arranging the armature and impelling-lever that the former when attracted by the magnets will move a considerable distance before engaging the impelling-lever, thus acquiring a certain momentum, which renders the action more positive than when the attraction of the magnet acts directly upon the weighted impelling-lever at the beginning, as is the case in the construction shown in the prior patent above referred to, wherein the impelling-lever is shown as supported by the armature when free from the detent.

As herein shown, the impelling-lever when released by the detent c brings up against the spindle D, which carries the clock-hands, (not herein shown,) the armature e therefore being free to move to the position shown in Fig. 5 and being entirely out of engagement with the weight b^3, so as to move some distance before it comes in contact with the said weight to lift the same. The said armature when released by the magnet is prevented from moving too far away from the pole-piece e^3 by its engagement with one of the posts i, which support the plate i^2, between which and the plate A are supported the said armature e and the levers b and d.

To prevent the adhesion of the engaging parts, which has been found a source of trouble in clocks of this kind, the said parts are protected, in accordance with the present invention, by a covering of organic substance, such as paper, the levers b and d being shown as provided with coatings b^{20} and d^{20}, of paper or similar substance, where they are engaged by the projection a^6, the said projection having a similar covering a^{60}, which may be a sleeve, which can be conveniently made of ivory or some other organic substance. In the same way the arm g^4 is provided with a covering g^{40} where it is engaged by the projections d^4 and b^6, and the said projections may be provided with coverings like that of the projection a^6. The tail c^4 of the detent c is provided with a covering c^{40} and the projection b^5 with a covering b^{50}, it having been found that this construction throughout entirely obviates the tendency of the parts to adhere, while the said coverings are sufficiently durable to be practically indestructible. In order to afford a good supporting-surface for the paper, the levers b and d and the tail of the detent c are shown as provided with offset tongues to which the paper is stuck. (See Fig. 9.)

The frame-pieces A and B, which support the electromagnet and the clock-train, are connected together by posts C, the rear plate B being secured to posts or projections a^{20} from the supporting-frame a^2, the said plate B having slots B^2, Fig. 3, along its under edge, so that to remove the said frame it is only necessary to take out the upper screw and loosen the two lower ones, after which the clock-frame can be slipped off the supporting-frame in case it is desired to remove the same for repairs or otherwise.

I claim—

1. In an electric clock of the kind described, a clockwork-frame for the operating mechanism comprising front and rear plates, a supplemental frame or support having three posts or projections arranged triangularly, a hole in the rear plate of the clockwork-frame to receive a screw extending into the post at the apex of the triangle, and slots in the lower edge of said plate to receive screws extending into the posts at the base of the triangle; and a pendulum supported wholly by said supplemental frame and being connected with a movable member supported in the clockwork-frame, as set forth.

2. The combination with the pendulum, of an impelling-lever therefor, a circuit-closing lever coöperating with said pendulum, a projection carried by said pendulum adapted to engage said levers respectively, a coating or covering of organic substance, as paper, for the parts of said levers which come in engagement with said projection, and a covering for said projection, substantially as described.

3. The combination with the impelling-lever and its detent, of the circuit-closing lever adapted to engage said detent, a covering or coating of organic substance, as paper, for said detent where it is engaged by said circuit-closing lever, a circuit-closing contact member adapted to be engaged by said lever, and a similar coating for said contact member where it is engaged by said lever, substantially as described.

4. In an electric clock, the combination with the pendulum, its impelling device, and the mechanism coöperating therewith, of coatings of organic substance, as paper, for those parts of the various devices which engage each other in the operation of the clock, substantially as described.

5. In an electric clock, the combination with the pendulum, of an impelling device therefor consisting of a weighted arm, a detent adapted to support said arm prior to its operation on the pendulum, a stop to support said arm after its operation, an electromagnet, and an armature for said magnet normally out of engagement with said impelling

device and at some distance therefrom but adapted to move toward and engage the same when the magnet is energized, the said parts not coming into engagement until the said armature has acquired momentum, substantially as described.

6. In an electric clock, the combination with the electromagnet, of a circuit-closer to control the same, the said circuit-closer comprising the adjustable plug g, the inclined split socket g^7, the movable contact g^3, and the projection g^2 extending into said socket to engage said plug, substantially as described.

7. In an electric clock, the combination with the electromagnet, of a circuit-closer to control the same, the said circuit-closer comprising a spring g^3 secured at one end to a suitable support and provided at its other end with projections g^2, the rigid member g^4 secured to said spring near its supported end, and adapted to be engaged to operate the circuit-closer, the projection g^6 to position the spring with relation to the rigid member, and a fixed contact to be engaged by the projection g^2 to close the circuit, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WALTER J. DUDLEY.

Witnesses:
HENRY J. LIVERMORE,
NANCY P. FORD.