(No Model.) 4 Sheets—Sheet 1.

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ELECTRIC WINDER FOR TIME LOCKS.

No. 545,021. Patented Aug. 20, 1895.

FIG. 1.

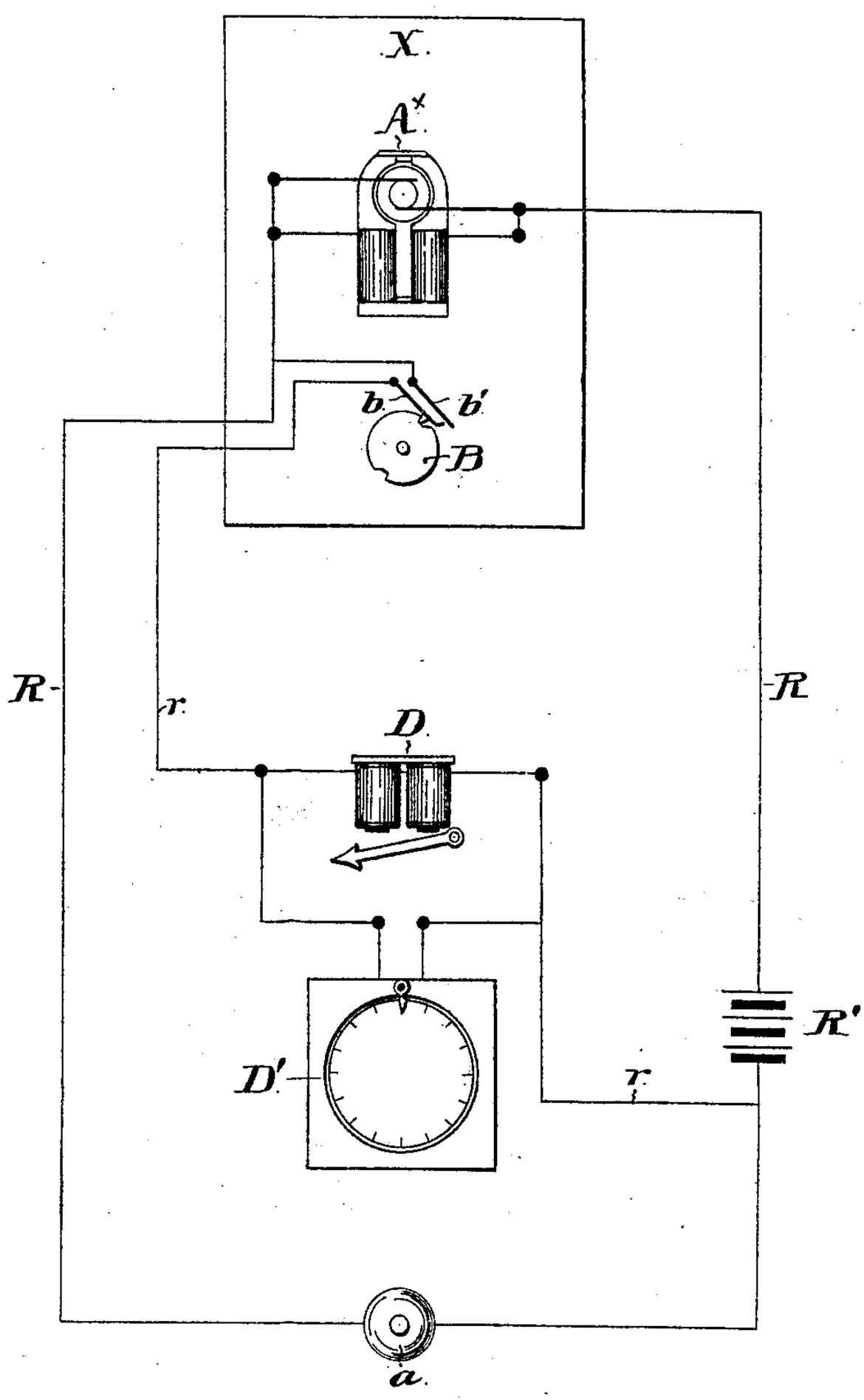

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FIG. 2.

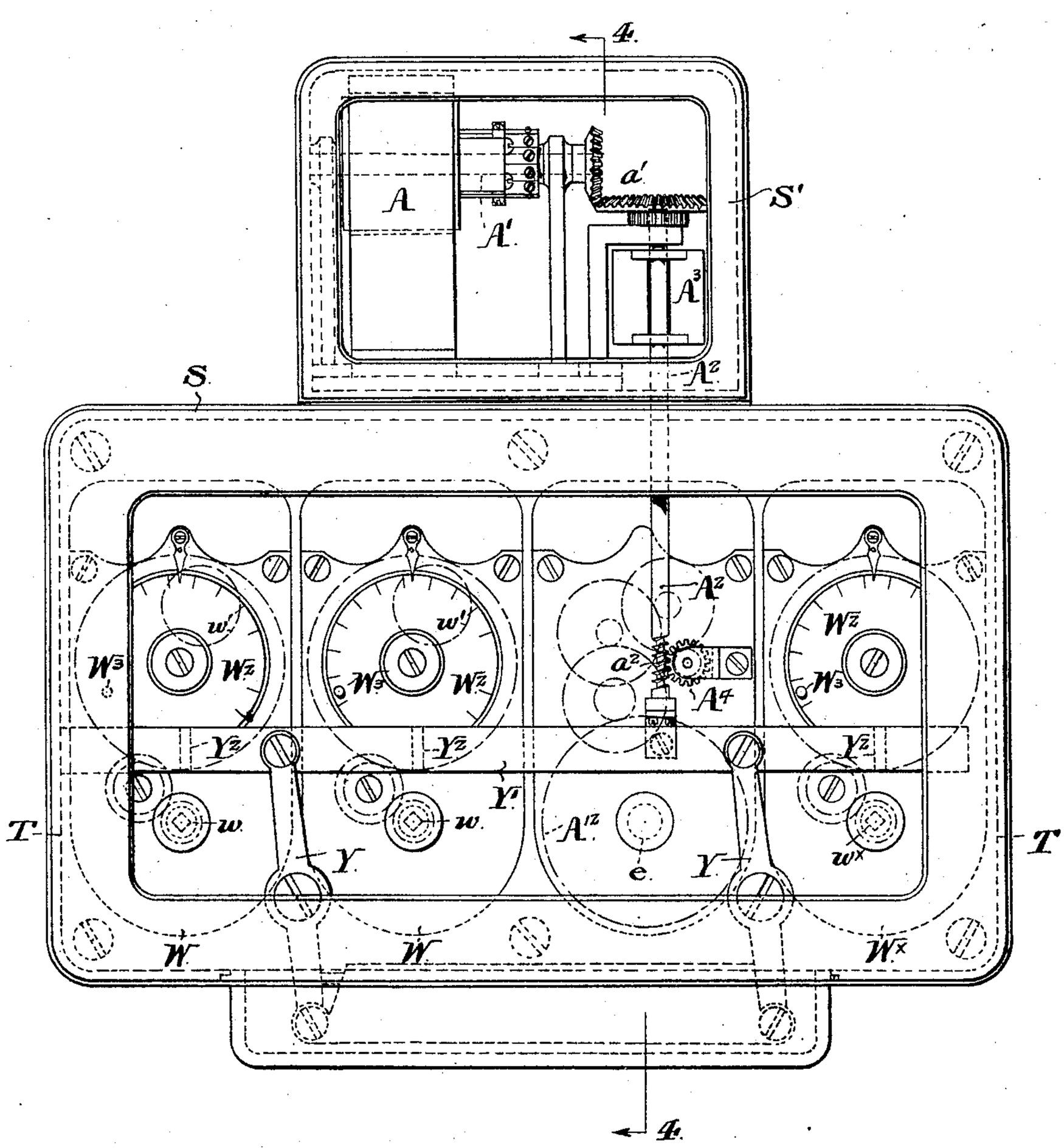

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FIG. 3.

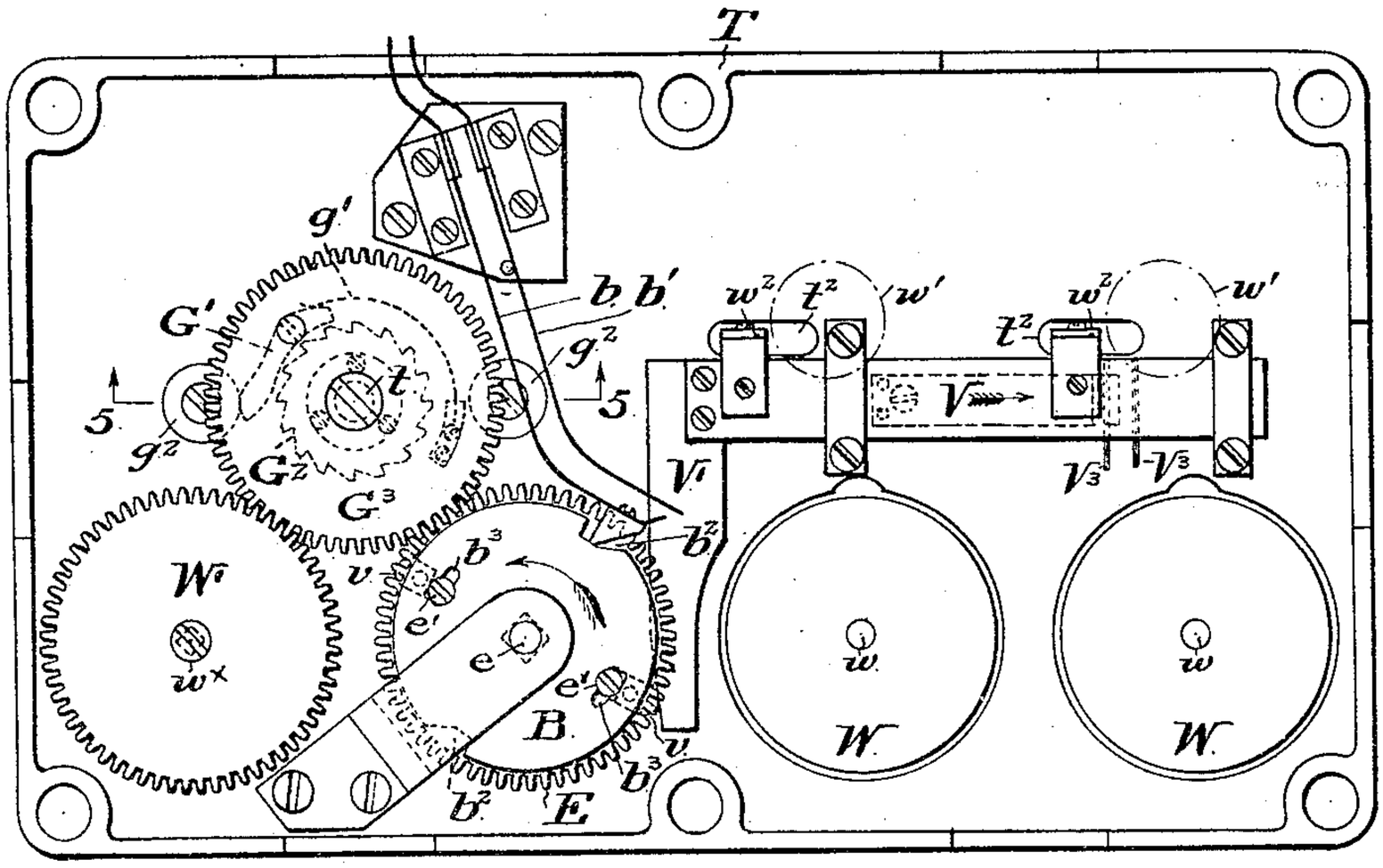

FIG. 5.

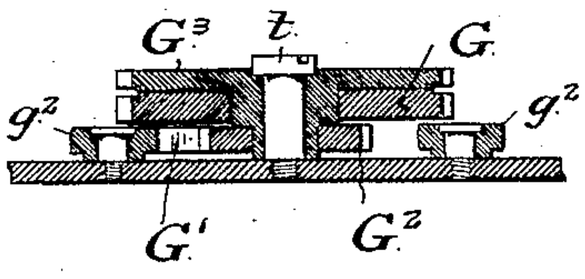

FIG. 6.

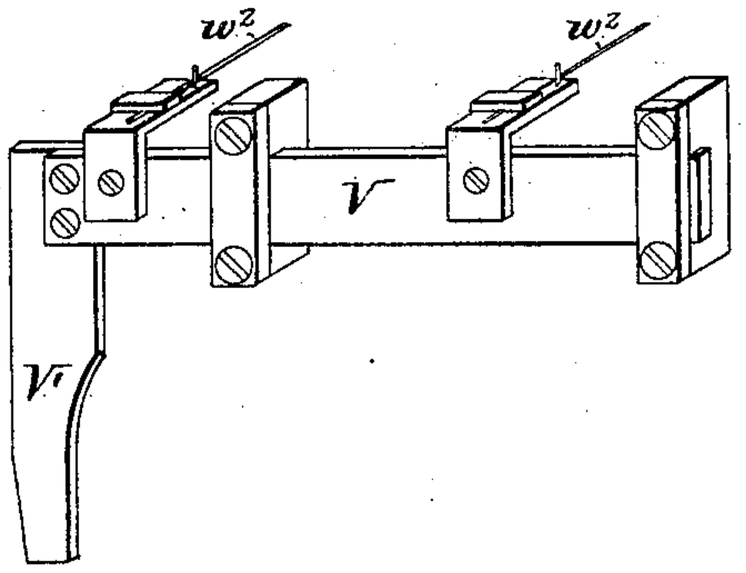

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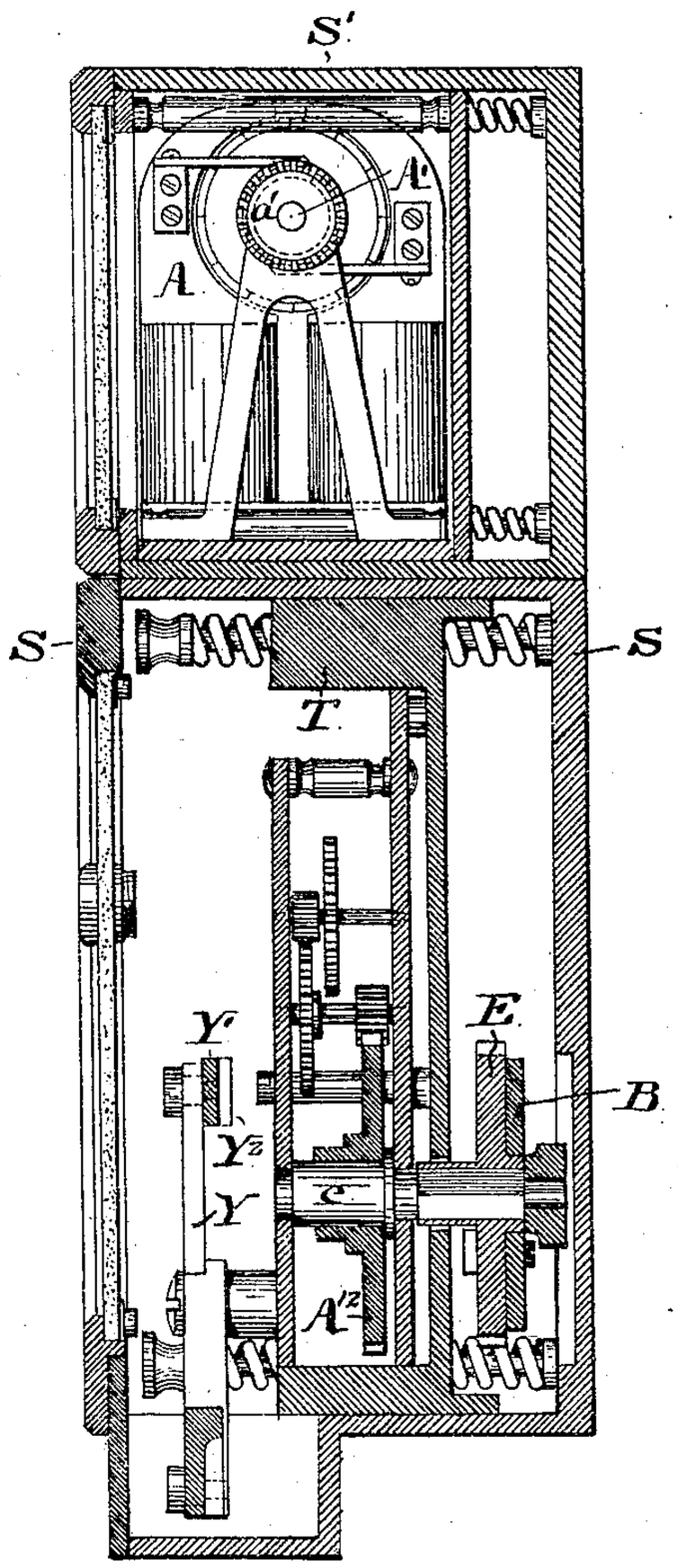
FIG. 4.



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UNITED STATES PATENT OFFICE.

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ELECTRIC WINDER FOR TIME-LOCKS.

SPECIFICATION forming part of Letters Patent No. 545,021, dated August 20, 1895.

Application filed April 17, 1895. Serial No. 546,152. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM H. HOLLAR, of the city of Philadelphia, in the State of Pennsylvania, GEORGE L. WEAVER, of the city of Boston, in the State of Massachusetts, and ANTHONY KENNEDY, of Charlestown, in the State of West Virginia, have invented a certain new and useful Electrically-Controlled Winding Mechanism for Time-Locks, whereof the following is a specification, reference being had to the accompanying drawings.

Our invention embraces certain modifications of the winding mechanism for which an application for Letters Patent was filed by us on the 1st day of April, 1895, Serial No. 543,997.

Our invention is primarily intended for use in connection with ordinary time-locks, such as are employed upon safes, vaults, &c., and its main purpose is to permit the rewinding of the clock movement of the time-lock without opening the safe or otherwise exposing the lock mechanism, the occasion for such rewinding action being any emergency in which it would be desirable to postpone the moment of opening the safe or vault.

The modifications which comprise our present invention are limited to the transmission and use of electrical energy alone to effect the said rewinding action.

In the accompanying drawings, Figure 1 represents diagrammatically a general system of control indicating conventionally the main operative parts and convenient adjuncts thereto that their relations may be clearly shown. Fig. 2 is a view in elevation of the front face of a time-lock mechanism to which our improvements have been applied. Fig. 3 is a rear view of said device with the entire outer casing and the rewinding electrical motor removed. Fig. 4 is a vertical transverse section through the device on the line 4 4 of Fig. 2, certain parts being shown in elevation. Fig. 5 is a fragmentary section on the horizontal line 5 5 of Fig. 4. Fig. 6 is a detached view of certain details shown in the other figures.

In ordinary time-locks, as a precaution against failure, it is usual to employ a plurality of clock-movements, any one of which, when in proper order, is capable of peforming the functions of the time-lock—*i. e.*, releasing the lock after a predetermined interval.

For simplicity of illustration we have shown our invention as adapted to rewind but one of said movements. With this organization it is, of course, necessary to provide means whereby the other movements shall be arrested to prevent the premature release of the lock by them. This restriction is, however, not one of principle but of detail, and it is obvious that any number of said clock-movements may be adapted to be simultaneously rewound by the mere duplication of the connecting parts.

To broadly state the main features of our invention, we would say that they comprise, in combination with a safe or vault and a time-lock therefor, a rewinding electrical motor normally ready to act but not energized, mechanism operatively connecting said motor with the winding member of the time-lock clock-movement, said rewinding motor being included in an electric circuit controllable from a point exterior to the safe or vault and provided with a circuit-controller, whereby the circuit may be modified to energize the rewinding-motor and thus effect the rewinding action.

With the foregoing main elements are combined certain adjuncts—such, for instance, as devices for prolonging or reporting the extent to which the rewinding action has been or is to be operated.

Referring to the diagrammatic view of Fig. 1, let it be assumed that X represents the vault having a time-lock (not shown) on the interior of its door. Let it be further assumed that $A^{\times}$ represents a rewinding electric motor, and R R represent wires in circuit with a battery R′ and with the coils of said rewinding-motor leading to a circuit-closer *a* exterior to the vault. If the circuit be closed and the motor energized, it will commence to operate upon the clock-spring. This might, of course, cause the complete rewinding of the clock-spring in the lock-movement, but to avoid the danger

attendant upon overwinding or to predetermine the extent of rewinding it is desirable to control the period or extent of operation of the rewinding mechanism. To this end let it be assumed that the circle at B indicates a rotating disk having cam-notches in its periphery, said disk being preferably situated within the vault itself and being maintained in operative connection with the rewinding mechanism, so that it will commence and continue to rotate therewith. Let it be assumed that *b b'* are two elastic terminal electrodes, forming a part of the circuit which controls the rewinding electric motor and detained normally out of contact with each other when one of them is located in a notch, but that when the rotation of the disk B takes place the said electrodes will be brought into contact by one of them riding on the surface of the disk from the cam-notch to the unbroken portion of the periphery. Such electrodes would therefore be in electrical contact with one another during a portion of a rotation corresponding to the distance between the cam-notches, when one would again re-enter a notch and spring away, leaving the other and returning to the normal position. Obviously, if such a device were combined with the rewinding-motor just described, the operation would be that as soon as the latter was energized the disk B would commence rotation and the circuit would be completed through the electrodes *b b'* and wires *r r* and maintained during the period of rotation of the disk from one cam-notch to another. Thus, even if the operator had only momentarily established the connection at the point *a* to energize the motor the circuit would be maintained automatically by means of the disk B and electrodes *b b'*, so that the operator would not be obliged to positively maintain the circuit during this period, but when the automatic action had lapsed and the circuit was again broken the motor would cease its rewinding action.

In order that the operator may at once know that the rewinding mechanism has been set in operation, a convenient adjunct to the above-described device is a telltale D, electrically operated through wires *r r* and electrodes *b b'* with which it is in circuit.

As shown in Fig. 1, the telltale D consists of a simple electromagnet having an indicating armature. The device represented at D' of Fig. 1 is provided with a fixed pointer and a graduated rotary dial, which may be automatically operated by suitable intermittent movements of ordinary construction, causing the dial to shift through one space under each impulse caused by the closing of the electric circuit through wires *r r*. The device D' would thus report not only that the rewinding mechanism was in operation, but by the relation of the graduated dial to its pointer would indicate the extent of said rewinding action. The device D' may be used in conjunction with the telltale D, as shown, or either may be used alone, and the circuits by which they are operated varied to suit the circumstances of their embodiment.

A convenient embodiment of the main features of our invention is illustrated in Figs. 2 to 6, inclusive, of the drawings as applied to a time-lock having a casing S and comprising the clock-movements W W W$^{\times}$, having the usual rotary front dials W^2, provided with tripping-pins W^3, adapted to engage with lugs Y^2 upon the link Y' of the levers Y Y. The movement of the link-levers Y Y, when engaged by the tripping-pins W^3, effects the release of the lock through the usual connection to said levers, as is well understood.

S' is the casing for the electric motor, conveniently disposed upon the top of the time-lock casing S. Within the motor-casing S' is mounted an ordinary electric motor A. The armature-shaft A' of said motor is connected by gears *a'* with a vertical shaft A^2. The shaft A^2 may be provided with a governing-fan A^3, as shown, within the motor-casing S'. The shaft A^2 is prolonged downward into the lock-casing S, and is therein connected to the winding member of the clock-movement W$^{\times}$ by the train of gears beginning with the worm-gear A^4 engaging with the worm *a*^{2} upon the shaft A^2.

The train of gears shown in dotted lines in Fig. 2, leading thence and ending with the gear A^{12} upon the arbor *e*, is merely for the purpose of reducing the rate of rotation from that of the motor, which is usually rapid, to that of the rewinding mechanism, which should be slow, to prevent any injurious disturbance of the delicate adjustment of the clock-movement to be rewound.

A portion of the train of gears just described is mounted within a recess in the front of a block T within the casing S. The arbor *e* extends in the rear of the block T and a gear E is secured thereon. The disk B, which effects the secondary circuit closing before described, is adjustably secured to the gear E by screws *e' e'* through slots *b*^{3} *b*^{3} in said disk. The gear E serves also conveniently to carry and actuate the cam projections *v v*, by which a stop mechanism is operated, upon the rotation of the rewinding-gear E to arrest the clock-movements which are not to be rewound.

We have shown our invention as adapted to rewind only the movement W$^{\times}$. With this organization it is necessary to stop the two movements W W to prevent the premature release of the lock by either of them.

A convenient stop mechanism is shown in Figs. 3 and 6. The dotted circles *w' w'* indicate gears in the respective clock-movements W W. The spring stop-pins *w*^{2} *w*^{2}, suitably mounted on the slide V, project through openings *t*^{2} in the rear face of the block T, and are in the normal position of said slide held clear of the teeth upon the gears *w' w'*; but movement of the slide V in the direction of the arrows would press the stop-pins *w*^{2} *w*^{2}

into lateral engagement with the teeth of the gears w' w' and prevent their further rotation, thus stopping the clock-movements W W. A keeper-spring V^2 upon the slide V, (see dotted lines in Fig. 3,) by the engagement of its pointed ends in either of the notches V^3 V^3, prevents the accidental displacement of the slide; but when the arbor *e* first rotates in the direction indicated by the arrow on Fig. 3 to rewind the movement $W^\times$ a cam projection *v* encounters the inclined end V′ of the slide V and shifts the slide V and stop-pins w^2 w^2 into lateral engagement with the gears w' w'. The keeper-spring V^2 engages with the corresponding notch V^3 and the arrested movements W W so remain until manually released by retraction of the slide V.

The precise construction of the connecting medium between the rewinding-motor and the winding member of the clock-movement $W^\times$ is not of the essence of our invention, but said medium may consist of any clutch mechanism which is capable of automatic engagement to rewind said clock-movement and of subsequent disengagement to permit the free operation of said clock-movement. The winding members of each of the clock-movements are their respective mainspring-arbors, which are squared upon their front ends to receive the ordinary key and extend through the rear of the mainspring-cylinders, as shown in the case of movements W W at *w w* in Fig. 3. The movement $W^\times$ is adapted to be rewound by the member $w^\times$, which is provided with a gear W′, mounted upon its rear end.

A stud *t* projecting from the block T serves to support a convenient form of clutch, of the type above referred to, consisting in this instance of a gear G^3, meshing with the gear W′ of this clock-movement. The gear G^3 being in a plane rearward of the gear E does not mesh with the latter, the apparent meshing of the two, which might seem to be indicated by Fig. 3, being due to the fact that the gear E is in mesh with the gear G, similar to the gear G^3, and directly behind the same, but loosely mounted upon its hub $g^\times$. The clutch-ratchet G^2 is integral with the gear G^3. The gear G is provided with a single pawl G′, and a pawl-spring *g′* constantly tends to throw the pawl G′ into engagement with the ratchet-wheel G^2. As shown in Figs. 3 and 5, two rollers g^2 are mounted upon the rear face of the block T in such a position as to lift the pawl G′ of the wheel G out of engagement with the ratchet G^2 of the wheel G^3, when the outer end of the pawl G′ passes under either of said rollers.

The parts just described are so related that when the rewinding-motor A ceases to rotate, by reason of the breaking of the electric circuit through it, due to the separation of the elastic terminal electrodes *b b′*, the pawl G′ shall be beneath and disengaged by one of the rollers g^2. Hence in either of the normal operating conditions of the time-lock, as shown in Fig. 3, or after the clock-movement $W^\times$ has been rewound and the movements W W stopped the winding member $w^\times$ of the movement $W^\times$ is free to rotate together with its gear-wheel W′, the gear G^3 and ratchet-wheel G^2 being idly rotated upon the stud *t*. The rotation of the gear G and its attached pawl G′ is prevented under normal conditions by reason of the intermeshing of the gear G with the normally stationary gear E upon the rewinding-arbor *e*.

The operation of the device is as follows: Let it be assumed that the three clock-movements W W $W^\times$, have been simultaneously wound by hand and set to release the lock after a certain interval. The three clock-movements progress simultaneously until the operator completes the electric circuit through the rewinding electric motor A, at the primary circuit-closer *a*, of Fig. 1. The motor A instantly begins to rotate. The consequent rotation of the arbor *e* brings a cam projection *v* against the inclined end V′ of the stop mechanism, and the clock-movements W W are arrested. The simultaneous rotation of the secondary circuit-closing disk B shifts the elastic terminal electrodes *b b′* from a recess b^2, and the circuit through the motor A is closed by their contact before the circuit is broken by the primary circuit-closer *a*, and so remain during half a revolution of the arbor *e*. The rotation of the arbor *e*, gear E, and the intermeshing gear G shifts the pawl G′ from under the roller g^2, and allows the pawl G′ to clutch the ratchet G^2 and rewind the clock-movement $W^\times$, through gears G^3 W′. The arbor *e*, disk B, and ratchet-clutch G′ G^2 having made a half-revolution the elastic terminal electrodes *b b′* are again separated in a recess b^2 of the disk B. The consequent arrest of the motor A stops the ratchet-clutch G′ G^2 in its normal disengaged position, and the clock-movement $W^\times$ is again free to rotate to effect the release of the lock at the moment to which said release has been postponed by the rewinding of the clock-movement $W^\times$.

It is obvious that without departing from the spirit of our invention the electric motor A may be variously disposed in relation to the clock movement or movements to be rewound in accordance with the character and position of said movements in the safe or vault. It is also obvious that the energizing-battery for the electric motor could be placed within the vault and its operation controlled from without by means of an auxiliary circuit or otherwise in any well-known manner without departing from the essential principle of our invention. Furthermore, we do not desire to limit our invention to the particular details of mechanical connection between said electric motor and the winding member of the clock-movement which we have shown. We use the term "vault" as

comprehending a safe or any form of inclosure to which the time-lock is applied.

We claim—

1. The combination with a time lock for a vault or safe, of a re-winding electric motor situated within the vault and operatively related to the clock spring of the time lock; an electric circuit comprehending said motor and provided with a source of electricity; and means independent of the clock movement and located exterior to the vault, whereby the said circuit may be controlled, substantially as set forth.

2. The combination with a time lock for a vault or safe; of a re-winding electric motor operatively related to a clock spring of the time lock movement; an electric circuit including said motor and extending to a point exterior to the vault, said circuit being provided with a suitable source of electricity; a primary circuit-closer located exterior to the vault and independent of the clock mechanism; a secondary circuit-closer adapted to close said circuit independent of the primary circuit-closer; and controlling mechanism, substantially as set forth, operatively connecting the winding motor with the secondary circuit-closer, whereby upon the initiation of the motor action by means of the primary circuit-closer the circuit may be maintained in a closed state during a predetermined period of the re-winding action, substantially as set forth.

3. In a time lock, the combination with a clock movement, of a re-winding electric motor operatively related to the clock spring; an electric circuit including said motor, and provided with a primary circuit closer; a secondary circuit closer; controlling mechanism, substantially as set forth, operatively connecting the winding motor with the secondary circuit closer, whereby said circuit may be maintained closed during a predetermined period of the re-winding action; a tell-tale and a circuit operatively related to said tell-tale, whereby the extent of operation of the re-winding motor may be reported, substantially as set forth.

4. In a time lock comprising a plurality of clock movements, the combination with one or more clock movements less than the whole number of a re-winding electric motor operatively related to the spring or springs of said clock or clocks; means to energize said motor; and stop mechanism operated by said re-winding motor and operatively related to the clock movement or movements in connection with the re-winding motor, whereby upon the re-winding of the clock movement or movements selected for that purpose, the remaining clock movement or movements may be automatically stopped, substantially as and for the purposes set forth.

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