(No Model.) 4 Sheets—Sheet 1.

M. MARTIN.

ELECTROPROTECTIVE SYSTEM FOR LOCKS.

No. 542,268. Patented July 9, 1895.

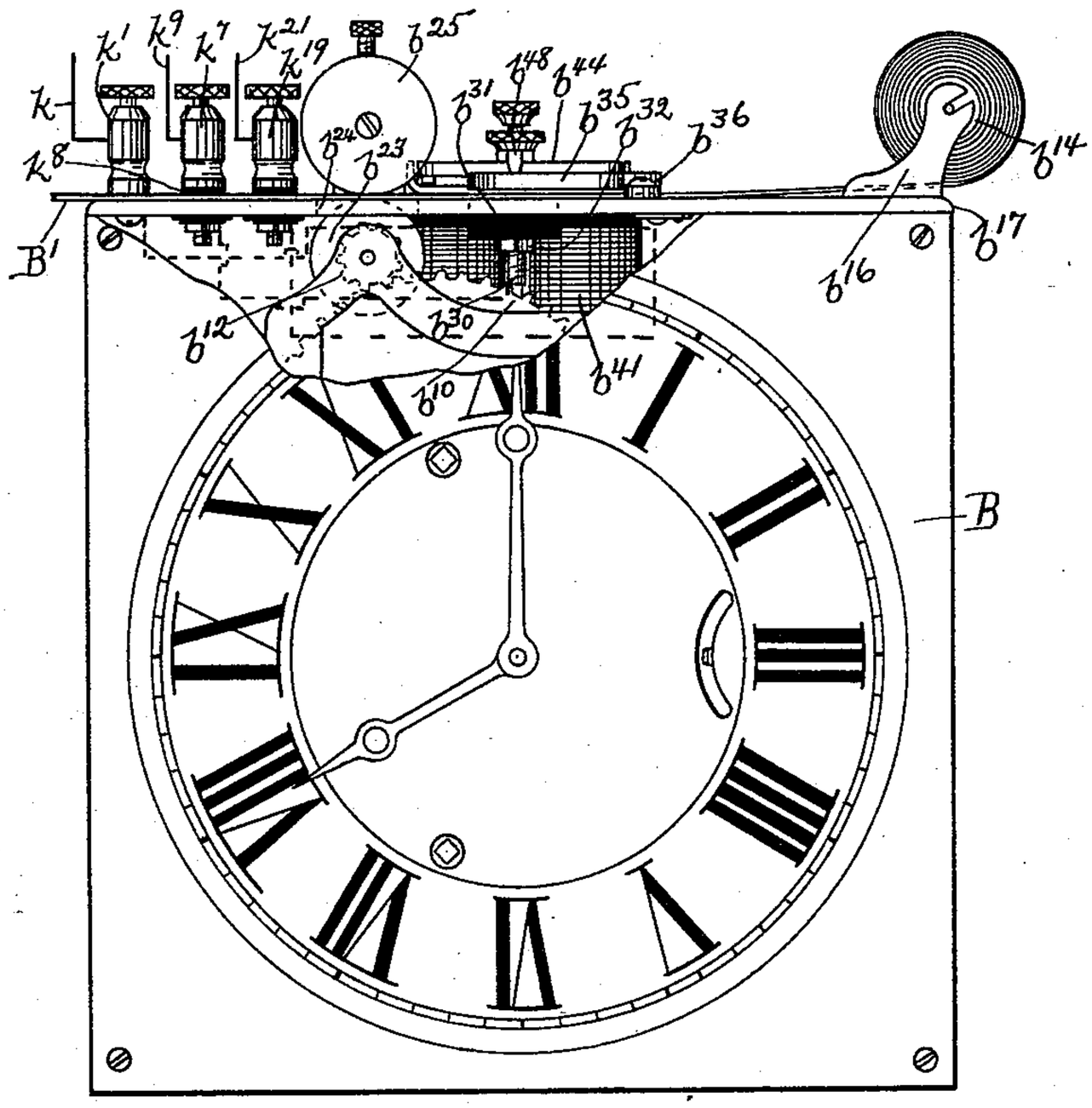

Fig. 1.

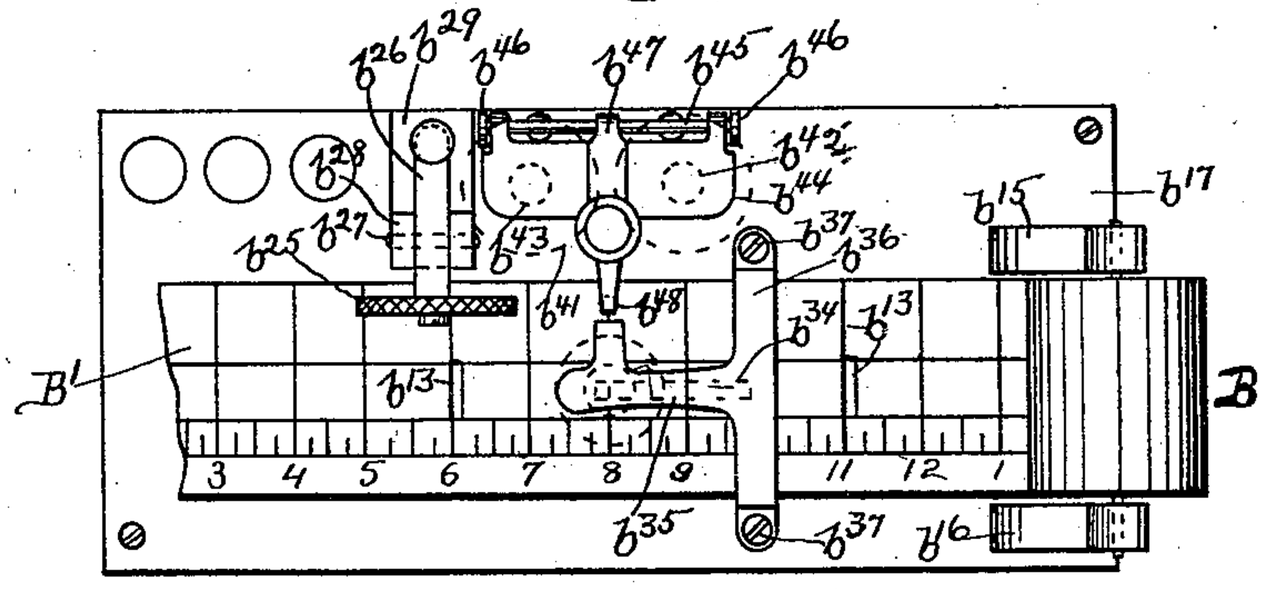

Fig. 2.

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M. MARTIN.

ELECTROPROTECTIVE SYSTEM FOR LOCKS.

No. 542,268. Patented July 9, 1895.

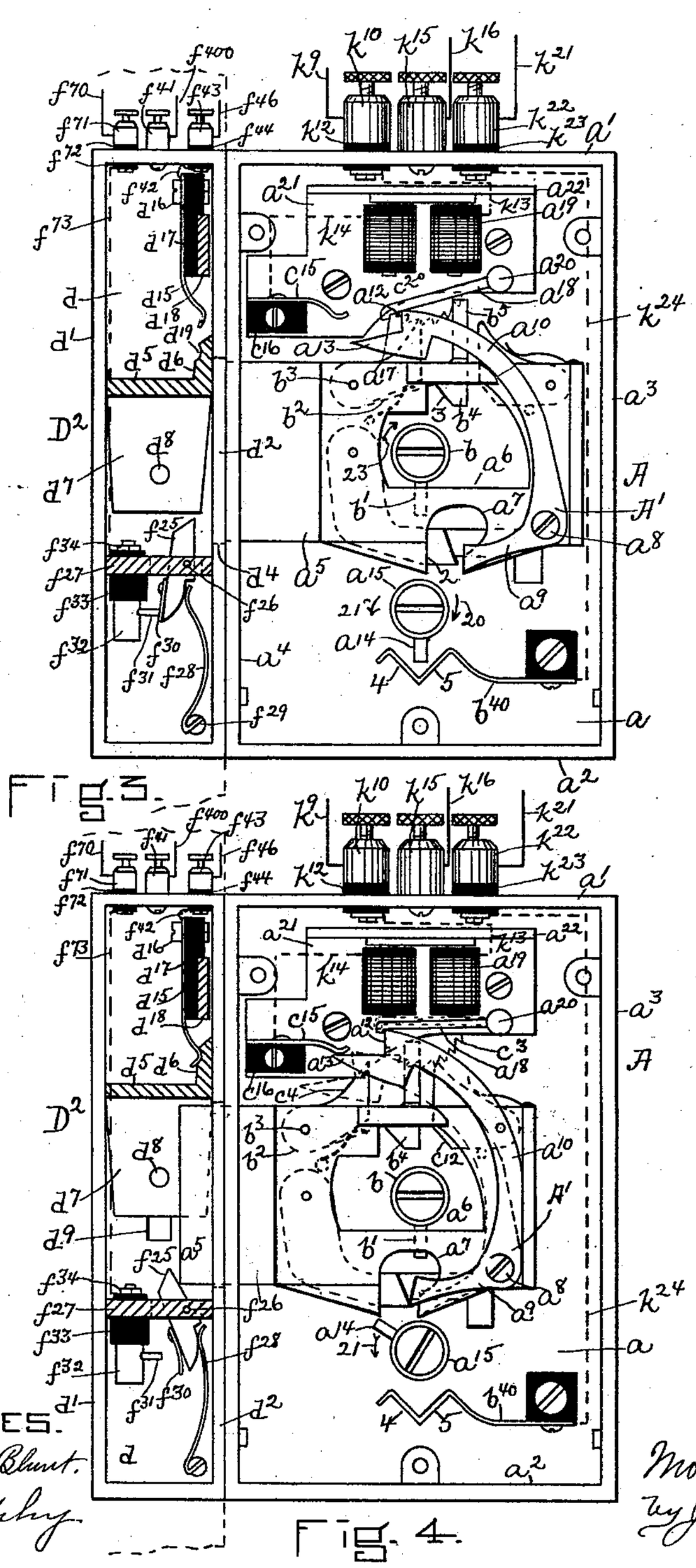

Fig. 3.

Fig. 4.

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ELECTROPROTECTIVE SYSTEM FOR LOCKS.

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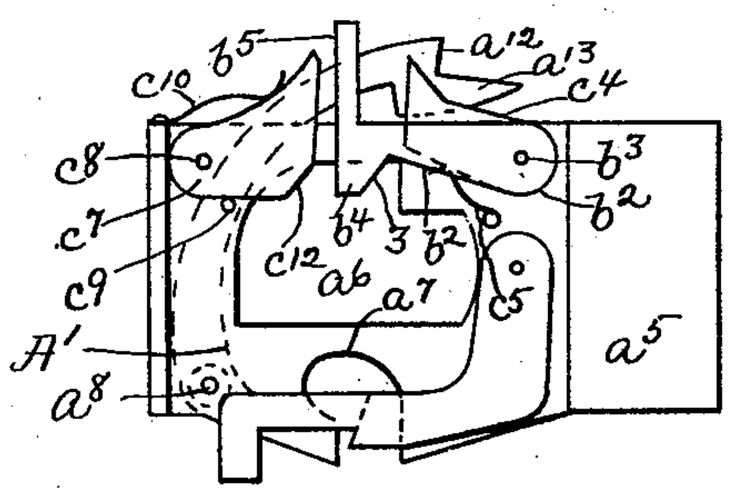

Fig. 5.

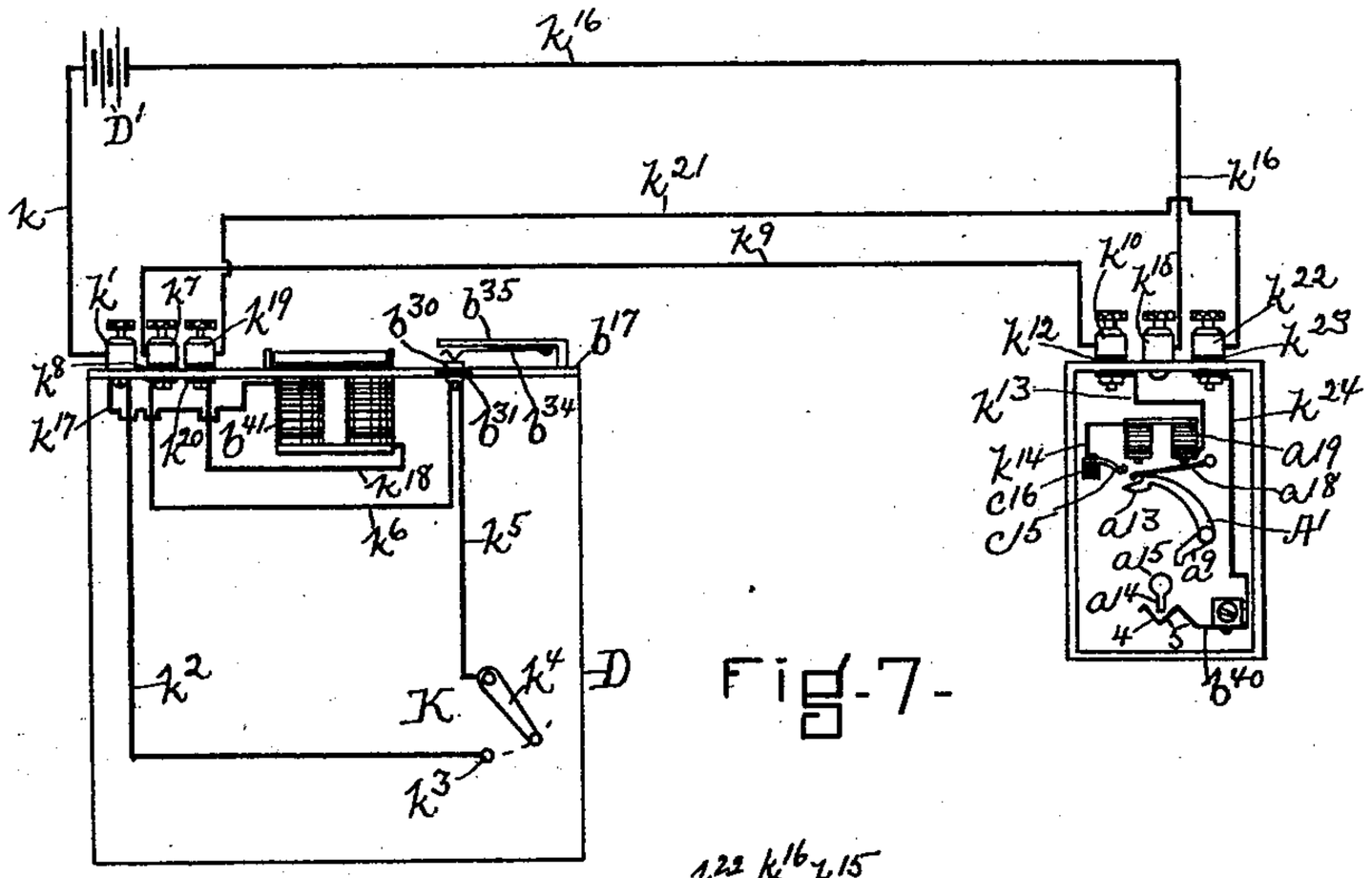

Fig. 7.

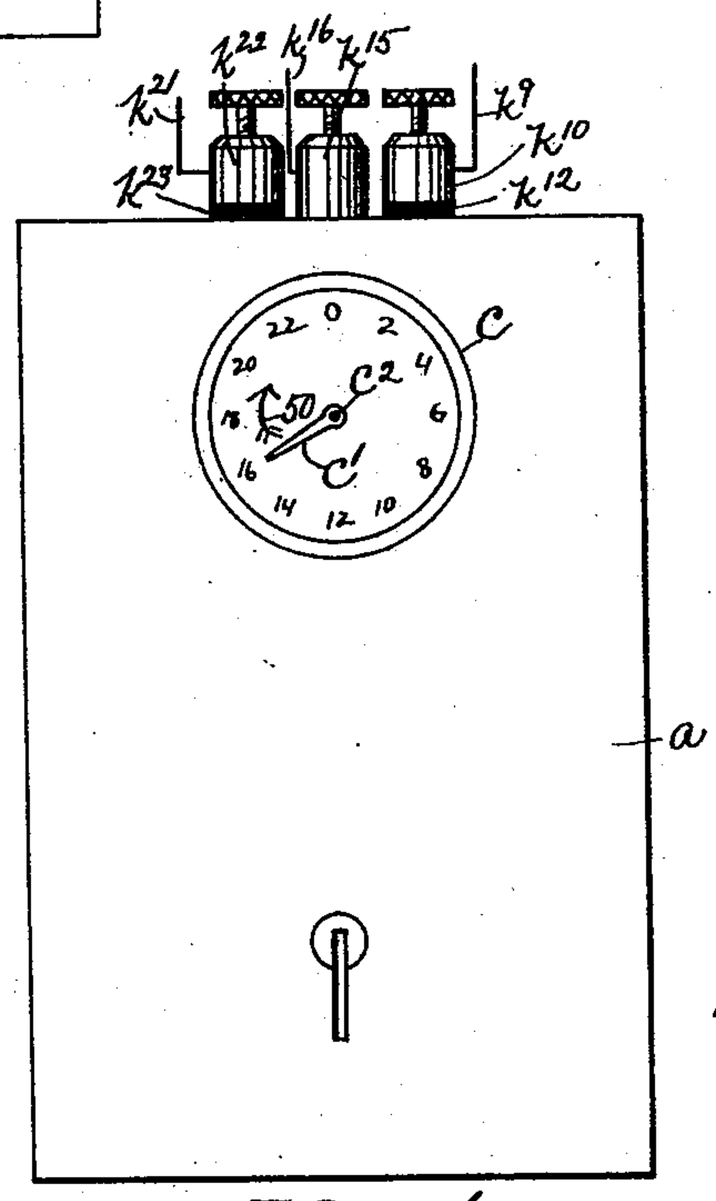

Fig. 6.

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ELECTROPROTECTIVE SYSTEM FOR LOCKS.

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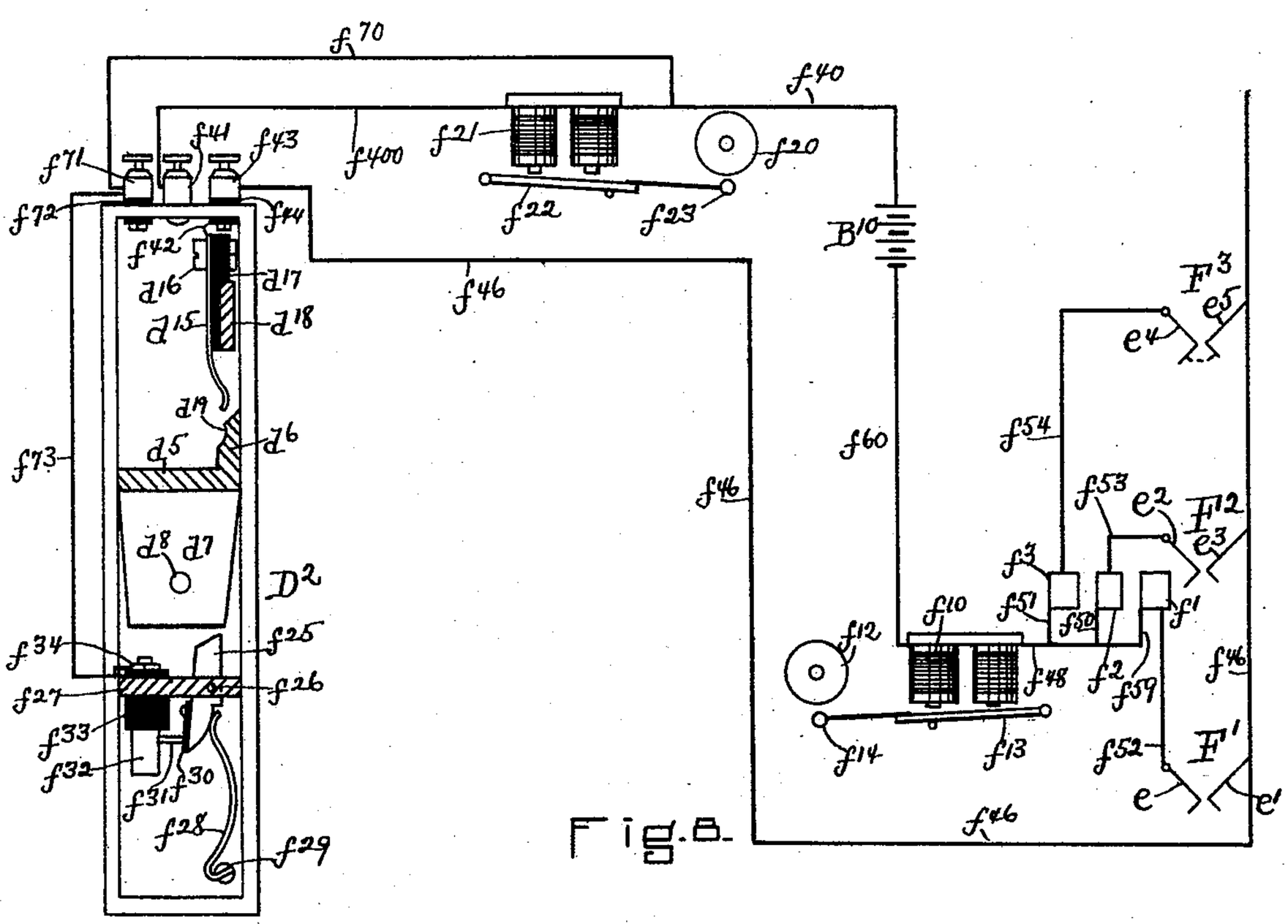

Fig. 8.

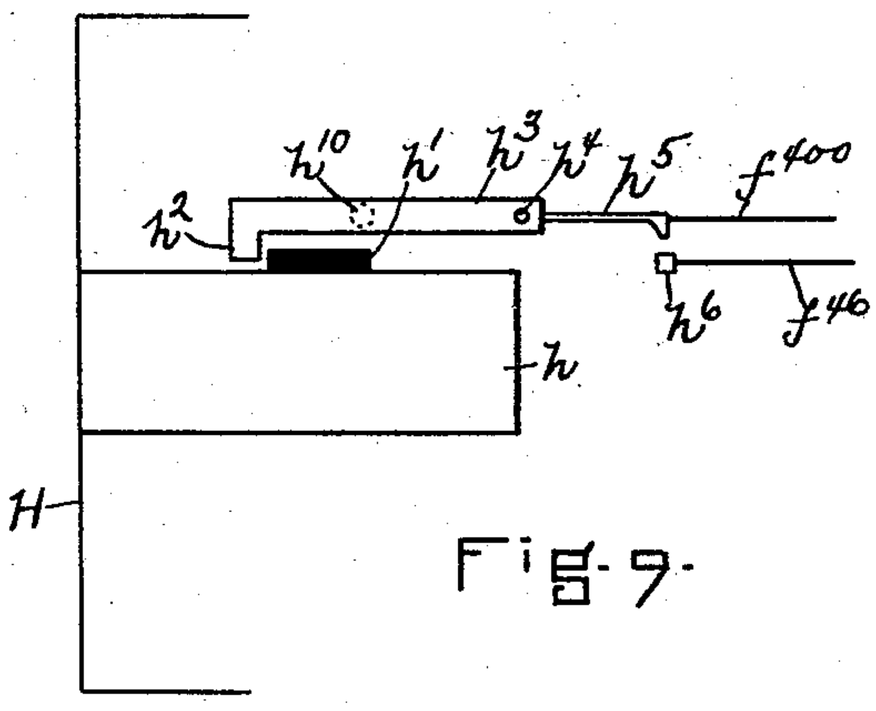

Fig. 9.

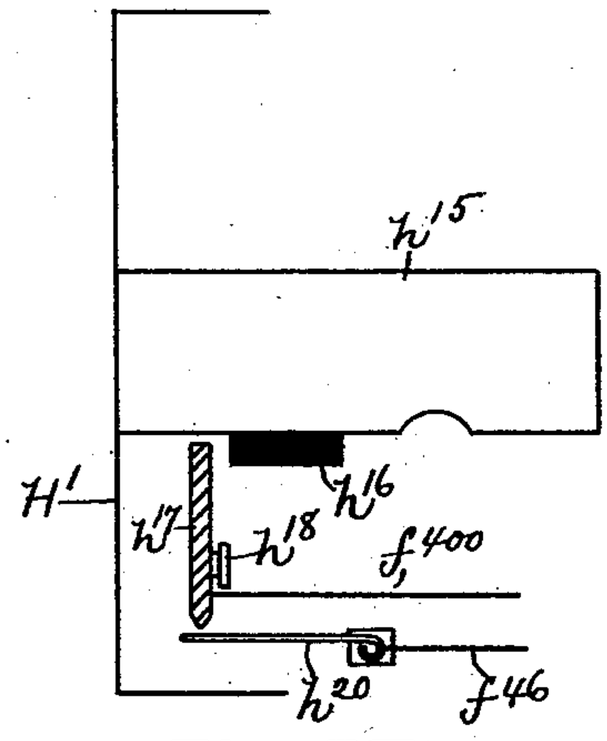

Fig. 10.

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UNITED STATES PATENT OFFICE.

MORRIS MARTIN, OF MALDEN, ASSIGNOR OF ONE-HALF TO BENJAMIN W. WELLS, OF BOSTON, MASSACHUSETTS.

ELECTROPROTECTIVE SYSTEM FOR LOCKS.

SPECIFICATION forming part of Letters Patent No. 542,268, dated July 9, 1895.

Application filed October 4, 1894. Serial No. 524,896. (No model.)

To all whom it may concern:

Be it known that I, MORRIS MARTIN, residing in Malden, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Electroprotective Systems for Locks, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention relates to an electroprotective system especially designed and adapted for stores and like places, and includes as an essential element of the system a test for the condition of the system at the time of closing the store or other place.

In accordance with this invention the testing part of the system is employed in conjunction with the lock for the store or other place, whereby the person locking the store is required to make the test before the lock can be operated.

The system preferably includes an alarm mechanism, the operation of which is governed in part by the operation of the test and in part by one or more circuit-controllers included in the system, as will be hereinafter described.

The portion of the system above referred to may be employed with a lock of the ordinary construction, such as now commonly employed on doors, or with a lock of any suitable or desired or special construction; but I prefer to employ it in conjunction with a novel lock, of a construction as will be described, which approximates somewhat the lock shown and described in United States Patent No. 520,795, granted to me June 5, 1894, in that two keys are employed, but which differs therefrom, as will be hereinafter set forth.

The system preferably, also, includes in it what I prefer to designate as a "program-clock," which may govern the operation at predetermined intervals of time of one or a plurality of devices, and which in the present instance controls the operation of an electromagnet in the clock, and which clock also forms a message recording or registering apparatus for the system to permanently record the number of times the lock or a circuit-controller in or attached to the lock has been operated and the time of each operation either of the lock or of the said circuit-controllers. This latter feature may and preferably will be utilized as a patrol or as a watchman's time-recorder, as will be hereinafter set forth.

The lock referred to may and preferably will be provided with an indicator to indicate the number of times the lock has been operated up to a predetermined number, and which in the present instance is constructed so as to enable it to be set to zero, or the normal starting position, by one of the keys, as will be described.

These and other features of this invention will be pointed out in the claims at the end of this specification.

Figure 1 is a front elevation, partially broken out, of a central-office receiving-instrument and program-clock employed in a system embodying this invention; Fig. 2, a top or plan view of the instrument or clock shown in Fig. 1; Fig. 3, a front elevation of the lock preferred by me, looking from outside the door, with the front plate of the lock removed, the parts being shown in their unlocked position; Fig. 4, a view similar to Fig. 3, with the parts in their locked position; Fig. 5, a rear elevation of the bolt mechanism removed from the lock-frame; Fig. 6, an elevation of the rear plate of the lock, looking on the inside of the door; Fig. 7, a diagram of circuits to illustrate the operation of the lock and program-clock feature of the system; Fig. 8, a diagram of circuits to illustrate the test and alarm features of the system, and Figs. 9 and 10 modifications to be referred to.

In order that the electroprotective system forming the subject of this invention in what I prefer to regard as its most perfected form may be readily understood, I will first describe the construction and operation of the lock and its co-operating parts, which I prefer to use.

Referring to Figs. 3 and 4, A represents a box or frame, within which the operating parts are located, the said frame in practice being preferably provided with a rear plate a, a front plate, which is not herein shown, top and bottom plates a' a^2, and side plates a^3 a^4. The box or frame of the lock contains within it a bolt a^5, preferably of the construction herein shown, it consisting of a substantially rectangular metal bar provided with a substan-

tially large opening a^6 and with a smaller opening or notch a^7 in its under side.

The lock mechanism, in accordance with this invention, is designed to be operated in one direction by a key, which will effect the movement of the bolt in one direction to lock the door, and to be rendered inoperative by said key until the locking mechanism is restored into a condition which will permit the locking-key to become again operative to effect the movement of the bolt in an opposite direction to unlock the door.

The change of the lock from its operative condition into its inoperative condition may and preferably will be effected in substantially the same manner as shown and described in the patent above referred to, and the restoration of the lock from its inoperative condition back into its operative condition, to render the locking-key again operative for the purpose of unlocking, may be effected after a predetermined lapse of time from outside the lock in substantially the manner shown and described in the patent referred to.

This invention has for one of its objects to construct the locking mechanism in a manner as will be described, so that it may be changed from its inoperative condition back into its operative condition by a mechanical or manually-operated device at the lock, which device is preferably made in the form of a second key, and for purpose of distinction I prefer to designate the second key as the "employer's" key and the first key as the "employé's" key.

Referring again to Figs. 3 and 4, the bolt a^5 has pivoted to it, as at a^8, an elbow-lever A', constituting one form of tumbler and comprising a substantially short arm a^9 and a substantially long curved arm a^{10}, which projects above the bolt, as herein shown, and is provided at its upper end with a shoulder a^{12} and a projecting finger a^{13}. The tumbler A' in its normal condition (shown by full lines, Fig. 3, and by dotted lines, Fig. 4) has its arm a^9 in position to be engaged by the bit a^{14} of a key a^{15}, which may and preferably will be permanently located within the lock-frame A and is pivoted to the back plate a, and which key will be referred to hereinafter as the "employé's" key, it being understood that this key is operated from outside of the door by means of a key in the hands of an employé, the key a^{15} to all intents and purposes forming, practically, a part of the employé's outside key.

In the normal or unlocked condition of the bolt a^5 the bit a^{14} is adapted to engage the wall 2 of the opening a^7 in the bolt and to carry the bolt forward into its locked position, (shown in Fig. 4,) if the condition of the striker, to be hereinafter referred to, permits of such movement, and when the tumbler A' is in its normal position (shown by full lines in Fig. 3 and by dotted lines in Fig. 4) the bit a^{14} will engage the arm a^9 of the said tumbler and will move or throw the bolt backward into its unlocked position.

In order to render the employé's key inoperative to withdraw the bolt a^5 from its locked position during predetermined intervals of time—as, for instance, from the time of locking a store at night until the time of opening in the morning—the tumbler A' on the forward movement of the bolt a^5 is turned on its pivot a^8, so as to raise the arm a^9 out of the path of movement of the bit a^{14} of the employé's key when the latter is rotated in a backward direction—namely, in the direction indicated by arrow 20 in Fig. 3. This withdrawal or movement of the tumbler A' may and preferably will be effected substantially as shown and described in the patent referred to—that is, the shoulder a^{12} on the tumbler A' may engage on the forward movement of the bolt a^5 a finger or projection a^{17} on an armature a^{18} of an electromagnet a^{19}, the said armature, as herein represented, being pivoted, as at a^{20}, to a plate a^{21}, secured to the back plate a of the lock-frame, the plate a^{21} having the said electromagnet secured to its upper portion a^{22}. On the forward movement of the bolt a^5, effected by the employé's key being turned in the direction indicated by arrow 21, the tumbler A' is carried forward until it meets the depending finger a^{17}, and on the continued forward movement of the bolt a^5 the tumbler A' is turned on its pivot a^8 into the full-line position, (shown in Fig. 4,) the armature a^{18} being elevated into its full-line position. (Shown in Fig. 4.) In the elevated position of the tumbler A' (shown in Fig. 4) its arm a^9 is raised up out of the path of movement of the bit a^{14} when the latter is rotated in the direction indicated by arrow 20, and at the same time the bolt a^5 has been thrown forward, so as to remove the wall 2 of the opening a^7 out of the path of movement of the bit a^{14} on its forward rotation in the direction indicated by arrow 21. It will thus be seen that the employé's key a^{15} is free to be turned both in forward and in a backward direction without effecting any movement of the bolt a^5.

One feature of the present invention consists in providing a mechanical or manually-operated device, whereby the lock mechanism may be restored to its normal condition, so that the employé's key may again become operative for the purpose of operating the lock in a backward direction.

The manually-operated device may and preferably will be made as herein shown, it consisting of a key b, provided with a bit b', the said key being pivotally secured to the back plate a of the lock-frame within the opening a^6 of the bolt, the latter being sufficiently removed from the back plate, so as to permit the bit b' to move in the arc of a circle behind the said bolt, the bit b' normally occupying the position shown in Figs. 3 and 4. The bit b' is adapted to engage in its rotation a lever or dog b^2, pivoted, as at b^3, (see Figs. 3

and 5,) to the rear side of the bolt a^5, the said lever or dog being shown as provided on its under side at its front end with an inclined finger b^4 and with an upright finger b^5, the bit b' of the key b being adapted to engage the inclined surface 3 of the finger b^4 when rotated in the direction indicated by arrow 23, Fig. 3, the said bit as it passes under and in engagement with the inclined surface 3 of the finger I^4 elevating the dog or lever b^2 sufficiently to disengage the armature a^{18} from the tumbler A′ when the said armature and tumbler are in their full-line position, (shown in Fig. 4,) thereby leaving the tumbler A′ free to drop or be forced into its dotted-line position, (shown in Fig. 4,) corresponding to the normal or full-line position, (shown in Fig. 3,) in which position the lock mechanism is restored to its normal condition, and the employé's key again becomes operative to move the bolt a^5 in a backward direction to unlock the door.

The key b in practice will preferably be operated from the outside of the door by a key in the hand of the employer, and for the purpose of this invention the key b may be designated as the "employer's" key.

From the above description it will be seen that the employé's key is operative to lock the bolt when the latter is in its normal condition, (shown by full lines in Fig. 3;) but the act of locking the bolt renders the employé's key inoperative for unlocking the bolt until the locking mechanism has been restored to its normal condition either from outside the lock by energizing the electro-magnet a^{19}, substantially as described in the patent referred to, and as will be hereinafter more specifically set forth, or by a mechanical device herein represented as the employer's key. Furthermore, it will be noticed that in this present arrangement the employé's key does the actual locking and unlocking of the door, but that it is rendered operative for unlocking the door by the employer's key, and in practice it is designed that the employer or his duly-authorized agent alone shall have possession of the second key, or what I prefer to designate as the "employer's" key, so that if between the predetermined intervals of time—as, for instance, between six o'clock p. m., the time of locking the store, and six o'clock a. m., the time for unlocking the store—the employer should desire to gain admission to the store he would first restore the lock to its normal condition by the use of the employer's key, after which he would throw the bolt in a backward direction to unlock the door with the employés key, it being understood that he has a duplicate of the employé's key.

The electro magnet a^{19}, controlling the restoration of the locking mechanism to its normal condition at the end of a predetermined interval of time, may and preferably will be energized by means of a circuit-controller governed in its operation by a program-clock or registering mechanism. (Shown in Fig. 1 and represented in diagram, Fig. 7.)

The program-clock or registering mechanism referred to forms the message-recording apparatus of the system, and may preferably be made as herein shown, it consisting of a clock B, provided with a time-movement of any usual or suitable construction, and only a portion of which is shown in Fig. 1—namely, the gear b^{10} and pinion b^{12} in mesh therewith.

The time-movement referred to is designed to feed of move what I prefer to designate as a "time-strip" B′, having upon it suitable graduations or marks indicative of hours and fractions of an hour and provided with suitable openings b^{13}, distributed throughout the length of the time-strip at predetermined intervals, corresponding to the intervals of time at which the devices controlled by the time-strip are to be operated.

In the present instance the time-strip B′ is shown as wound upon a reel or roller b^{14}, supported in uprights b^{15} b^{16}, secured to the top plate b^{17} of the clock-frame, the said uprights being shown as located at one end of the said top plate.

In the present instance the feed of the time-strip B′ is effected by means of a feeding-roller b^{23}, (see Fig. 1,) mounted upon the shaft of the pinion b^{12}, so as to be rotated by the time-movement and extended up through a slot b^{24} in the top plate b^{17}, which slot is indicated by dotted lines in Fig. 1, the roller b^{23} engaging the under surface of the time-strip B′ and co-operating with an upper feed-roller b^{25}, engaging the upper surface of the time-strip B′, so as to nip or grip the time-strip between it and its co-operating feed-roller b^{23}.

The feed roller or wheel b^{25} is shown in the present instance as carried by a lever b^{26}, pivoted, as at b^{27}, in suitable uprights b^{28} of a frame or block b^{29}, the rear end of the said lever being acted upon in an upward direction by a spring, (not herein shown,) but which is interposed between the rear end of the said lever and the block or frame b^{29}, the said spring acting to turn the lever b^{26} on its pivot and force the feed roller or wheel b^{25} down upon the time-strip B′.

The time-strip B′ is provided, as above described, with graduations indicative of hours and fractions of an hour, and the time-movement effects a feeding of the time-strip B′ at such a rate that the graduations on the time-strip will pass under or by a predetermined point at the intervals of time corresponding to the graduations on the said strip. The predetermined point in the present instance is represented as a circuit-controller comprising, as herein shown, two members, one member being located below the time-strip, and the other member being located above the time-strip and normally separated from contact with its co-operating lower member by the said time-strip, but which at the desired or predetermined intervals of time is permitted to

come into contact with its co-operating lower member by means of the slots b^{13} in the time-strip.

The members of the circuit-controller referred to may be of any suitable or desired construction capable of performing the function of the same, and in the present instance the lower member is shown as a metal screw-rod b^{30}, (see Figs. 1 and 7,) extended up through an insulating plug or disk b^{31}, fitted into a suitable hole in the top plate b^{17}, from which the metal or conducting rod b^{30} is electrically separated by the insulating disk or plug b^{31}.

In Fig. 1 the metal rod b^{30} is shown as screw-threaded and provided with a nut b^{32}, which serves to secure the said rod to its insulating-plug b^{31}, the upper end of the said rod being provided with an enlargement or head to prevent downward movement through the insulating-plug. In order to enable the working of this portion of the system to be more readily comprehended, I have shown in Fig. 7 the metal rod b^{30} as extended above the insulating-plug b^{31}. The upper member of the circuit-controller for the electromagnet a^{39} in the lock, and which magnet will be hereinafter referred to as the "lock-magnet," is preferably made as herein shown, it consisting of a spring, finger, or pen b^{34}, (see full lines, Fig. 7, and dotted lines, Fig. 2,) fastened at one end to the under side of an arm b^{35}, shown in the present instance as forming part of a guide-bar b^{36}, secured, as by screws b^{37}, to the top plate b^{17}, the said guide-bar being suitably shaped to afford a passage between its under side and the top plate b^{17} for the time-strip B′. The free end of the spring b^{35} is located over or substantially in line with the metal rod b^{30}, and is normally separated therefrom by the time-strip B′; but it will readily be understood that when a slot or opening b^{13} in the said time-strip passes under the spring b^{34} the latter is free to drop down through the slot and make contact with the member b^{30} of the circuit-closer, thereby closing the circuit of the lock-magnet at this point. This circuit will be hereinafter more specifically traced in the diagram, Fig. 7.

Referring again to Fig. 4, the full-line position of the armature a^{18} and the tumbler A′ represents the condition the locking mechanism is in when the circuit-controller at the program-clock is in condition to effect the energizing of the magnet a^{19}. Let it be supposed that the circuit of the electromagnet a^{19} is closed by the contact of the spring or member b^{34} with the metal rod or bar b^{30} and that the magnet a^{19} in the lock is energized. When the lock-magnet is energized, as above described, the armature a^{18} is attracted from the full-line position (shown in Fig. 4) into its dotted-line position, thereby withdrawing the said armature from engagement with the tumbler A′ and leaving the latter free to be acted upon by gravity or to be forced downward by a spring or in other suitable manner into its dotted-line position, (shown in Fig. 4,) and when in the dotted-line position (shown in Fig. 4,) the lock mechanism has been restored to its normal condition to render the employé's key again operative to throw the bolt a^5 in a backward direction to unlock the door.

In the system shown and described in my patent above referred to a registering or recording mechanism is shown, which is operated by the movement of the bolt in either direction in order to obtain a permanent record of the number of times the lock has been operated. In the present system I prefer to not only obtain a permanent record of the number of times the bolt has been operated, but also to obtain a record of any attempt on the part of an operator to tamper with the lock by means of the employé's key, and this result may and preferably will be accomplished as will now be described.

Within the lock-frame A, I have provided a circuit-controller having one member, herein shown as a metal pen, finger, or spring b^{40}, (see Figs. 3 and 4,) made V-shaped at its outer end and having its V-shaped end located in such position with relation to the bit a^{14} of the employé's key, constituting the other member of the circuit-controller, that in the normal position of the said key the bit will project between the two legs or members 4 5 of the V, so that a movement of the employé's key in either direction from its normal position will bring the bit a^{14} in contact with one or the other member 4 5 of the V-shaped spring and close the circuit of the registering-magnet b^{41}, located in the frame of the program-clock B and supported therein in any suitable or desired manner, it being shown in Figs. 1 and 2 as located at the top of the clock and having its pole-pieces b^{42} b^{43} projected through suitable holes in the top plate b^{17}, the said pole-pieces co-operating with an armature b^{44}, located above the top plate and shown in the present instance as fast on a rock-shaft b^{45}, having bearings in suitable uprights b^{46}, (see Figs. 1 and 2,) the said armature being provided with an arm b^{47}, carrying a marking device represented as a prick-point or stylus b^{48}, which prick-point or stylus in the normal or unattracted position of the armature b^{44} is above the time-strip B′ a sufficient distance to permit the unobstructed feed of the said time-strip; but when the armature b^{44} is attracted by the energizing of its magnet b^{41} the said prick-point or stylus is brought down in contact with the time-strip B′, so as to preferably puncture the same, and thereby make a permanent record of the time at which the circuit of the magnet is closed.

By reference to Figs. 3 and 4 it will be seen that if the employé's key is turned in the direction indicated by arrow 21, as in the act of throwing the bolt a^5 forward to lock the door, the bit a^{14} will be brought in contact with the member 5 of the V-shaped end of the circuit-controller b^{40} and a record of the movement of the employé's key in the direc-

tion of arrow 21 will be made upon the time-recording strip B′. If the employé's key a^{15} should be turned from its normal position in the direction of arrow 20, Fig. 3, as would be the case if an attempt were made to throw the bolt a^5 backward and thereby unlock the door, the bit a^{14} will make contact with the member 4 of the V-shaped end of the circuit-controller b^{40} and will again energize the recording-magnet b^{41} to make a permanent record of this closing of the circuit.

It will be noticed by reference to Fig. 3 that the employé's key a^{15} is moved but a substantially short distance from its normal position (shown in said figure) in either direction—that is, either in the direction indicated by arrow 20 or in the direction indicated by arrow 21—before the circuit of the recording-magnet is closed, and it will be noticed that the circuit of the recording-magnet is energized before any action can be had upon the bolt a^5—that is, the circuit of the recording-magnet is not dependent upon the actual movement of the bolt. This feature may be utilized as a patrol or watchman's time-recorder, for by reason of the fact that the circuit of the recording-magnet may be closed without actuating the bolt a^5 a watchman or patrol for the system may be required to try the door of the store or other place equipped with this system at predetermined intervals of time during the hours the said store is closed and the door is supposed to be locked.

To illustrate: The watchman or patrol may be provided with an employé's key and required to operate it to close the circuit of the recording-magnet b^{41} once in every half-hour during the hours in which the store is closed—as, for instance, between six o'clock p. m. and six o'clock a. m. In this way an absolute record is made at predetermined intervals of time that the watchman or patrol has tried the door of the store or like place and has reported such trial.

As I have explained, the movement of the bolt either in the act of locking the door or in the act of unlocking the door necessarily makes a record upon the time-strip B′, and the record obtained at the time the bolt is moved may be readily distinguished from the record of a watchman or patrol, owing to the fact that the patrol-record is regular or periodical and the record of the bolt operation is irregular and less in number, and, furthermore, the number of records indicative of the operations of the bolt should agree with the visual indicator c on the back plate a of the lock-frame work. The circuit of the recording-magnet will be hereinafter specifically traced.

The indicator c may be substantially of the construction shown in my patent referred to, and consists of a graduated dial on the outside of the door, having numbers indicative of the operation of the bolt and preferably provided with a suitable glass or other covering, the numbers shown in Fig. 6 being even numbers.

The graduated dial has co-operating with it a finger or pointer c', mounted on a shaft c^2, having bearings in the back plate a and in the supporting plate or frame a^{21} for the magnet a^{19}, between which plate and the inner side of the back-plate a is located a ratchet-wheel c^3. (Best shown in Fig. 4.) The ratchet-wheel c^3 has co-operating with it a pawl c^4, pivotally secured to the bolt a^5 by the pivot b^3 for the lever or dog b^2. (See Figs. 4 and 5.) The pawl c^4 is normally held up in engagement with the teeth of the ratchet-wheel c^3 by a spring c^5, (see Fig. 5,) and the said pawl is so shaped as to rotate the ratchet-wheel in the direction indicated by arrow 50, Fig. 6, the distance of two teeth on each backward movement of the bolt a^5. The ratchet-wheel c^3 is provided with a guard, which is not herein shown, but which may be the same as shown in the patent referred to, by which the said pawl c^4 is rendered inoperative to move the ratchet-wheel c^3 and its pointer c' after the latter has been moved to register with a predetermined indication, which, in the present instance, is shown in Fig. 6 as the number "22." When the pawl c^4 engages the guard referred to, the bolt a^5 is still free to be operated; but the indicator at the lock will not respond to the operations of the bolt, while the recording-magnet of the program-clock continues to be energized at each movement of the lock, so that it is impossible for a manipulator to work the indicator at the lock so as to agree with the registrations of the recording-magnet in order to avoid detection by this means.

In the indicator at the lock, as thus far described, which is essentially the same as that shown in the patent referred to, the said indicator, in order to be set to zero, would have to have its ratchet-wheel turned back, so as to bring the pointer to the zero-mark; but in order to enable the indicator-pointer c' to be set to zero from the indication "22," by moving the said pointer in the direction indicated by arrow 50, I have provided a pawl c^7, (see Fig. 5,) pivoted to the bolt a^5, as at c^8, and normally pressed down against a stop c^9 by a spring c^{10}. The pawl c^7, in accordance with this invention, is suitably shaped to be engaged by the bit b' of the employer's key b and to be lifted upward on the movement of the bit b' in the direction of arrow 23, Fig. 3, a sufficient distance to rotate the ratchet-wheel c^3 the distance of two teeth, and thereby move the pointer c' to zero and at the same time withdrawing the guard from engagement with the pawl c^4, thereby setting the lock-indicator again in its starting position. The pawl c^7 is provided, as herein shown, with an inclined or beveled face c^{12}, (see Figs. 4 and 5,) which is adapted to be engaged by the bit b' of the employer's key and to be forced upward as the said key is rotated in the direction of arrow 23, Fig. 3.

In practice the program-clock B will preferably be inclosed in a suitable case provided with a door having a lock of ordinary construction, the key of which is to be retained in the possession of the employer. This case is represented in the diagram Fig. 7 by the letter D. In order to prevent the battery D′ of the circuit, including the magnet a^{19}, from running down while the clock-circuit controller is closed by a slot b^{13} in the time-recording strip B′, passing under the member b^{34} of the said controller, I prefer to interpose in the circuit of the lock-magnet a^{19} a circuit-controller located within the lock-frame A, which circuit-controller is composed of two members, one member being shown as a pen, spring, or brush c^{15}, (see Fig. 3,) secured to an insulating-support c^{16}, herein represented as attached to the magnet-supporting frame a^{21}, the other member of the said circuit-controller being the tumbler A′, the finger a^{13} of which is adapted to be brought in contact with the member c^{15}, when the bolt is thrown forward into its locked position. (Shown in Fig. 4.) The circuit of the lock-magnet will be hereinafter more specifically described.

The electroprotective system as thus far described may be employed alone after the manner described in the patent referred to; but I prefer to employ it in conjunction with a protective system for other parts of the building, which other parts may be supposed to be accessible from outside the building—such, for instance, as windows, doors, &c.—and to enable this invention in its most perfected form to be clearly comprehended I prefer to designate the additional portion of the system to be now described as the "alarm" and "test" system.

The test system, and also the alarm system, when the latter is used, is employed in connection with the lock for the store or like place in such a manner, as will be described, as to prevent the forward movement of the bolt to lock the door until the testing portion of the system has been operated. This result is accomplished by placing in the path of movement of the bolt or some operative part thereof an obstruction or barrier to its movement in a direction to lock the door. This obstruction or barrier may be made in various forms and may be located in various parts of the completed lock, and while I have herein shown the obstruction or barrier as located within the striker D^2 for the lock I do not desire to limit my invention either to the particular location or to the particular form shown, as I believe this feature is broadly new with me.

I will now describe what I regard as the preferred form of the barrier or obstruction.

Referring to Figs. 3 and 4, the striker D^2 for the lock is represented as a hollow rectangular box or frame, composed of a back plate d, side plates d' d^2, and a front plate, which is not herein shown. The side d^2 of the striker is provided with a suitable hole (represented by dotted lines d^4, Fig. 3) for the passage of the bolt a^5. Within the striker-frame D^2 is located the obstruction or barrier for the passage of the bolt a^5 through the striker-opening d^4, the said obstruction or barrier being herein shown as a substantially horizontal bar or plate d^5, having an upright portion d^6 for a purpose as will be described, and with a depending portion or leg d^7, to which is secured a pin or rod d^8, extended out through a slot d^9 in the back plate d of the striker-frame, the said pin or rod d^8 being preferably provided with a suitable thumb-piece on the outside of the striker-frame. In the normal position of the obstruction the pin d^8 rests upon the bottom of the slot d^9 and the upright portion d^6 of the bar d extends below the top of the striker-opening d^4, as clearly shown in Fig. 3, so that if it should be attempted to move the bolt a^5 while the obstruction d^5 is in its normal position (shown in Fig. 3) the bolt would strike against the upright portion d^6 and would be prevented from entering its socket or striker D^2, so as to lock the door. It follows, therefore, that in order to shoot the bolt home or into its striker the obstruction to its movement must be first removed, which in the present construction is effected by lifting the obstruction d^5 upward or from the position shown in Fig. 3 to that shown in Fig. 4.

The obstruction or barrier referred to may, and preferably will, form one member of a circuit-controller, the other member of which may, and preferably will, consist of a contact pen or finger d^{15}, secured as by screw d^{16} to an insulating-block d^{17}, carried by the cross-bar d^{18} within the striker-frame D^2. To insure good electrical contact, I prefer to bend the outer end of the terminal finger d^{15} and to provide for the same a recess or notch d^{19} in the upright portion d^6 of the obstruction or barrier, so that when the said barrier is moved upward into the position shown in Fig. 4 the contact-finger d^{15} will be forced outward and its bent end will fit into the notch or recess d^{19}, thereby insuring good electrical contact and at the same time serving to lock the barrier in its upper position, as represented in Fig. 4.

The barrier and its co-operating pen or finger d^{15} constitute a circuit-controller for a test-circuit, to be hereinafter specifically described, and for sake of distinction I will hereinafter refer to the said barrier as the "controller" for the test-circuit. The test-circuit referred to is designed to contain in it auxiliary circuit-controllers for different parts of the building to be protected. These auxiliary circuit-controllers may, and preferably will, be applied to the windows and doors and like means of access to a building from the outside of the same, and by the term "window," hereinafter used, I desire to include any construction or means which closes an opening in a building and through which access may be had to the inside of the building. The auxiliary circuit-controllers referred to may, and

preferably will, be of the class known as "normally-open" circuit-controllers, and may be of any suitable or desired construction, and in the present instance I have represented three such circuit-controllers in the diagram, Fig. 8, marked, respectively, F′ F² F³, which may be supposed to be located, respectively, on the first, second, and third floors of a building. These circuit-controllers may, and preferably will, be of like construction; but to enable this portion of the system to be readily understood I prefer to designate the circuit-controllers on the different floors by different letters—that is, the circuit-controllers on the floor F′ are composed of the members e e', those on the floor F² of the members e^2 e^3, those on the floor F³ of the members e^4 e^5, and it may be supposed that the members e e^2 e^4 are the movable members of the circuit-controllers, being adapted to be brought into contact with their co-operating members e' e^3 e^5 when the windows to which they are attached are opened. The system preferably is provided with an annunciator for each floor and marked, respectively, f' f^2 f^3, the said annunciators being of any suitable or desired construction.

It is the purpose of the test portion of the system to require the clerk or other person locking the door of the store or other place to test the circuit containing the circuit-controllers attached to or operated by the windows, so as to know that the various windows are closed before the store is locked, and preferably, also, to enable the circuit, including the auxiliary circuit-controllers, to be transferred by the locking of the door to an alarm-circuit.

In order that the clerk or operator locking the door may be audibly notified of the fact that a window has been left open when he makes his test, (if a window should happen to be open,) I prefer to provide in the circuit an electromagnet f^{10}, which may and preferably will operate a bell f^{12}, the said magnet having its armature f^{13} in the present instance provided with with a striker f^{14} for the bell f^{12}. It will be understood that this form of bell is merely shown to illustrate the system and that I may employ for testing purposes any other form of bell or, if desired, any other suitable or preferred form of signal.

As above stated, I desire that the system should include, in addition to the test portion referred to, an alarm system, which may be referred to as the "outside" alarm, inasmuch as in practice this alarm is designed to be employed to give notice of an attempt to enter the building through the windows or doors controlled by the auxiliary circuit-controllers. The alarm in the present instance is shown as a substantially large bell f^{20}, preferably in practice located on the outside of the building and controlled in its operation by an electromagnet f^{21}, included in an alarm-circuit, as will be described, the said magnet in the present instance being represented in the diagram, Fig. 8, as having its armature f^{23} provided with a striker f^{23}; and while the alarm-bell f^{20} and the test-bell f^{12} are represented in the diagram as single-tap bells I wish it to be understood that such form of bells is employed merely for the purpose of illustrating the system and that instead of a single-tap bell a continuous ringing or vibrating bell, or what is commonly known as a "power-bell," adapted to be sounded continuously for a predetermined length of time and commonly known as "normally-wound-up" bells, may be used. Furthermore, it is evident that instead of locating the alarm at the immediate vicinity of the building protected the electromagnet f^{21} may be employed to transmit an alarm to a distant point—as, for instance, to a police or other station—and in this case the electromagnet f^{21} may be used to control the operation of an automatic transmitter of any suitable construction and designed to send the number of the building to the central station.

The alarm-circuit is preferably provided with a circuit-controller rendered effective to place the alarm-circuit under control of the auxiliary circuit-controllers by the bolt of the lock when the latter is moved forward into its striker. This circuit-controller I will hereinafter designate as the "alarm-circuit" controller, which may be of any suitable construction, but preferably of the construction herein shown, it consisting of a movable dog or lever f^{25}, pivoted, as at f^{26}, in a cross-bar f^{27}, located, as herein shown, within the striker-frame D² below the striker-opening d^4, the upper end of the said pivoted lever being extended above the cross-bar a sufficient distance to bring it into the path of movement of the bolt a^5, so that when the said bolt is moved or thrown into its striker, as represented in Fig. 4, the lever or dog f^{25} will be turned on its pivot against action of a spring f^{28}, secured, as by a screw f^{29}, within the striker frame D², the said spring, as herein shown, acting upon the lower portion of the pivoted lever f^{25} to bring it, or preferably a light spring f^{30}, into contact with the co-operating member of the alarm-circuit controller, which co-operating member in the present instance is shown as a stud or finger f^{31}, extended from a post f^{32}, supported by the cross-bar f^{27}, but electrically separated therefrom by a bushing or sleeve f^{33} of insulating material, the said post being secured to the cross-bar f^{27}, as by a nut f^{34}. (See Figs. 1, 3, and 8.) In the normal or unlocked condition of the locking mechanism the test-circuit controller and the alarm-circuit controller occupy the position shown in Figs. 3 and 8, and when the operator has tested the circuit and the bolt is thrown forward into its locked condition the said circuit-controllers occupy the position shown in Fig. 4. In order to enable the operation of this portion of the system to be more readily understood, I will specifically trace the circuits, including the test and alarm circuit controllers, as

shown in Fig. 8. Referring to said figure, B^{10} represents a battery having one pole, herein shown as the positive pole, connected by wire f^{40} to one coil of the electromagnet f^{21}, having its other coil connected by wire f^{400} to a binding-post f^{41}, secured to the striker-frame D^2 and in electrical connection therewith. From this it will be understood that the striker-frame, and consequently the member d^6 of the test-circuit controller, forms part of the circuit, including the battery B^{10}, and the co-operating member d^{15} of the circuit-controller, which is insulated from the striker-frame D^2, is connected by wire f^{42} to a binding-post f^{43}, electrically separated by insulation f^{44} from the striker-frame D^2. The binding-post f^{43} is connected by wire f^{46} to one member of the window or auxiliary circuit-controllers, herein represented as the members e' e^3 e^5, the co-operating members e e^2 e^4 of which are represented as connected, respectively, by wires f^{52} f^{53} f^{54} to one end of the coils of the electromagnets of the annunciators f' f^2 f^3, respectively, the other end of the coils of the said electromagnets being connected, respectively, by branch wires f^{59} f^{50} f^{51} to a wire f^{48}, joined to one end of the coil of the test-magnet f^{10}, the other coil of which is connected by wire f^{60} to the negative pole of the battery B^{10}.

In order that the alarm-electromagnet f^{21} may not be energized sufficiently to sound or give an alarm when a test is made, the said electromagnet is normally shunted out of the circuit of the battery B^{10} by a branch wire or loop f^{70}, connected to the wire f^{40} and to a binding-post f^{71}, secured to the striker-frame D^2, but separated therefrom by insulation f^{72}. The binding-post f^{71} is connected by wire f^{73} to the post or stud f^{32}, insulated from the cross-bar f^{27} within the striker-frame.

In order that the working of the test and the alarm portion of the system may be clearly comprehended, I will specifically trace the test and the alarm circuits.

When the operator desires to lock the door, he moves the test-circuit-controlling member d^6 into contact with the co-operating member or pen d^{15}, and if the windows of the store or like place are all closed the test system will remain silent; but if one of the windows should happen to be left open—as, for instance, a window on the third floor F^3—the circuit of the test-magnet f^{10} will be closed and the said magnet will be energized to sound the test-signal, and, as herein represented, the annunciator for the third floor will drop to indicate to the clerk or operator on what particular floor a window has been left open. The closure of the circuit-controller on the floor F^3 may be indicated by the dotted line, which represents the contact of the members e^4 e^5. Before tracing the circuit of the test-magnet it will be understood that the bolt of the lock has not as yet been moved into its striker, and consequently the alarm-circuit controller will be in its closed position. (Represented in the diagram, Fig. 8.) The circuit of the test-magnet may now be traced as follows: from the positive pole of the battery B^{10} by wire f^{40}, shunt wire f^{70} to binding-post f^{71}, thence by wire f^{73} to the member f^{32} of the alarm-circuit controller, thence by the stud or pen f^{31}, lever f^{25} to the striker-frame D^2, and consequently to the member d^6 of the test-circuit controller, thence by the contact-pen d^{15}, wire f^{42}, binding-post f^{43}, wire f^{46} to the third floor of the building, thence by circuit-controllers e^5 e^4 of the window, which is open, thence by the wire f^{54} through the annunciator-magnet f^3, and thence by branch wire f^{51}, wire f^{48}, test-electromagnet f^{10} and wire f^{60} back to the negative pole of the battery B^{10}. It will thus be seen that when the test-circuit is closed between the members d^6 d^{15} of the test-circuit controller at the lock and between the auxiliary circuit-controllers e^4 e^5 at the window, which is open, the circuit of the test-magnet f^{10} will be completed, as just described, and as a result the said magnet in the present instance will attract its armature f^{13} and strike the bell f^{12} a single blow, notifying the operator or clerk that a window on the third floor has been left open. The clerk or operator is then required to go to the third floor and close the window, and if he should neglect to do this and attempt to lock the store the alarm-circuit would be completed as soon as the bolt was shot home, for by reference to Fig. 4 it will be seen that when the bolt is shot home the alarm-circuit controller is open, and in this condition the circuit of the battery B^{10} is completed through the alarm-electromagnet f^{21} and the test-magnet f^{10}, which circuit may be traced as follows: from the positive pole of the battery B^{10} by wire f^{40} through the electromagnet f^{21}, wire f^{400} to the striker-frame D^2, and thence by the circuit-controllers d^6 d^{15}, wire f^{42}, binding-post f^{43}, wire f^{46}, third floor of the building, circuit-controllers e^5 e^4 of the open window, wire f^{54} through the annunciator f^3, branch wire f^{51}, wire f^{48}, test-magnet f^{10} and wire f^{60} back to the battery.

It will be noticed that when the bolt is shot home the lever f^{25} is turned on its pivot, so as to remove its spring f^{30} from engagement with the stud or post f^{31}, thereby opening the shunt around the alarm-magnet f^{21}. The energizing of the alarm-electromagnet f^{21} attracts its armature f^{22} and causes the alarm-bell f^{20} to be sounded, thereby giving an outside burglar-alarm, which would immediately compel the clerk to go back and close the window.

In case it is desired to employ an automatic transmitter—such, for instance, as a break-wheel, indicative of the number of the building protected, which break-wheel causes a circuit running to the police or other central station to be operated to give the alarm at the central station—the electromagnet f^{21} in that case, when energized, would set the automatic transmitter in operation. Inasmuch as

the automatic transmitter may be of any usual suitable construction, such as now commonly employed in burglar-alarm systems, I have not deemed it necessary to illustrate the same.

If the operator making the tests receives no indication from the test-magnet or from its bell f^{12} that a window is open, he can then lock the door and the alarm-magnet f^{21} will remain inactive, while the doors or windows of the building are closed, but if an attempt should be made to enter the building by one of the windows, and the latter should be raised or lowered, the circuit of the alarm-magnet f^{21} would be closed between the auxiliary circuit-controllers e^4 e^5, as above specified.

It will thus be seen from the above description that it is obligatory upon the clerk or operator locking the door to make his test of the condition of the building when he leaves it, in order to permit the lock to be operated to lock the door, and substantially obligatory upon him to place the windows of the building in proper condition in case one or more should be left open.

I have thus far described the test-circuit controller as located within the striker-frame D^2, and while I may prefer this construction I do not desire to limit this feature of my invention to the particular construction shown, for other forms of test-circuit controllers governing the operation of the bolt mechanism may be employed, and to illustrate the breadth of this feature of my invention I have shown two modifications of the test-circuit controllers which may be applied to any construction of lock.

Referring to Fig. 9, H represents a lock-frame provided with a bolt h, which may be of any usual or suitable construction, or it may be a bolt of special construction, and, in fact, may be the bolt a^5. The bolt h is represented as provided with a projection h', which co-operates with a finger h^2 on a lever h^3, pivoted as at h^4, the said finger normally being extended into the path of movement of the projection h'. The lever h^3 may have secured to it one member h^5 of a test-circuit controller, which may correspond to the member d^6, (shown in Fig. 8,) and this member h^5 co-operates with a second member h^6, corresponding to the member d^{15}, (shown in Fig. 8,) and the said members may be supposed to have connected to them wires f^{400} f^{46} of the circuit. (Shown in Fig. 8.) The lever h^3 may be supposed to be located within the lock-frame and to be provided with a thumb-piece or projection h^{10} extended out through the casing, so that the operator can lift the lever h^3 upward and remove the projecting finger h^2 from the path of movement of the stud h', which upward movement closes the test-circuit between the members h^5 h^6 after the manner already described with relation to Fig. 8.

In Fig. 10 H′ represents the lock-frame and h^{15} the bolt, which is provided on its under side with a projection h^{16}, into the path of movement of which is extended a sliding bar or rod h^{17}, provided with a thumb-piece h^{18}, extended to the outside of the lock, so as to enable the operator to move the said sliding piece in opposite directions. The sliding piece h^{17}, as represented, forms one terminal of the test-circuit controller, which terminal may correspond to the terminal d^6 of the test-circuit controller (shown in Fig. 8) and may have connected to it the circuit-wire f^{400}, and the other member of the circuit-controller (shown in Fig. 10) is represented as a spring h^{20}, suitably secured to a portion of the lock-frame and having connected to it the wire f^{46} of the test-circuit.

I have thus far described the test-circuit controller as controlling the movement of the bolt of the lock, and while I prefer this construction I do not desire to limit my invention in this respect, as I desire to claim, broadly, the necessary operation of the test-circuit in order to render the lock mechanism available for locking the door, and it will readily be seen that in a lock of the construction having a guard for the keyhole the said guard could be made to operate the test-circuit. For instance, in the normal position of the guard over the keyhole the test-circuit would be open and the circuit-controllers would be in the position of the circuit-controllers d^6 d^{15}, (represented in Fig. 8;) but in order to enable the operator to put his key into the keyhole the guard must be moved to one side, which movement would close the members of the test-circuit controller, and thereby effect the test in precisely the same manner as the upward movement of the member d^6 effects the closing of the test-circuit.

I have thus specifically described the operation of the burglar-alarm portion of this system in connection with a lock, and I will now specifically describe the operation of the lock shown in Figs. 3 and 4 and preferred by me, as being the most complete system.

Let it be supposed that the operator has raised the member d^6 of a test-circuit controller and that the burglar-alarm portion of the system is in proper condition. He then throws the bolt a^5 forward into its striker and into the position shown in Fig. 4 by means of the employé's key a^{15}, the bit a^{14}, as above described, engaging the wall 2. The outward movement of the bolt a^5 raises the tumbler A′ into its full-line position, (shown in Fig. 4,) thereby rendering the employé's key a^{15} inoperative for the purpose of unlocking the door until the locking mechanism has been again restored to its normal condition. The restoration of the locking mechanism to its normal condition—namely, the restoration of the tumbler A′ into its full-line position (shown in Fig. 3) and its dotted-line position (shown in in Fig. 4)—may be effected automatically and positively, as above described, the

automatic return being effected by means of the electromagnet a^{19}, governed by the time-recording strip B′.

The electromagnet a^{19} is included in circuit with the circuit-controller governed by the time-recording strip B′, and the circuit-controller in practice is designed to be operated to close the circuit of the magnet a^{19} at predetermined intervals—as, for instance, at six o'clock a. m., the time of opening. When the employé or other person operates the bolt a^5 with the employé's key to lock the door, the said employé's key is rendered inoperative until six o'clock a. m., except to the employer or other duly-authorized person having the employer's key or mechanical device for positively releasing the tumbler A′ from engagement with the armature a^{18} and permitting it to be restored to its normal position.

In order to enable the automatic restoration of the lock to be readily understood, I will specifically trace the circuit of the electromagnet a^{19} in Fig. 7, it being supposed that a slot b^{13} in the time strip B′, is in line with the circuit-controlling member b^{34}, thereby permitting the said member to pass through it and into contact with the member b^{30}.

Referring now to Fig. 7, D′ represents a battery having one of its poles, herein shown as the positive pole, connected by wire k to a binding-post k' on the program-clock B. The binding-post k' is electrically connected with the top metal plate b^{17}, and consequently with the upper member b^{34} of the lock-magnet circuit-controller. The binding-post k' is also connected, as herein shown, by wire k^2 to one terminal or member k^3 of a circuit-controller K, located in the vicinity of the clock, and having its other member (represented as a pivoted lever K^4) joined by wire k^5 to the member b^{30} of the lock-magnet circuit-controller, the said member b^{30} being connected by wire k^6 to a second binding-post k^7, electrically separated from the top plate b^{17} of the program-clock by suitable insulating washers k^8, the binding-post k^7 of the program-clock being connected by wire k^9 to a binding-post k^{10} on the lock, the said binding-post k^{10} being electrically separated from the lock-frame by insulating material or washers k^{12}, and the said binding-post k^{10} is electrically connected by wire k^{13} to one coil of the lock-electromagnet a^{19}, the other coil of the said magnet being joined by wire k^{14} to the contact-pen or circuit-controller c^{15}, with which co-operates the finger a^{13} on the tumbler A′.

The lock-frame has electrically secured to it a binding-post k^{15}, connected by wire k^{16} to the negative pole of the battery D′. The binding-post k' of the program-clock is connected, as by wire k^{17}, to one coil of the recording or registering magnet b^{41}, having its other coil connected by wire k^{18} to a binding-post k^{19}, electrically separated from the top plate b^{17} of the program-clock, as by washers k^{20}, and the binding-post k^{19} is connected by wire k^{21}, to a binding-post k^{22} on the lock-frame, the binding-post k^{22} being electrically separated from the lock-frame by insulating-washers k^{23}. The binding-post k^{22} is joined by wire k^{24}, to the terminal pen or circuit-controller b^{40}, with which co-operates the bit a^{14} of the employé's key. The bit a^{14} of the employé's key and the terminal pen b^{40}, as above set forth, constitute the circuit-controller for the recording-magnet b^{41}, whereby each movement of the bolt both in its forward and in its backward direction in the act of locking and unlocking the door is recorded upon the time-strip B′, so that a positive record of the number of times the bolt has been operated and the time at which it was operated is obtained. The circuit for the recording-magnet b^{41}, when closed by the movement of the employé's key a^{15}, may be traced as follows, namely: from the positive pole of the battery D′ by wire k to the binding-post k', thence by wire k^{17} through the magnet b^{41}, wire k^{18}, binding-post k^{19} thence by wire k^{21}, binding-post k^{22} of the lock, thence by wire k^{24} to the terminal pen b^{40}, employé's key a^{15} to the framework A of the lock, and thence by the binding-post k^{15} and wire k^{16} to the negative pole of the battery.

When the bolt mechanism is in its locked condition, the tumbler A′ is in the position shown by full lines in Fig. 4, with its finger a^{13} in engagement with the terminal pen c^{15}, and at such time the lock-magnet a^{19} is under control of the circuit-controller at the program-clock, the condition of which is governed by the time-strip B′.

Let it be supposed that the time-strip B′ is in the position it would occupy at six o'clock in the morning, the time of opening the store, in which position the slot b^{13}, in line with the graduation 6 on the time-strip, would be over the member b^{30} of the circuit-controller, thereby allowing the spring member b^{34} to close the circuit of the lock-magnet at the program-clock. This circuit may be traced as follows: from the positive pole of the battery D′ by wire k to binding-post k', thence by the top plate b^{17}, metallic arm b^{35}, contact member or terminal b^{34}, co-operating terminal or member b^{30}, wire k^6 to binding-post k^7, thence by wire k^9 to binding-post k^{10} of the lock, thence by wire k^{13}, magnet a^{19}, wire k^{14}, terminal pen c^{15}, tumbler A′ to the frame A of the clock, and thence by binding-post k^{15} and wire k^{16} to the negative pole of the battery D′. When the circuit of the magnet a^{19} is completed, as just described, it attracts its armature a^{18} from its full-line position (shown in Fig. 4) into its dotted-line position (shown in said figure,) thereby withdrawing the finger a^{17} on the armature from engagement with the shoulder a^{12} on the tumbler A′ and permitting the said tumbler to descend into its dotted-line position, Fig. 4—that is, into its normal position—in which position the said tumbler is in condition to be engaged by the bit a^{14} of the employé's key when the latter is turned in the direction indicated by arrow

20 to move the bolt a^5 backward to unlock the door. When the employé's key is moved in the direction indicated by arrow 20 in the act of unlocking the door, the bit a^{14} engages with the arm 4 of the terminal pen b^{40} and closes the circuit of the recording-magnet b^{14}, which circuit is the same as that above described.

At certain times—as, for instance, when taking account of stock—it is desired to render the employé's key operative for unlocking the door independent of the circuit-controller at the program-clock and also independent of the employer's key. This result may be effected by means of the circuit-controller K at the program-clock—that is, by bringing the lever k^4 into engagement with the terminal k^3, in which condition the circuit of the lock-magnet a^{19} is completed when the bolt is in its locked position, and at such time the said magnet will attract its armature, so as to raise it into its dotted-line position, Fig. 4, thereby leaving the tumbler A′ free to descend into its operative position, while the circuit-controller K remains closed. This latter circuit may be traced as follows: from the positive pole of the battery D′ by wire k to binding-post k', thence by wire k^2, terminal k^3, lever k^4, wire k^5 to the member b^{30} of the lock-magnet circuit-controller, thence by wire k^6 to binding-post k^7, thence by wire k^9 to the binding-post k^{10} of the lock, thence by wire k^{13}, magnet a^{19}, wire k^{14}, terminal pen c^{15}, tumbler A′ in its forward position, lock-frame A to binding-post k^{15}, and thence by wire k^{16} to negative pole of the battery. It will thus be seen that as soon as the employé's key has moved the bolt into its striker the circuit of the magnet a^{19} is closed between the finger a^{13} of the tumbler A′ and the terminal c^{15}, which energizes the magnet a^{19} and releases the tumbler A′, thereby enabling the employé's key to be operative for unlocking the door. When the bolt is in its forward position and the door is locked, the tumbler A′ may be positively restored into its operative position (indicated by dotted lines, Fig. 4) by the employer's key, which in its movement in the direction indicated by the arrow 23 in Fig. 3 strikes the inclined surface 3 of the dog or lever b^2 and raises the same sufficiently to lift the armature a^{18} from engagement with the tumbler A′, thereby permitting the latter to drop into its dotted-line position (shown in Fig. 4) and restoring the locking mechanism into condition to be unlocked by the employé's key.

In practice it will be understood that the employer will be provided with two keys—namely, his own key, which I have herein termed the "employer's" key, and a duplicate of the employé's key.

By an inspection of Figs. 3 and 4 it will be seen that as the bolt a^5 is moved forward the pawl c^4 will be carried forward preferably the distance of two teeth on the ratchet-wheel c^3, and on the movement of the bolt a^5 in a backward direction the said ratchet-wheel will be rotated the distance of two teeth, the said wheel in its rotation moving the pointer c' of the lock-indicator the distance of two graduations. When the pointer has been moved up to the highest indication on the dial c—namely, the number "22,"—it is rendered inoperative, as above described, until restored to zero, although the bolt a^5 may continue to be operated. The pointer c' may be restored to zero from the highest indication, as 22, by continuing the movement of the pointer c' in the direction of arrow 50, Fig. 6, through the instrumentality of the employer's key engaging the pawl c^7, the said pawl in the forward or locked condition of the bolt mechanism being in engagement with a tooth of the ratchet-wheel c^{30}, (indicated in Fig. 4,) and when the employer's key is rotated in the direction indicated by arrow 23, Fig. 3, to restore the tumbler A′ to its normal position the pawl c^7 is carried upward and backward, thereby turning the ratchet-wheel c^3 the distance of two teeth, so as to bring the pointer c' to zero.

The program-clock, provided with the time-recording strip having the slots d^{13}, may be provided with any desired number of slots, which may be arranged so as to co-operate with other circuit-controllers than the lock-magnet circuit-controller for other purposes—as, for instance, to ring the bell at eleven or twelve o'clock or at any other desired time, or to operate electromagnets controlling other features or mechanisms.

From the above description it will readily be seen that the burglar-alarm portion of the improved system may be employed with a lock of any desired construction and may be applied to doors of stores as now equipped, although I prefer to employ it in connection with a lock mechanism of substantially the construction shown in Figs. 3 and 4, in order to obtain the most perfected system, and so, also, the lock and the program-clock may be employed independent of the burglar-alarm portion, and, furthermore, the lock may be employed without the program-clock, in which latter case the electromagnet a^{19} may be omitted, although the armature a^{18} would be retained to effect the movement of the tumbler A. Furthermore, I prefer to employ the alarm system together with the test portion or system, but in some instances it may be thought sufficient to use the test alone—as, for instance, in stores where the employer locks up. In the present instance the burglar-alarm circuit is shown as a normally-open-circuit system; but it will be understood that it is equally well adapted for use as a closed-circuit system.

I claim—

1. In an electro-protective system for stores and like places, the combination of the following instrumentalities, viz:—an electric circuit provided with a test circuit controller and with one or more auxiliary circuit controllers, and a locking mechanism governed in its op-

eration by the condition of the test circuit controller, for the purpose specified.

2. In an electro-protective system for stores and like places, the combination of the following instrumentalities, viz:—an electric circuit provided with a test circuit controller and with one or more auxiliary circuit controllers, a lock provided with a bolt, and a key to operate said bolt rendered effective to move the bolt in one direction by the operation of the test circuit controller, for the purpose specified.

3. In an electro-protective system for stores and like places, the combination of the following instrumentalities, viz:—an electric circuit provided with a test circuit controller and with auxiliary circuit controllers, a locking mechanism governed in its operation by the condition of the test circuit controller, and an alarm circuit rendered effective by the operation of the locking mechanism, for the purpose specified.

4. In an electro-protective system for stores and like places, the combination of the following instrumentalities, viz:—an electric circuit, a lock, and a circuit controller for said circuit co-operating with the said lock to necessitate the operation of the circuit controller to permit the lock to be actuated, for the purpose specified.

5. The combination with a lock, of an obstruction or barrier normally preventing the operation of the said lock but adapted to be moved to permit the said lock to be operated, and an electric circuit rendered effective by the movement of the said barrier or obstruction, for the purpose specified.

6. A lock constructed to be operated by two keys of different make or design, means in said lock rendered effective by the act of locking with one key to render the said lock inoperative to be unlocked by the said key, and a second key to act on said means to restore the lock into condition to be unlocked by the first key, for the purpose specified.

7. A lock constructed to be locked by the use of one key and to be unlocked by the conjoint use of two keys, means in the said lock rendered effective by the locking key to render the lock inoperative to be opened by the locking key, and a second key to act on said means to place the lock in condition to be unlocked by the locking key, for the purpose specified.

8. A lock provided with a bolt mechanism, and with a device to permit the said bolt mechanism to be unlocked by a key when the said device is in one condition, means rendered effective by the movement of the bolt in one direction to operate said device to render the said key inoperative to move the bolt in the opposite direction, and a second key to operate said device to render the first key again operative to move the bolt in the said opposite direction, substantially as described.

9. A lock provided with a bolt mechanism, and with a device to permit the said bolt mechanism to be unlocked by a key when the said device is in one condition, means rendered effective by the movement of the bolt in one direction to operate said device to render the said key inoperative to move the bolt in the opposite direction, and mechanical means to act on the said device and restore it into condition to render the said key again operative to move the bolt in the said opposite direction.

10. In an electro-protective system for stores and like places, the combination of the following instrumentalities, viz: a lock provided with a bolt mechanism, a key to effect the movement of the bolt in opposite directions, a tumbler co-operating with the said bolt and operated on the movement of the bolt in one direction to render the operating key inoperative, an electro-magnet to operate said tumbler and restore it into position to render the said key again operative, a circuit controller governing the operation of the said electro-magnet, and a movable time strip controlling the operation of the said circuit controller, substantially as described.

11. In an electro-protective system for stores and like places, the combination of the following instrumentalities, viz:—a lock mechanism, a key to operate it, an electro-magnet in circuit with said lock, and a circuit controller at the lock included in said circuit and co-operating with said key, for the purpose specified.

12. The combination of the following instrumentalities, viz:—a clock comprising a time movement, a time strip moved thereby and provided with time indications or graduations, and having one or more slots or openings, and a circuit controller governed by said time strip as described, a marking device, an electro-magnet to operate the said marking device, and a circuit controller to govern the operation of said electro-magnet.

13. The combination with a lock, of an indicator responsive in a given direction to the operation of the lock for a predetermined number, means to render the said indicator non-responsive to the operation of the lock and yet permit the said lock to be operated after the said predetermined number at which the indicator is rendered non-responsive, and means to move the indicator in the same direction to again render it responsive to the operation of the lock, substantially as described.

14. In an electro-protective system for stores and like places, the combination of the following instrumentalities, viz:—a lock provided with a bolt, means rendered effective by the act of locking to render the locking key inoperative, means to restore the lock to an operative condition to enable the inoperative key to again become operative, a barrier or obstruction to the operation of the lock by the locking key, and an electric circuit controlled by said barrier or obstruction, for the purpose specified.

15. In an electro-protective system for stores and like places, the combination of the following instrumentalities, viz:—a lock provided with a bolt, means rendered effective by the act of locking to render the locking key inoperative, means to restore the lock to an operative condition to enable the inoperative key to again become operative, a barrier or obstruction to the operation of the lock by the locking key, and an electric circuit controlled by said barrier or obstruction, and an alarm circuit provided with a controller operated by the said bolt, substantially as described.

16. A lock provided with a bolt having an opening a^6 and a notch or opening a^7, a movable tumbler having an arm normally forming one wall of the notch a^7, a key provided with a bit co-operating with the said tumbler, a pivoted lever to engage the tumbler and withdraw its arm from the path of movement of the said bit, a movable dog to engage the said lever and release the said tumbler, and a second key to actuate said dog, substantially as described.

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

MORRIS MARTIN.

Witnesses:
JAS. H. CHURCHILL,
M. M. BLUNT.