J. F. COLE.

RECORDING DOOR LOCK.

APPLICATION FILED NOV. 13, 1911.

1,043,069.

Patented Nov. 5, 1912.

10 SHEETS—SHEET 1.

Fig. 2.

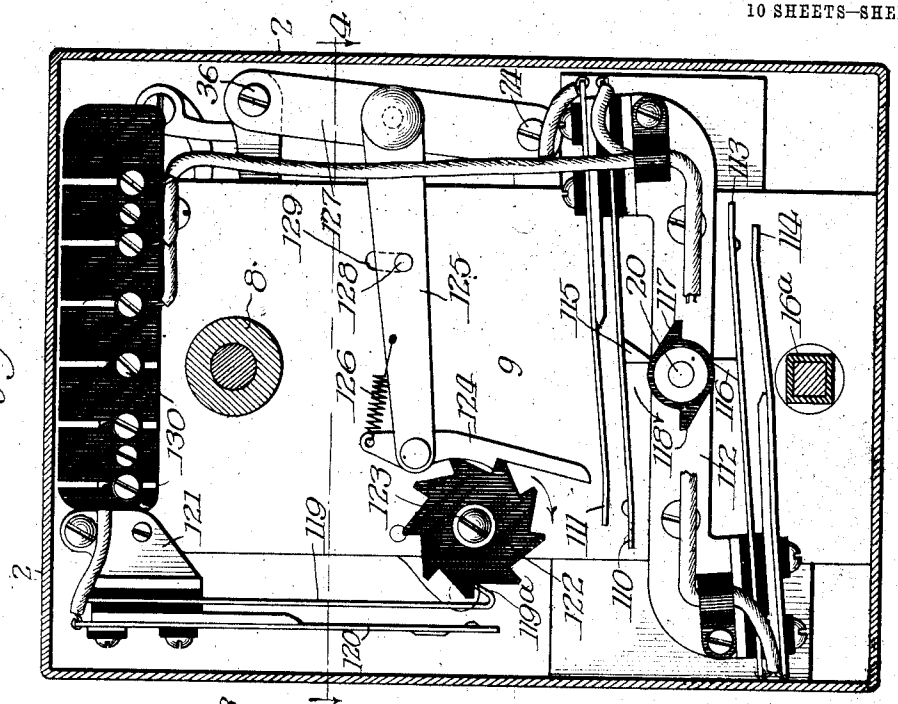
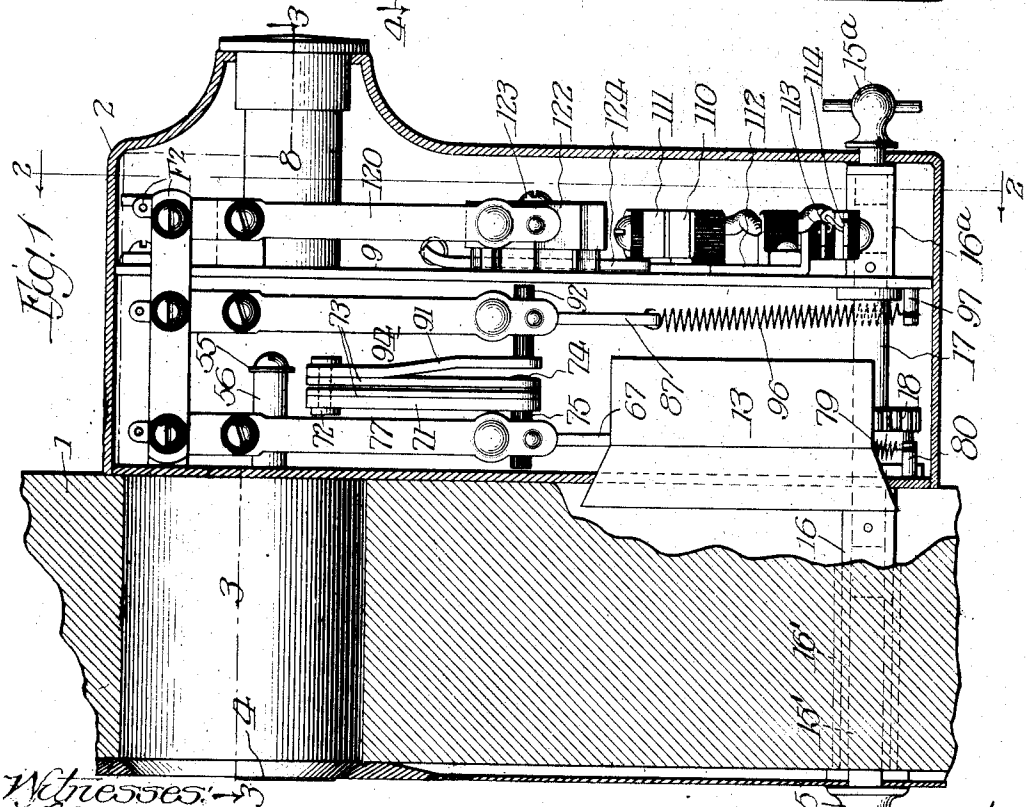


Fig. 1



Witnesses:
S. N. Pond

Joseph F. Cole, Inventor.
by Offield, Towle, Graves & Offield, Attys.

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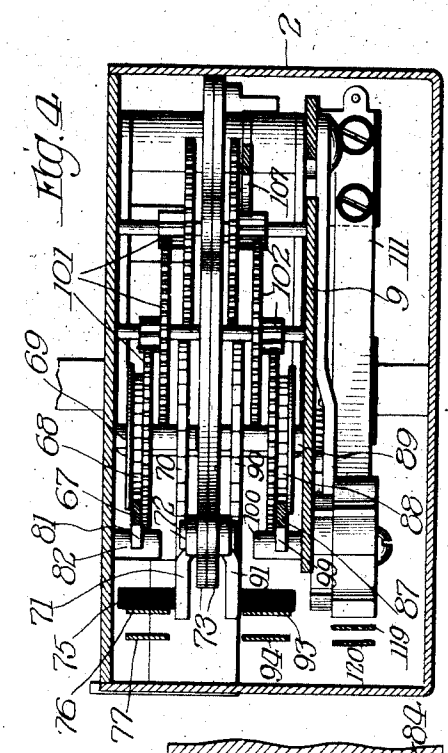

Fig. 4

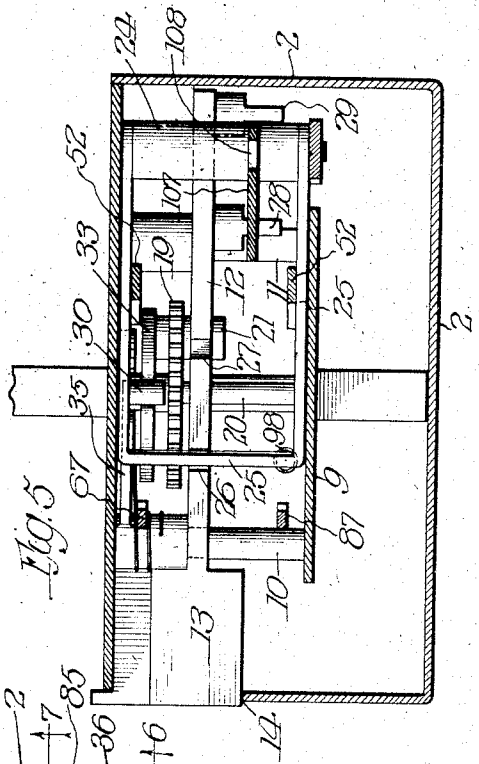

Fig. 5

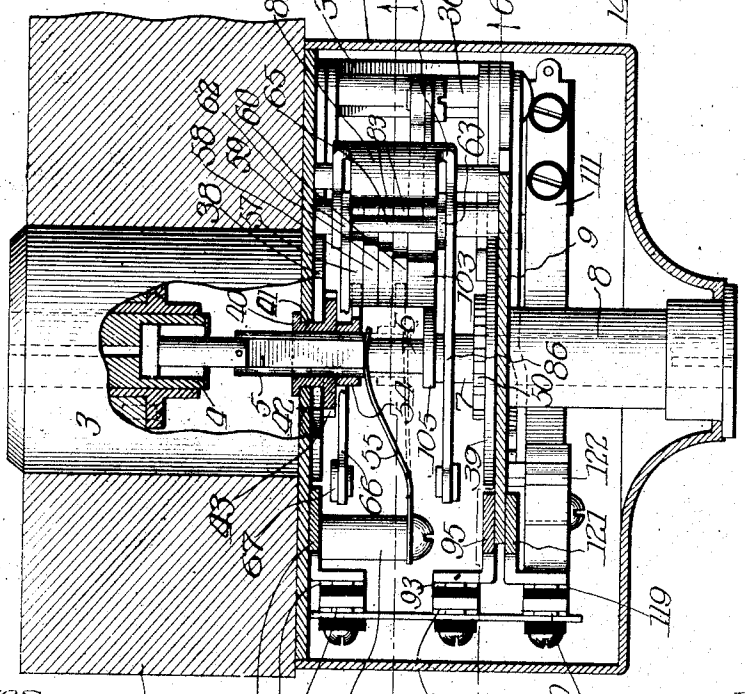

Fig. 3

Witnesses
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10 SHEETS—SHEET 3.

Fig. 7

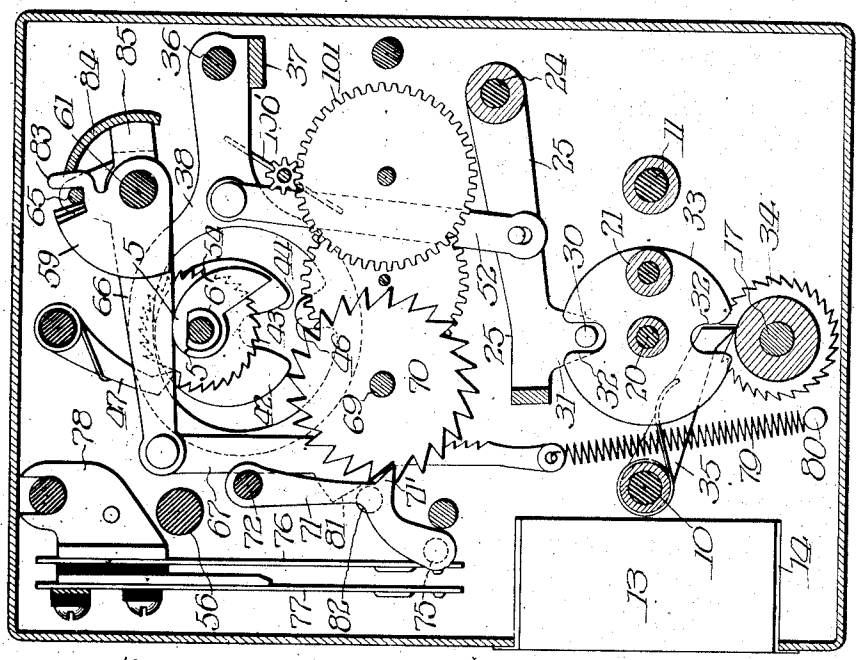
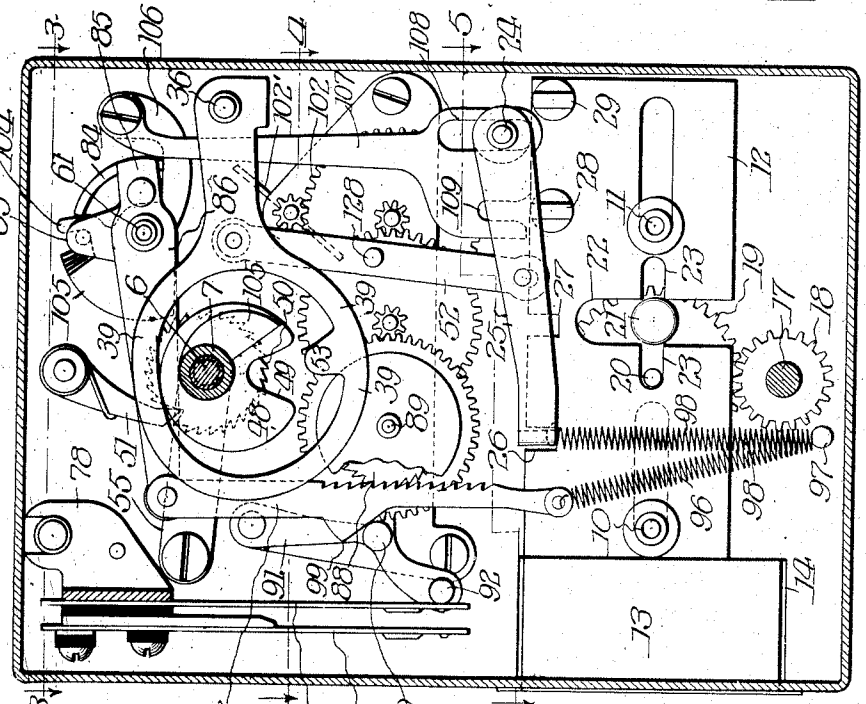


Fig. 6



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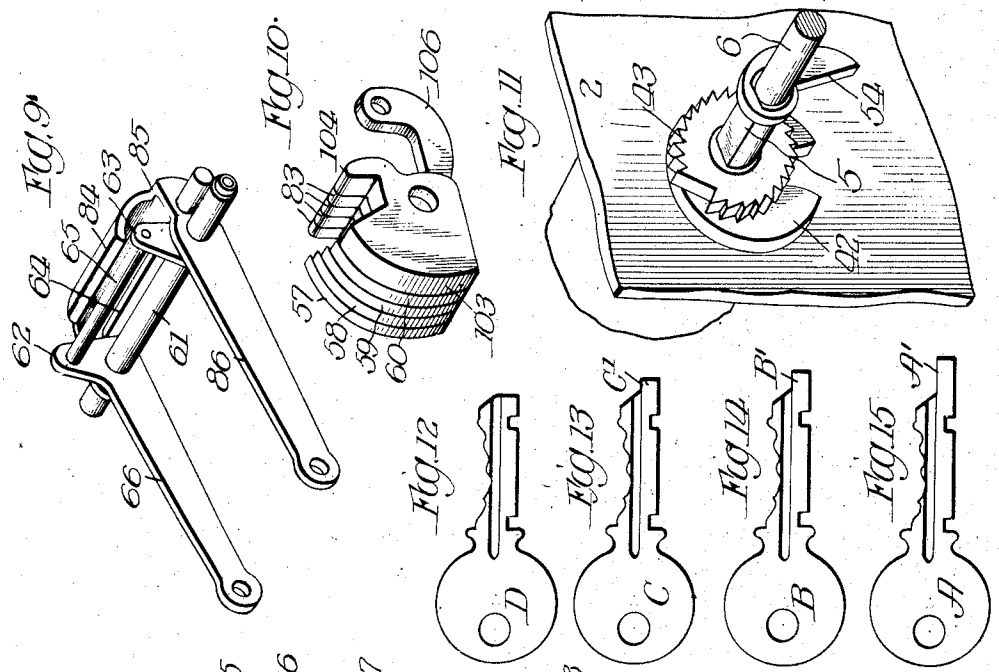
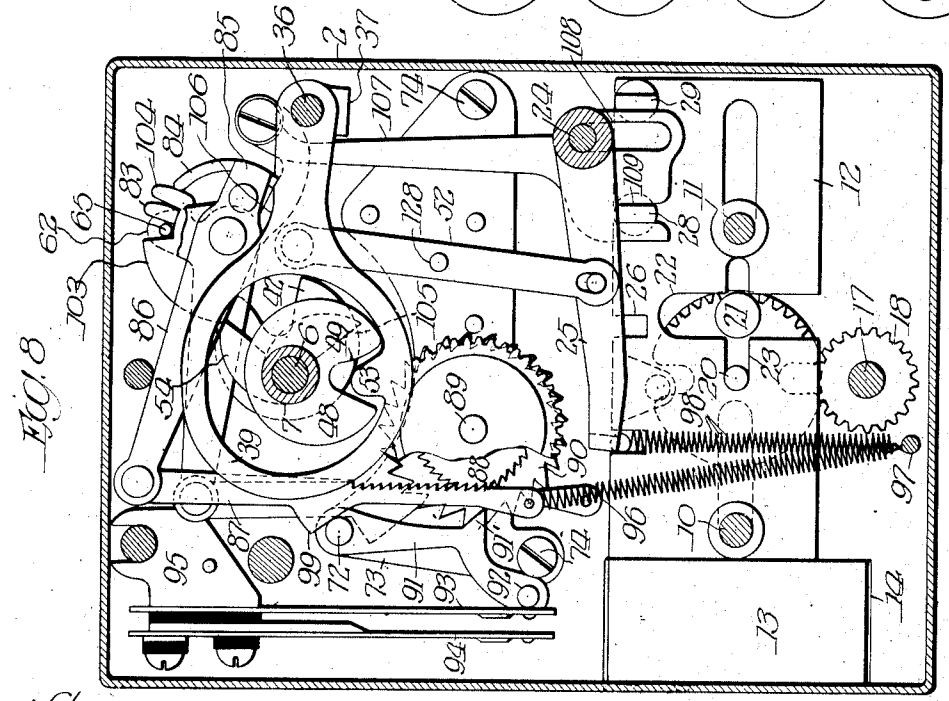
10 SHEETS—SHEET 4.





Witnesses:
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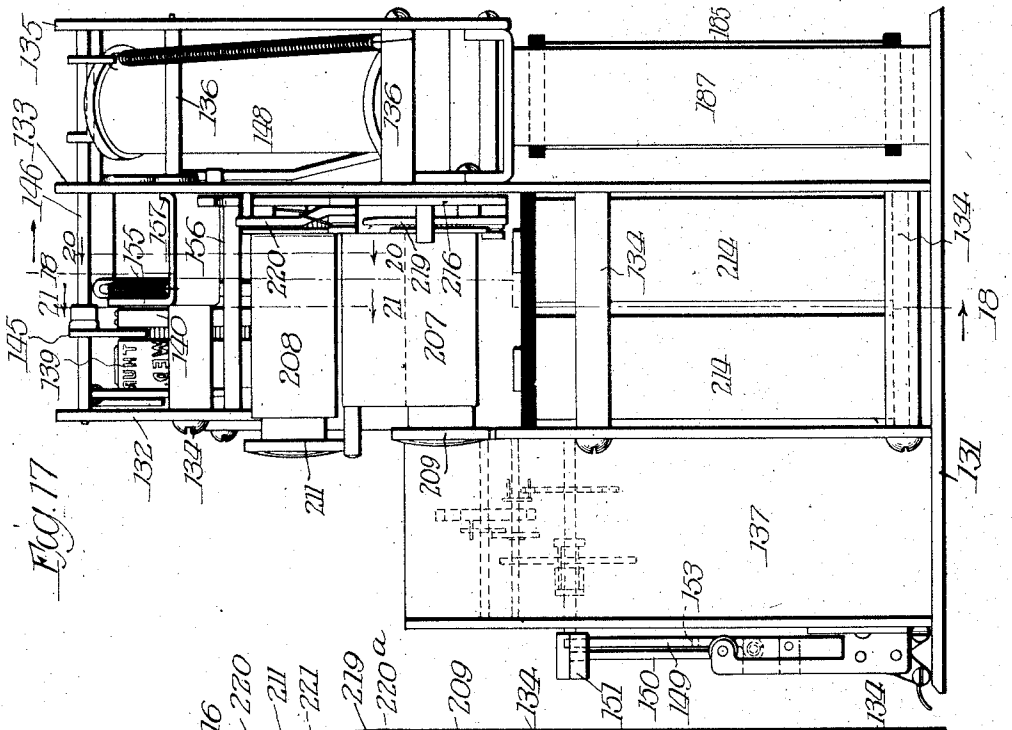

Fig. 17

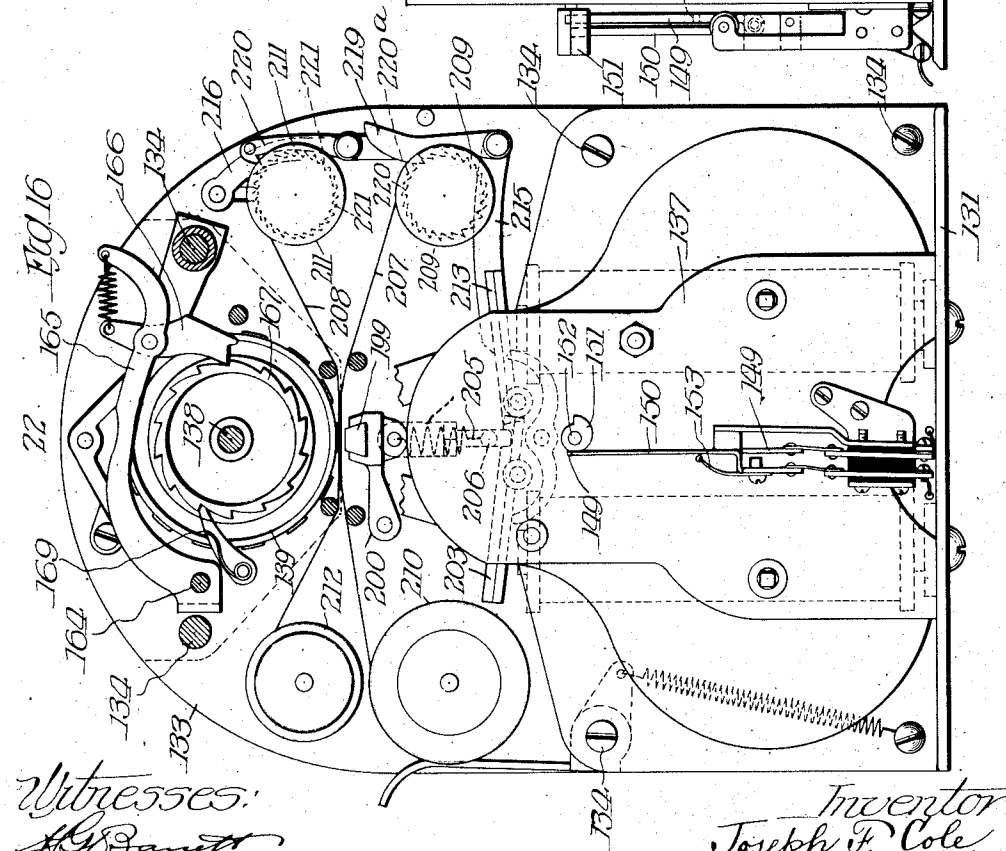

Fig. 16

Witnesses:

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1,043,069.

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10 SHEETS—SHEET 6.

Fig. 19

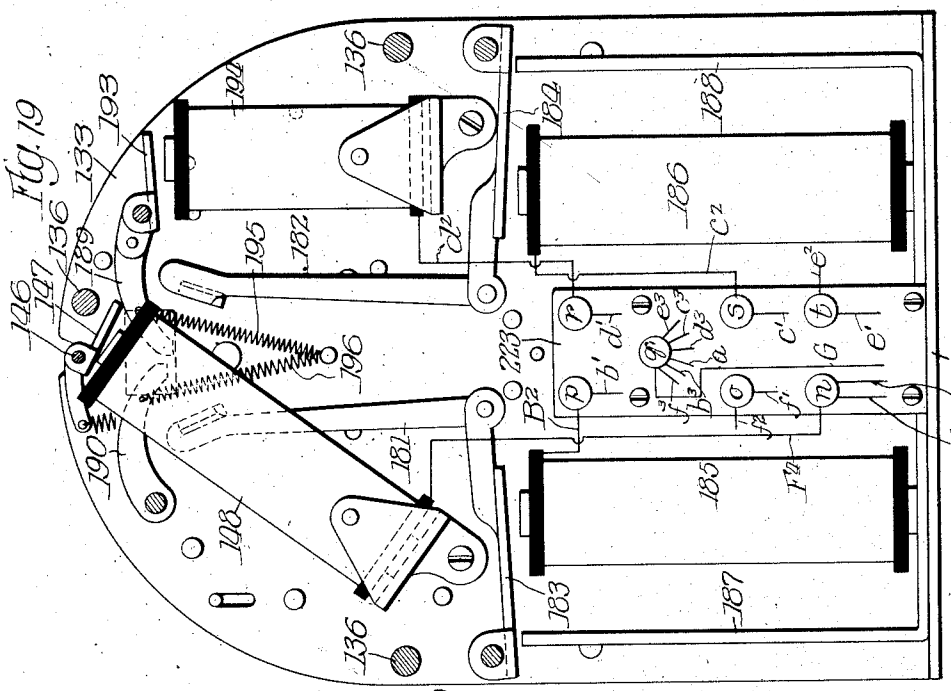
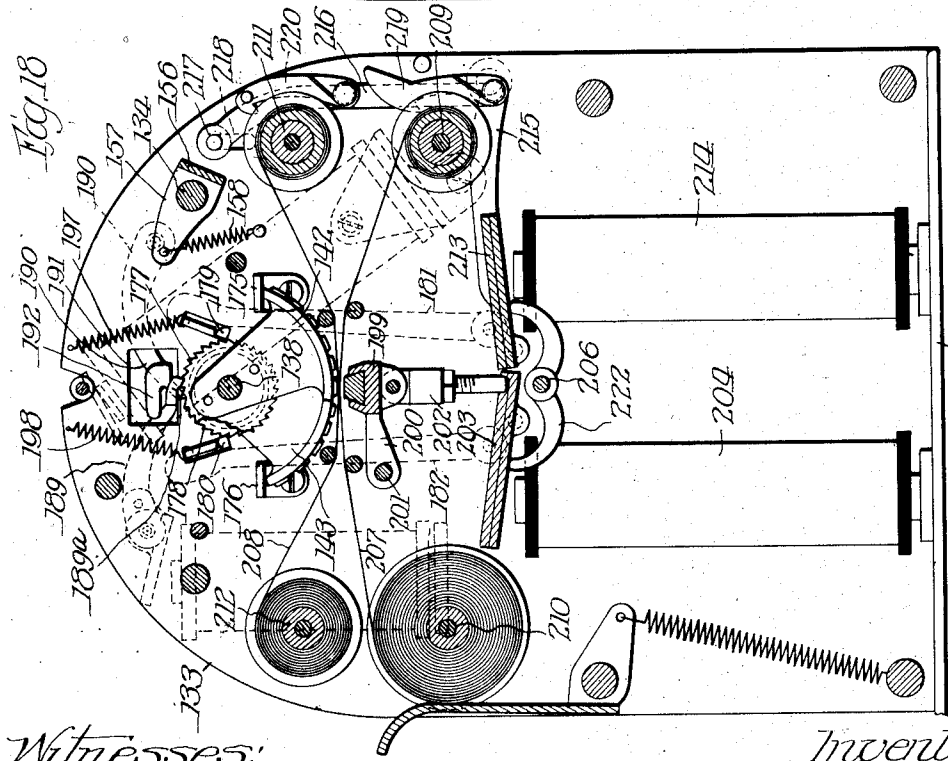


Fig. 18



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10 SHEETS—SHEET 7.

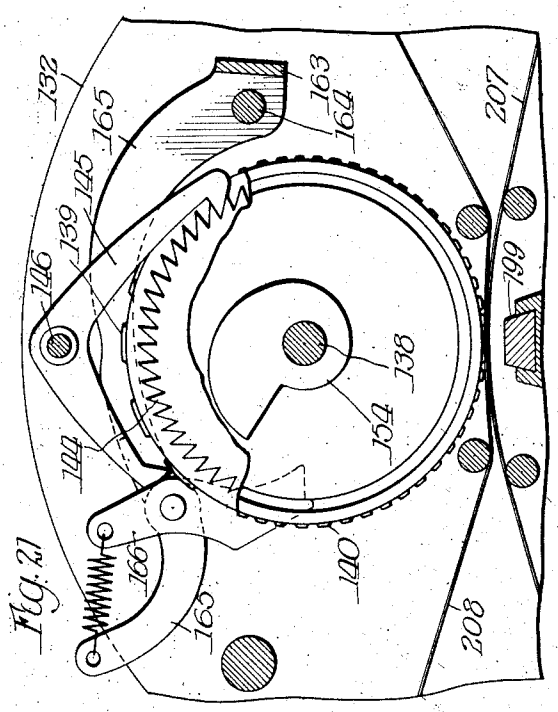

Fig. 21

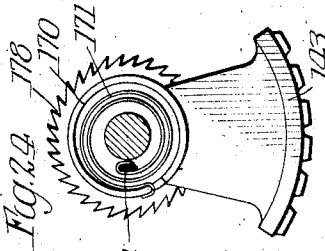

Fig. 24

Fig. 26

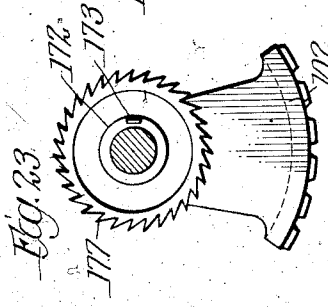

Fig. 23

Fig. 25

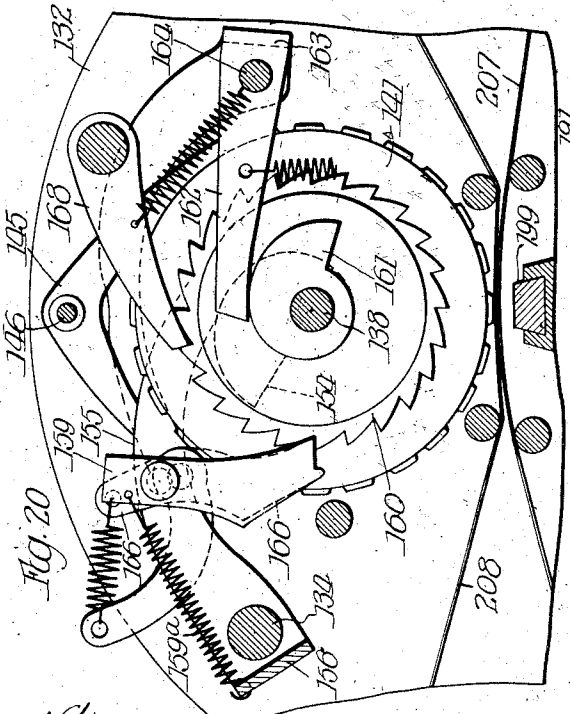

Fig. 20

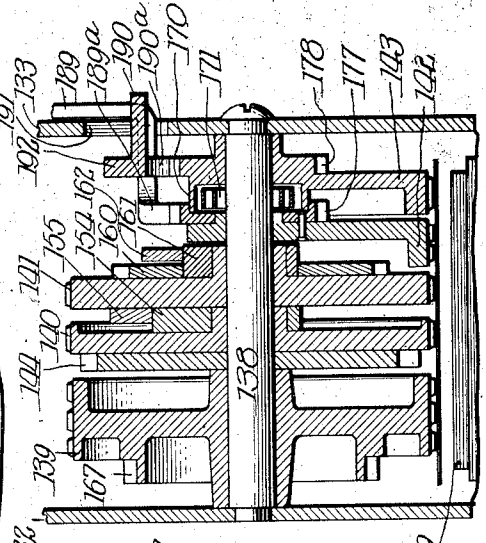

Fig. 22

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RECORDING DOOR LOCK.

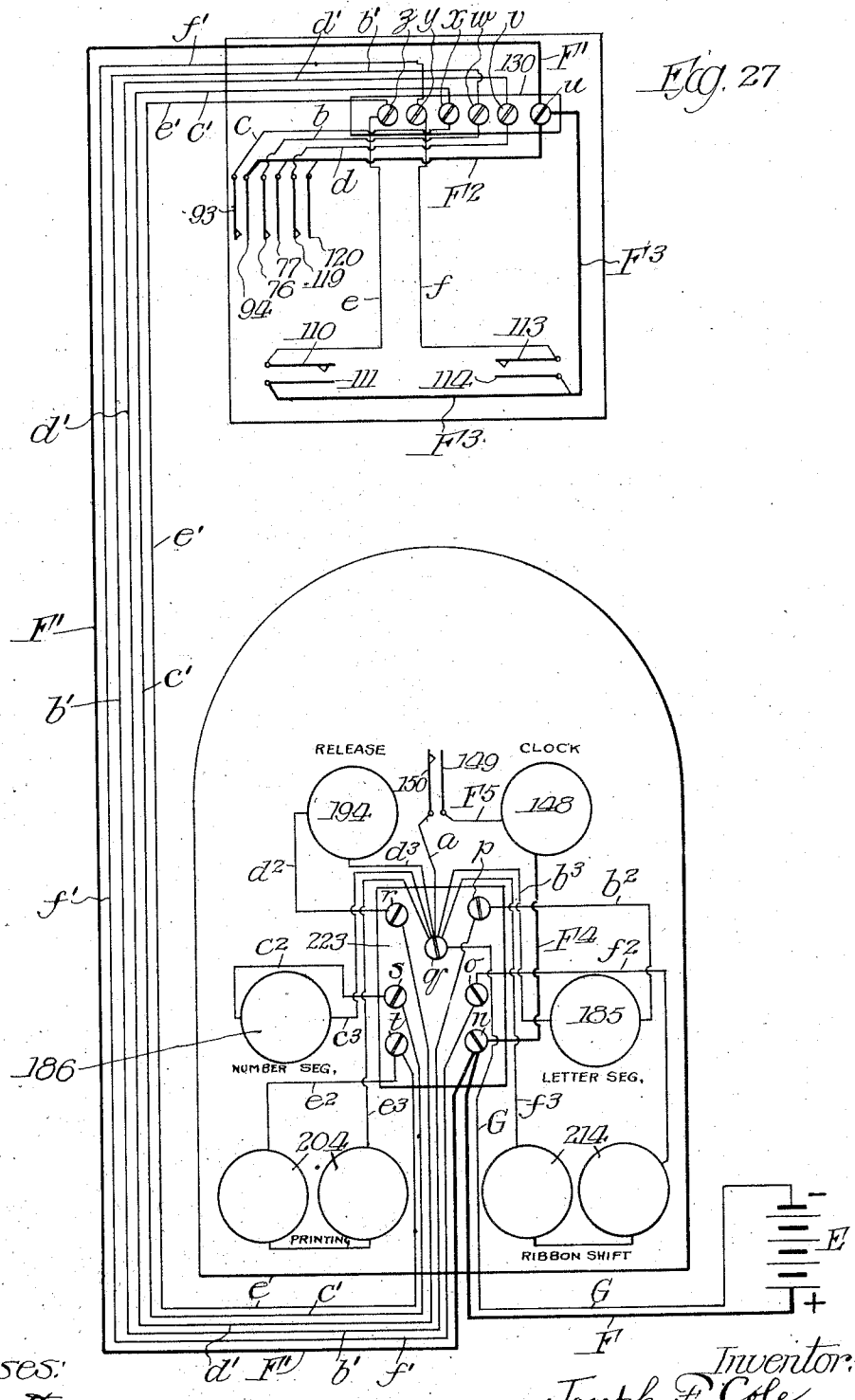
APPLICATION FILED NOV. 13, 1911.

1,043,069.

Patented Nov. 5, 1912.

10 SHEETS—SHEET 8.

Fig. 27



Witnesses:
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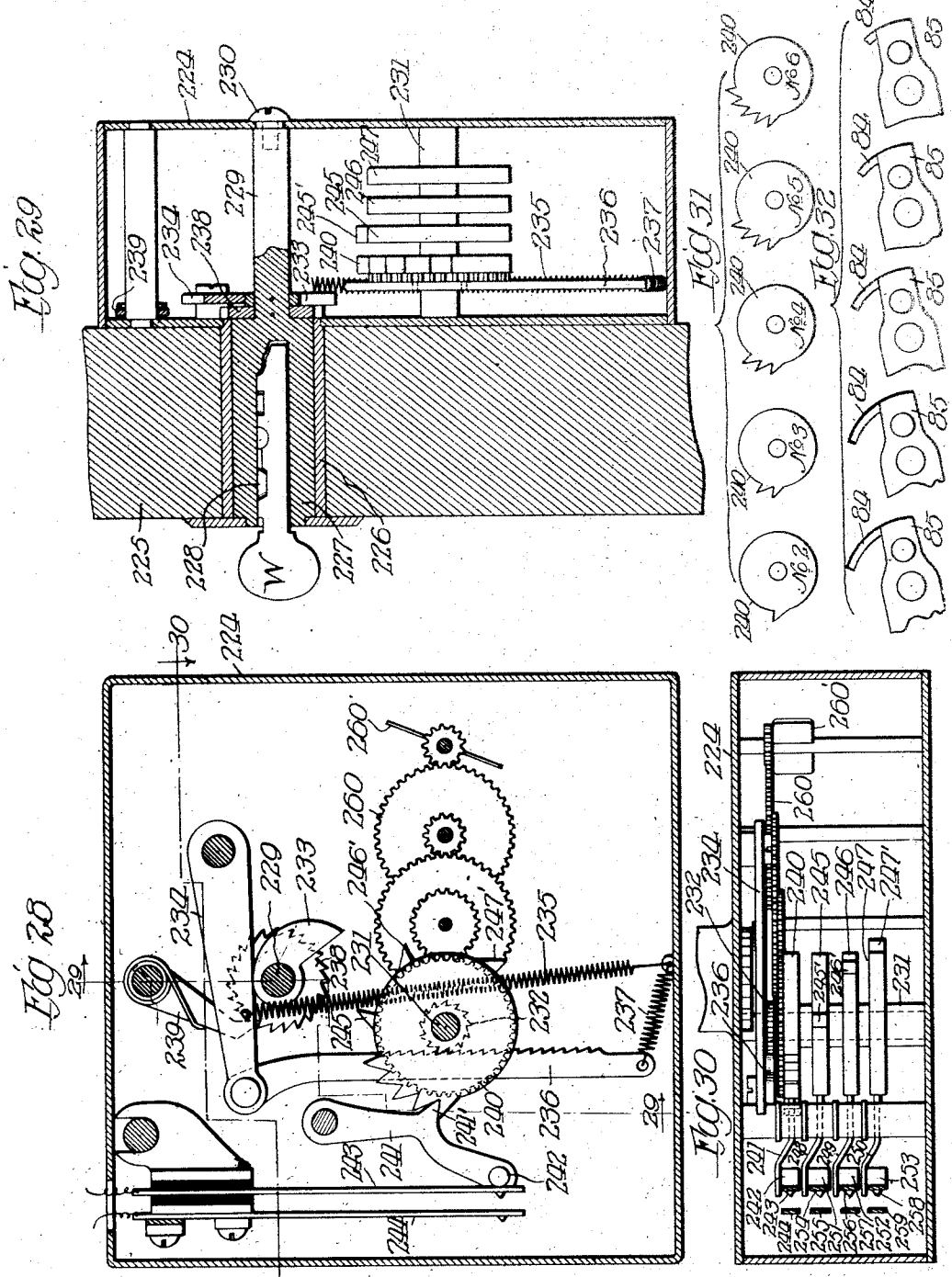
10 SHEETS—SHEET 9.



Witnesses
H. G. Barnett
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Attys.

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APPLICATION FILED NOV. 13, 1911.

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10 SHEETS—SHEET 10.

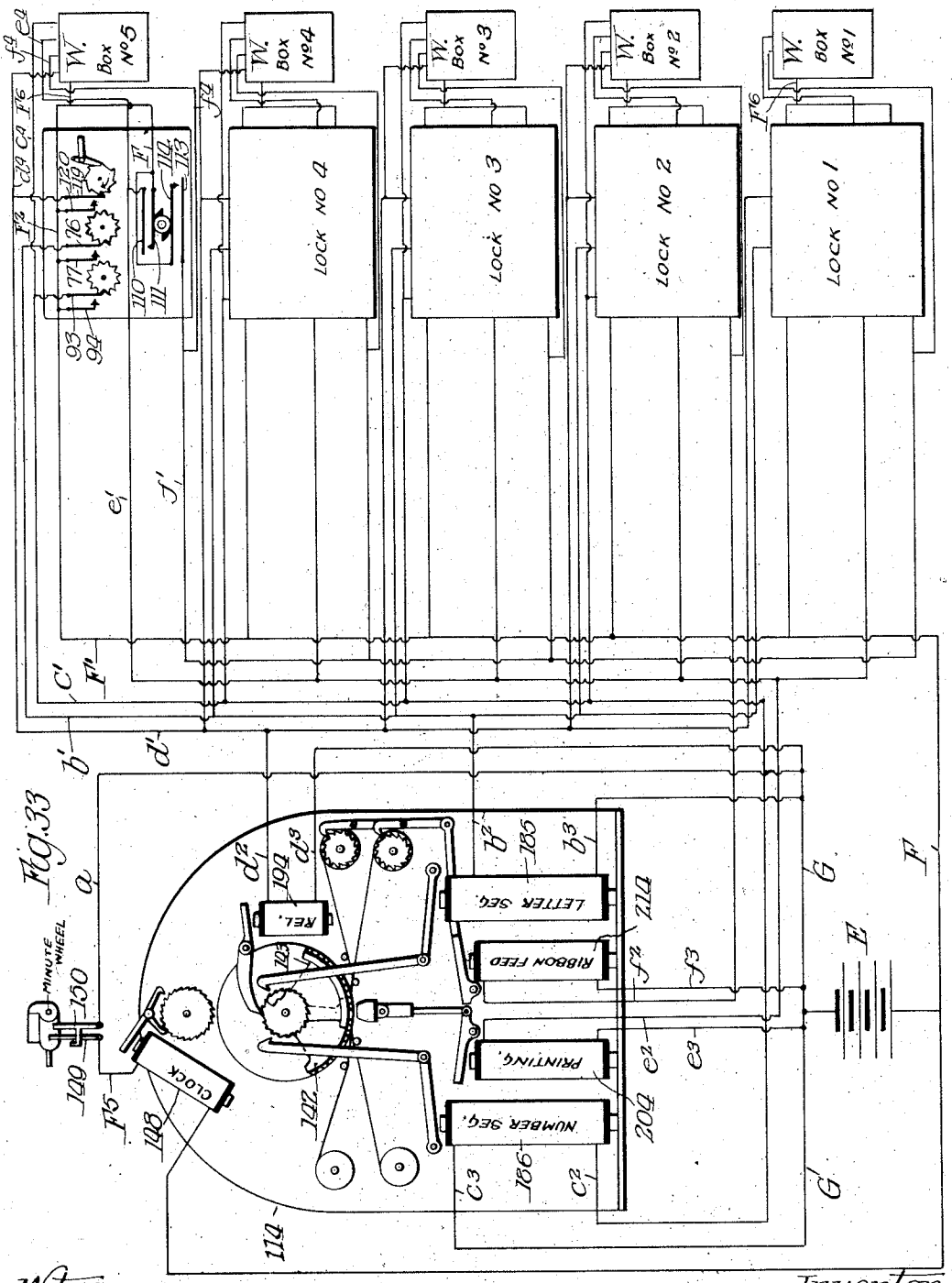

Fig. 33

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Joseph F. Cole,
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Graves & Offield Attys

UNITED STATES PATENT OFFICE.

JOSEPH F. COLE, OF ELKHART, INDIANA, ASSIGNOR TO NATIONAL RECORDING LOCK COMPANY, OF PORTLAND, MAINE, A CORPORATION OF MAINE.

RECORDING DOOR-LOCK.

1,043,069. Specification of Letters Patent. Patented Nov. 5, 1912.

Application filed November 13, 1911. Serial No. 660,118.

To all whom it may concern:

Be it known that I, JOSEPH F. COLE, a citizen of the United States, residing at Elkhart, in the county of Elkhart and State of Indiana, have invented certain new and useful Improvements in Recording Door-Locks, of which the following is a specification.

My invention relates to recording door locks of a general type illustrated in Letters Patent to LeGrand C. Bush and Joseph F. Cole, No. 981,164, dated January 10, 1911, wherein the recording mechanism is located outside the lock-casing, preferably in the office of the building, and is electrically connected with the differential lock mechanism; and wherein, also, a set of differential keys is employed to properly set and actuate the recording mechanism and release the bolt of the lock, while a separate knob or other tool is employed to throw the bolt in both directions after the same has been released.

Among the salient objects of my invention are, to provide, in a recording door-lock of the character above outlined, an improved mechanism for effecting, by electrical means, the setting of the printing segment which indicates the key used, to provide an improved system wherein a single recording mechanism may serve a plurality of locks or locks and watchman's boxes located at different points on or in the building and may make a record of the particular lock or box used at any given time; to provide a system wherein the number of electric circuits required between one or more locks and the recorder may be reduced to a minimum by the employment of a single circuit for the setting of the key or lock indicating printing segment and the differential setting of said segment by variations in the number of electrical pulsations or impulses transmitted over the circuit, according to the key used or the particular lock operated; and to provide improved means for preventing the actuation of the lock without establishing a record thereof.

Other minor objects and purposes of the invention will be apparent from the following description, when taken in connection with the accompanying drawings which illustrate one practical embodiment of the invention, and in which,—

Figures 1 to 11, inclusive, are views pertaining to the lock mechanism and circuit-closing mechanism comprised within the lock housing or casing that is attached to the door. In these views, Fig. 1 is a side elevation of the lock mechanism, the casing thereof appearing in vertical section and applied to the inner side of a door, a fragment of which latter also appears in vertical section. Fig. 2 is a rear elevation of the lock mechanism, with the casing in vertical section, on the line 2—2 of Fig. 1. Fig. 3 is a horizontal section on the line 3—3 of Figs. 1 and 6, most of the parts of the lock mechanism appearing in top plan. Fig. 4 is another horizontal section on the line 4—4 of Figs. 2 and 6. Fig. 5 is still another horizontal section on the line 5—5 of Fig. 6. Figs. 6 and 7 are vertical sectional views on the lines 6—6 and 7—7, respectively, of Fig. 3. Fig. 8 is a view similar to Fig. 6, but with parts removed for the sake of clearness and showing certain of the key-actuated parts in raised position. Figs. 9, 10 and 11 are detail perspective views of various parts of the selector mechanism through which the key and lock indicating segments are set to proper printing position according to the particular key or lock used. Figs. 12, 13, 14, and 15 are views showing a set of differential keys employed with the lock. Figs. 16 to 21 inclusive are views of the recording mechanism. Of these, Fig. 16 is a rear elevational view. Fig. 17 is a side elevational view. Fig. 18 is a vertical section on the line 18—18 of Fig. 17. Fig. 19 is a front elevational view. Figs. 20 and 21 are enlarged detail views in vertical section on the lines 20—20 and 21—21 of Fig. 17. Fig. 22 is a detail view in axial section of the printing wheels and segments and in part of their actuating devices. Figs. 23 and 24 are detail elevational views of the letter-printing segment and number-printing segment, respectively, and their actuating ratchets and spring. Figs. 25 and 26 are detail views of the letter and number-printing segments, respectively, showing the printing faces thereof. Fig. 27 is a diagrammatic view illustrating one practical arrangement of electrical circuit connections between a lock and the recorder. Fig. 28 is a vertical section through one of the watchman's boxes. Fig. 29 is a view similar to Fig. 28 taken in a plane at right-angles to the plane of the latter figure. Fig. 30 is

a horizontal section through one of the watchman's boxes. Fig. 31 is a group view showing the differential vibrator disks employed in the several watchmen's boxes for closing the number-segment actuating circuits. Fig. 32 is a group view showing the differential devices in the several locks for controlling the differential movement of the lock-indicating segment. Fig. 33 is a general diagrammatic view of a complete system showing a recorder, a series of five locks, and a series of five watchmen's boxes all suitably interconnected.

In its most complete and perfect form my invention comprehends a recording system for one or a series of door locks applicable to large buildings such as stores, factories, warehouses, office buildings, and the like, and wherein each individual lock is served by a plurality of differential keys or like members which have the double function of releasing a detent or latch which holds the bolt against movement and recording the use and the hour and date of use of the particular key employed. The recording mechanism is further provided with means for making a record of the particular lock used at any given time (where a single recording mechanism serves a plurality of different locks). To this end, the recording mechanism is equipped, in addition to the usual day, hour and minute disks, with pivoted segments, one of which has on its periphery a plurality of symbols (preferably letters) which distinguish the several keys pertaining to each lock, and the other of which has on its periphery a plurality of symbols (preferably numerals) which distinguish the particular lock operated at any given time. The key recording segment is set to its proper printing position, according to the key used, by a pawl-and-ratchet mechanism that is actuated by intermittent impulses of an electro-magnet; these impulses being transmitted from a circuit-closing mechanism in the lock itself that effects one or more rapid successive closures of the circuit through devices selectively operated by the keys; and this method of setting the key-recording segment to proper printing position constitutes one important feature of my present invention. The lock-designating segment is similarly set to proper position, according to the lock used, by pawl-and-ratchet mechanism electrically actuated through differential impulse-creating mechanism embodied in the several locks of a complete system or equipment. The time-printing disks of the recording mechanism are stepped forward minute by minute, hour by hour, and day by day, through the agency of a magnet controlled from the minute-arbor of a clock mechanism, as usual in this class of devices; and the release of the key and lock-designating segments, and the actuation of the ribbon feed devices of the printing mechanism are effected through electro-magnets, the circuits of which are controlled by contact devices also actuated by mechanism within the lock casing. In some situations where a recording door-lock system of this character would be employed, night watchman's boxes are also used; and my invention, as embodied in a system employing a plurality of locks, is well adapted, by a simple extension, to serve as a means for recording the actuation or operation of a plurality of night watchman's boxes where these latter are given identifying numbers or other designations identical with those of the locks themselves.

Referring now more specifically to Figs. 1 to 15 inclusive of the drawings, which illustrate the lock casing and the parts carried thereby, 1 designates a section of a door, to the inner side of which is suitably secured the lock casing designated as an entirety by 2. 3 designates an ordinary Yale lock section set in the door 1 and provided with the usual key-controlled cylinder 4 mounted therein. Slidably keyed to the inner end of the cylinder 4 is a shaft section having a flat or other non-circular portion 5 that projects through that wall of the casing 2 that lies against the door and an inner reduced circular portion 6 that telescopes at its free end within the inner end of the cylinder 7 of another Yale section 8 mounted within the casing 2. Rigidly secured within the casing and disposed parallel with the inner and outer walls thereof is an intermediate frame-plate 9 that supports the inner end of the Yale section 8 and likewise affords bearings for various parts of the lock mechanism as hereinafter described.

Slidably mounted on horizontal studs 10 and 11 (Figs. 5 and 6) secured to and extending between the frame-plate 9 and the inner wall of the casing 2 is the slotted shank 12 of a lock-bolt, the head 13 of which is adapted to play through an opening 14 in one of the edge walls of the lock casing. The bolt is actuated by a knob 15 having a square shank 15′ (Fig. 1) fitting within one end of a square coupling member 16 revolubly mounted in a transverse socket 16′ in the door 1 and pinned or otherwise keyed to a shaft 17 journaled in the lock casing near its lower end (Fig. 1). A similar inside knob 15^a is similarly connected through a square coupling member 16^a with the opposite end of the shaft 17. Fast on the shaft 17 is a pinion 18 (Figs. 1 and 6) that meshes with a gear 19 journaled on a cross-shaft 20; said gear having an eccentric wrist-pin 21 engaging a vertical slot 22 in the bolt-shank 12 and directly actuating the latter. The bolt-shank is also horizontally slotted, as shown at 23, on opposite sides of the slot 22 (Fig. 6) to permit the play of the bolt over the

shaft 20. The actuation of the shaft 20 and gear 19 through a half turn effects the full actuation of the bolt in one direction; and the actuation of said shaft and gear through the remaining half turn effects the full actuation of the bolt in the opposite direction.

Pivoted on a post or stud 24 is a latch bail 25, the cross member of which normally engages one of two notches 26 and 27 formed in the upper edge of the bolt-shank 12, thereby locking the latter against movement until said locking bail has been raised. On one side of the bolt-shank 12 adjacent to the upper edge thereof are a pair of laterally projecting studs 28 and 29 (Figs. 5 and 6) which also coöperate with a device hereinafter described to prevent the shooting of the bolt before the recording mechanism has been set to printing position. In connection with the locking bail 25 I also provide a device for locking the actuating mechanism of the bolt at the limits of the throw of the latter, the same comprising a pin 30 (Figs. 5 and 7) projecting inwardly from a depending lug 31 on one of the arms of the locking bail 25, said pin 30 coöperating with oppositely positioned notches 32 formed in a disk 33 that is fast on the shaft 20 which carries the gear 19, and is consequently rigid relatively to the latter. The wrist-pin 21 may be secured directly to the face of the gear 19; or, as herein shown, it may be secured to the face of the disk 33 which lies alongside and closely adjacent to the gear 19 and extend through a hole in the latter, as herein shown, thus increasing the relative rigidity of the disk 33 and gear 19. The shaft 17, to which the knob for throwing the bolt is directly applied, turns, of course, always in one and the same direction; and back turning thereof is prevented by a ratchet 34 (Fig. 7) fast on said shaft 17 and engaged by a spring-actuated dog 35.

The above described locking devices of the bolt and its actuating mechanism are withdrawn to free the bolt and its actuating mechanism by means actuated by a key when inserted in either of the Yale sections 3 and 8 and given a half turn; such releasing means comprising the following parts. On a post or stud 36 projecting from the inner wall of the casing 2 is hung a bail member 37, the parallel arms of which are formed as eccentric straps 38 and 39, the former lying directly against the inner wall of the casing 2 and the latter lying directly against the inner face of the frame-plate 9, as clearly shown in Fig. 3.

Mounted in the inner wall of the casing 2 and confined against longitudinal movement by a collar 40 is a short sleeve 41 through which the shaft section 5 passes, and fast on said sleeve, within the lock casing is an eccentric 42 and a ratchet-disk 43. The eccentric 42 is formed with a deep notch 44 in its flat side adapted to coöperate with a tooth 46 on the inner periphery of the eccentric 38 in a manner hereinafter described. A spring-actuated pawl 47 coöperates with the ratchet-disk 43 to prevent back turning of the eccentric. The rotatable cylinder 7 of the Yale section 8 also has fast thereon, just inside the frame-plate 9, an eccentric 48 (Fig. 6) having a notch 49, and also a ratchet-disk 50 coöperating with a spring-actuated pawl 51 to limit the turning of the cylinder 7 in one direction. Pivoted to the arms of the eccentric straps 38 and 39 are a pair of depending links 52 that are pivotally connected, with slight lost motion, to the arms of the bail 25, whereby the raising of the eccentric straps through either of the eccentrics 42 and 48 effects the raising of the locking bail 25, thus releasing both the bolt and its actuating mechanism, so that the bolt may be thrown by either of the knobs 15 and 15^a. When the outside eccentric 42 is turned by a key inserted in the Yale section 3, both eccentric straps 38 and 39 (which are rigidly connected) are raised, and at such time a tooth 53 on the eccentric strap 39 enters the notch 49 of the inner eccentric 48 and thereby locks the cylinder 7 of the inner Yale section 8 against actuation from inside the door. Similarly, when the eccentric arms 38 and 39 are raised by the eccentric 48, the tooth 46 of the eccentric strap 38 engages the notch 44 of the eccentric 42 and thereby prevents actuation of the cylinder 4 of the outer Yale section 3 from outside the door.

An additional function of the eccentrics 42 and 48 and the teeth 46 and 53 is to insure, during the last half turn of the key, through the engagement of said eccentrics with the upper ends of said teeth, the downward or return movement of the eccentric straps 38 and 39, although these latter are also spring-actuated on their downward or return movement through their connection to the locking bail 25, as will hereinafter appear.

I will next describe the mechanism through which a plurality of differential keys operating through the outer Yale section 3 effect the selective setting, in the recording mechanism, of a printing segment that carries type-symbols corresponding with the designations of the several keys. Fast on the flat shaft section 5 is a cam 54 that is engaged on its inner side by a leaf-spring 55 mounted on a stud 56, whereby said cam and the slidable shaft to which it is secured are normally held in the outermost position shown by full lines in Fig. 3. This cam 54, as the shaft 5, 6, is turned, is adapted, depending upon the position of the cam 54, to raise one of a plurality of differential segments 57, 58, 59, and 60 (Fig. 10) of stepped or graduated widths, which are pivotally mounted on a transverse shaft 61 extending between the inner wall of the

casing and the intermediate frame-plate 9. Also pivoted on the shaft 61 are a pair of upstanding arms 62 and 63 (Fig. 9) that are rigidly connected by a cross-bar 64 and also, at their upper ends, by a rod 65, which latter, as best shown in Figs. 3 and 7, extends across and is adapted to be struck and moved by the stepped or differential faces of the selector segments 57, 58, 59, and 60. Rigid with the arm 62 is a relatively long arm 66 (Figs. 7 and 9), to the free end of which is pivoted a depending rack-bar 67, the teeth of which engage the teeth of a ratchet-disk 68 (Fig. 4) fast on a stub-shaft 69 secured to and projecting inwardly of the inner wall of the casing 2. Fast on the shaft 69 is a ratchet-shaped vibrator disk 70 (Fig. 7) coöperating with which is a circuit-closer in the form of a depending arm 71 hung from a pivot-pin 72 and having a V-shaped tooth 71′ adapted to engage the periphery of the vibrator-disk 70. The pivot-pin 72 is mounted in the upper ends of a pair of parallel frame-plates 73 that are rigidly mounted on studs or posts 74 secured to the inner wall of the casing. The arm 71 carries at its lower end a laterally projecting pin 75, best seen in Fig. 4, that normally lies against the innermost, 76, of a pair of contact strips 76 and 77 that are insulated from each other and suspended from a bracket 78 secured to the inner wall of the casing. To the lower end of the depending rack-bar 67 is secured a tensile-spring 79 anchored at its lower end to a stud 80 (Figs. 1 and 7) projecting from the inner wall of the casing 2, whereby the arm 66 is normally urged in a downward direction, and whereby, after the arm 66 has been raised, the rack-bar is made effective to transmit rotary movement to the shaft 69 and vibrator-disk 70, thereby imparting a rapid vibrating or pulsating movement to the circuit-closer 71, which transmits the latter to the contact-strip 76 through the pin 75. The direction of pull of the spring 79 is such as to normally urge the teeth of the rack-bar 67 into engagement with the teeth of the ratchet-disk 68, but to insure such engagement, as well as to limit the downward movement of the rack-bar 67 I form on the back of the latter a cam-shaped lug 81 (Figs. 4 and 7) that is adapted to engage a fixed stud 82 projecting inwardly from the inner wall of the casing.

Referring next to the mechanism through which a printing segment bearing type numerals or other identifying symbols pertaining to the several locks of a system may be set to proper position to record the identifying symbol of whatever lock was operated at any given time, it will be noted that each of the differential segments 57, 58, 59, and 60, has, in rear of the rod 65, an upstanding lug or tooth 83, all of these lugs normally lying flush with each other and on one side engaged with the rod 65, and thereby sustaining the pivoted segments to which they belong in normal position to be engaged and actuated by the cam 54. When any one of the segments is raised by the cam 54, its lug 83 is adapted to engage the adjacent edge of a curved plate 84 carried by a bail 85 that is pivotally mounted on the shaft 61, the arms of said bail lying just outside the arms 62 and 63 (Fig. 9), and one of said arms being extended in the form of an arm 86 similar to and normally lying parallel with the arm 66. The arm 86 is connected to a contact-closing mechanism substantially identical with that already described and set in operation by the arm 66, and consists of a depending rack-bar 87 (Figs. 6 and 8) engaging a ratchet-disk 88 fast on a stub-shaft 89 projecting from the frame-plate 9, said shaft 89 also having fast thereon a vibrator-disk 90 coöperating with a depending circuit-closer arm 91 hung from the pivot-pin 72 and having a V-shaped tooth 91′ engaging the toothed periphery of the vibrator-disk 90. In the lower end of the arm 91 is a laterally projecting pin 92 that engages the innermost, 93, of a pair of contact strips 93 and 94 insulated from each other and suspended from a supporting bracket 95 carried by the frame-plate 9. To the lower end of the rack-bar 87 is secured a tensile-spring 96, the lower end of which is anchored to a stud 97 on the frame-plate 9; to which latter, it may here be mentioned, is also anchored the lower end of a tensile-spring 98 that is connected to and normally draws down the locking-bail 25. The rack-bar 87 is also provided with a cam projection 99 that coöperates with a fixed stud 100 to limit the downward movement of the rack-bar 87 and insure its engagement with the ratchet-disk 88. In practice, the curved plates 84 of the several locks that may be connected to a common recording mechanism are made of varying widths, as shown in Fig. 32; that is to say, the upper operative edges of said curved plates are at varying distances from the adjacent sides of the lugs 83 of the selector segments, so that the several plates 84 of a series of locks will be engaged at different times in the movements of the selector segments, and consequently the arm 86 will be swung through different angles in the several locks, with a consequent difference in the number of successive closures of the contact strips 93 and 94; and a corresponding difference in the number of electrical impulses transmitted to the segment-setting devices of the recording mechanism.

By reference to Fig. 4 it will be observed that the ratchet-disks 68 and 88 are locked to two simple trains of speed multiplying gears and pinions designated as an entirety

by 101 and 102, respectively, which drive speed-regulating fans 101′ and 102′; these gear trains and fans serving simply to control the rate of speed of the circuit-closing vibrating mechanism, and consequently the rapidity of the pulsations transmitted over the circuit.

Referring again to the selective mechanism for setting the key-indicating segment of the recording mechanism, it will be observed by reference to Figs. 12 to 15 inclusive, that each lock is provided with a plurality of differential keys or similar lock-releasing and recording mechanism actuating devices designed to be carried by the different officers or employees of an establishment where the present recording lock system may be installed, these keys being designated preferably A, B, C, and D, respectively. As herein shown, these are ordinary Yale or other lock keys, with the exception that the keys A, B, and C are provided with longitudinal extensions A′, B′, and C′, respectively, of decreasing lengths in the order named; while the key D is a plain key with no longitudinal extension. It will be manifest that if the key D is inserted in the Yale section 3, the movable shaft 5, 6, will not be shifted longitudinally, and consequently the cam 54 will engage and lift the selector segment 57. If the key C be inserted, its extension C′ will shift the cam 54 to a position in which it will engage the segment 58. If the key B be inserted, its extension B′ will shift the cam 54 to a position in which the segment 59 will be engaged by the cam; and if the key A be inserted, its extension A′ will shift the cam 54 to the dotted line position shown in Fig. 3 wherein the segment 60 will be engaged by the cam.

I also preferably provide the key-recording segment of the recording mechanism with a symbol, conveniently the letter I, which indicates the actuation of the lock from the inside by any one of the keys: and the selective device for setting the segment with this symbol in printing position is similar to the differential selective devices 57, 58, 59 and 60 above described, and consists of a segment 103 pivoted on the shaft 61 alongside the segment 60 and formed with an operating face in graduated or stepped relation to the operating faces of the segments 57, 58, 59, and 60, as clearly shown in Figs. 3 and 10. This segment operates to effect a single closure of the contact strips 76 and 77 through the same mechanism, already described, by which the differential closures of said contact strips are effected by the segments 57, 58, 59, and 60; and it is also provided with a lug 104 having the same function as the lugs 83 of the remaining segments to effect the closure of the contact strips 93 and 94. This segment 103 is actuated by a cam 105 that is similar to but independent of the cam 54 and is fast on the inner end of the rotatable cylinder 7 of the inner Yale section 8, said cam being actuated by any one of the keys that may be inserted in the Yale section 8 and turned therein. This segment 103 is formed with a tail-piece 106, the upper edge of which is adapted to be engaged by the lower edge of the cross member of the bail 85, as clearly shown in Fig. 8, whenever said bail is rocked downwardly by the engagement of any of the lugs 83 and 104 with the upper edge of the plate 84, which always occurs whenever any key is inserted and turned either from the outside or from the inside. To the free end of the tail-piece 106 is pivoted a depending locking-bar 107, the lower portion of which has a guide-slot 108 playing over the pivot shaft 24 of the bail 25, and also a vertical notch 109 adapted, as the locking bar 107 descends, to lockingly engage one of the studs 28 and 29 on the shank of the bolt, so as to prevent actuation of the latter until after the key and lock-indicating segments of the recording mechanism have been set to correct printing positions.

In the operation of the lock, from either the outside or the inside, the key is first inserted, then turned half way around, which releases the bolt and sets the printing segments to correct printing position, the knob is then turned completely around, which throws the bolt, and the key is then actuated through the remaining half turn, which again locks the bolt. I provide in the lock mechanism operated by the knob which throws the bolt for closing electric circuits through which the printed impression is made upon the paper ribbon of the printing mechanism and through which the feed of the paper and inking ribbons of the said mechanism is effected; and I also provide within the lock a circuit-closing mechanism that operates during the last half turn of the key for effecting the release of the key and lock designating segments, which latter are automatically spring-actuated to normal position.

Referring first to the circuit-closing mechanism for effecting the printing impression and feed of the paper and inking ribbons, which is best shown in Fig. 2, 110 and 111 designate a pair of insulated contact strips mounted on one end of a bracket 112 secured to the back side of the frame-plate 9, said contact strips being in a circuit that actuates, through an electro-magnet in the recording mechanism, the printing platen. Said bracket 112 also has attached thereto beneath the contacts 110 and 111, a pair of insulated contact strips 113 and 114, that are in a circuit which, through an electro-magnet in the recording mechanism, effects the

feed of the paper and inking ribbons of the printing mechanism. The contact strips 110 and 113 are provided on their adjacent sides with cam lugs 115 and 116, respectively, that are engaged successively by a pair of cam-wipers 117 and 118 fast on the bolt-actuating shaft 20; the cam-wipers 117 and 118 being so disposed that each alternately closes the contacts 110 and 111 and the contacts 113 and 114, the closing of the former contacts, however, always slightly preceding the closing of the latter contacts.

The controlling mechanism of the circuit which, through an electro-magnet in the recording mechanism, effects the release of the key and lock-indicating segments, is best shown in Figs. 1 and 2, and comprises a pair of contact strips 119, 120 insulated and suspended from a bracket 121 secured to one corner of the frame-plate 9. The lower end of the strip 119 has an upwardly inclined hook-like extension 119^a which engages the teeth of a ratchet-disk 122 pivoted at 123 on the rear side of the frame-plate 9. The ratchet 122 is actuated in the direction indicated by the arrow, Fig. 2, one tooth at a time, by a pawl 124 pivotally suspended from the free end of an arm 125 and normally urged into engagement with the ratchet-disk by a spring 126. The arm 125 is pivoted at its other end to a rigid bar 127 secured to the outer ends of the posts or studs 36 and 24, and is connected by a lateral pin 128 to one of the links 52 (Figs. 6 and 8), said pin playing through a slot 129 in the frame-plate 9. From this it will be seen that as the link 52 is raised during the first half turn of the key, the arm 125 will be raised to carry the pawl 124 into engagement with the next tooth of the ratchet 122; and as soon as the spring 98, which is connected to the locking bail 25, acts to draw the latter down, the link 52 is drawn downwardly, and consequently the arm 125 and pawl 124, causing a tooth of the ratchet-disk 122 to effect an instantaneous closure of the contact strips 119 and 120. The hook-shaped end of the strip 119 has an additional function to act as a detent to prevent back turning of the ratchet 122 upon the upward or idle movement of the pawl 124.

On the back side of the frame-plate 9 at its upper end is secured a binding-post carrier 130 formed of suitable non-conducting material, of which material the ratchet-disk 122 is also formed, and carrying a series of six binding-posts which will be more particularly referred to in connection with the description of the various circuits.

Referring now to the recording mechanism, which will preferably be located in the main office of the building in which the system is installed, and which is shown in Figs. 16 to 26, inclusive, of the drawings, it may be stated at the outset that this mechanism is, in many respects, similar to recording mechanisms used in connection with time-clocks, time-stamps, and the like, and includes a series of printing disks bearing type indicating the days of the week, the hours, and the minutes, and driven electrically by mechanism controlled by an ordinary clock. In addition, it contains two pivoted segments, one bearing a series of letters corresponding with the various keys used on each lock, and the other bearing a series of numerals corresponding with numbers assigned to the several locks of a system. The mechanism also includes magnets for setting the letter and number segments to positions determined by the particular keys used or the particular locks operated, a magnet for actuating the printing platen, a magnet for actuating the paper and inking ribbon shift, and a magnet for effecting the release from set positions of the letter and number segments.

In the drawings, 131 designates a suitable base plate, from which rise a pair of parallel main frame plates 132 and 133 connected and spaced by tie-rods 134. Opposite the upper portion of the frame-plate 133 is another parallel frame-plate 135 suitably secured thereto and spaced therefrom by tie-rods 136; and on the outer side of the frame-plate 132 and resting on the base plate 131 is an ordinary clock-work mechanism designated as an entirety by 137. Rotatably mounted side by side on a shaft 138 (Fig. 22) extending between the frame-plates 132 and 133 is a type-wheel 139 indicating the days of the week, a type-wheel 140 indicating the minutes of each hour, a type-wheel 141 bearing two series of numerals 1 to 12 inclusive indicating the twenty-four hours of a day, and, preferably, the A. M. and P. M. divisions of a day, a printing segment 142 (see Figs. 23 and 25) having on its periphery the letters W, I, A, B, C, D, in the order named, and a segment 143 (see Figs. 24 and 26) having on its periphery the numerals 1, 2, 3, 4, 5, 6, in the order named. Fast with the minute wheel 140 is a ratchet-disk 144 (Figs. 21 and 22) that is driven by a bent arm 145 similar to the anchor of an ordinary anchor escapement, this member being fast on a shaft 146 journaled in and between the frame-plates 132 and 135 (Fig. 17). Fast on the shaft 146, between the frame-plates 132 and 135 is an armature 147 (Fig. 19) that coöperates with the core of a magnet 148. This magnet is in a circuit which includes a pair of spring-contact strips 149 and 150 (Figs. 16 and 17) that bear against a rotary cam 151 fast on the minute arbor 152 of the clock-train. The strip 150 carries a spring-tongue 153 that normally lies just behind and slightly separated from the strip 149; but the strip 150 is slightly shorter than the

strip 149, and consequently drops off the peak of the cam just before the strip 149, thus establishing an instantaneous contact which is broken as soon as the strip 149 drops off the peak of the cam. The circuit is closed by this device once each minute through the magnet 148, whereby the minute-printing wheel 140 is stepped forward at regular minute intervals. Cam-controlled pawl-and-ratchet mechanism transmits the movement of the minute wheel to the hour wheel and the day wheel. Any approved mechanism for this purpose may be employed, but a simple and practical mechanism is illustrated mainly in Figs. 16, 20, and 21. On the opposite side of the minute wheel 140 from the ratchet 144 is a cam 154 that engages the end of an arm 155, which latter forms one arm of a bail 156 pivoted on one of the tie-rods 134 of the frame. The other arm 157 of said bail is drawn downwardly by a spring 158 (Fig. 18) to hold the arm 155 in engagement with the cam 154. To the arm 155 is pivoted a pawl 159 (Fig. 20) held in engagement by a spring 159ª with a ratchet-disk 160 on one side of the hour-wheel 141. Also fast with the hour wheel 141 is another cam 161 which engages one arm, 162, of a bail 163 that is pivoted on a cross-rod 164, the other arm 165 of said bail (see Fig. 16) having pivoted thereto a pawl 166 spring-actuated into engagement with a fourteen tooth ratchet 167 on the side of the day wheel 139, said day wheel carrying type designating the days of the week for a period of two weeks. Spring-actuated dogs 168 and 169 prevent back turning of the ratchet-disks 160 and 167, respectively, and of the type wheels fast therewith.

Referring to Figs. 22, 23, and 24, the hub 170 of the numeral segment 143 is hollow and contains a coil-spring 171. The hub 172 of the letter segment 142 carries a lug 173 to which one end of the spring 171 is attached, the opposite end of said spring being hooked over a lug 174 carried by the hub 170 of the segment 143. The tendency of this spring is to swing the two segments outwardly in opposite directions, their normal position being that shown in Fig. 18 wherein the segments 142 and 143 are engaged with fixed stops 175 and 176, respectively. The hubs of the segments 142 and 143 are further provided with ratchets 177 and 178, respectively, the teeth of which point in opposite directions when the segments are operatively assembled. The ratchet-disks 177 and 178 are actuated by pawls 179 and 180, respectively, which project through slots in the frame-plate 133 and are carried by arms 181 and 182 (Fig. 19) that are pivotally connected at their lower ends to the free ends of a pair of pivoted armatures 183 and 184, respectively, pertaining to magnets 185 and 186 mounted on L-frames 187 and 188 directly below the connected frame-plates 133 and 135 (Fig. 17). The printing segments 142 and 143 are retained in set position by a pair of detent pawls 189 and 190, which normally engage the ratchets 177 and 178, respectively. These pawls are pivoted on the back side of the frame-plate 133 and have laterally offset noses 189ª and 190ª, respectively, that extend and operate through a rectangular slot 191 in the frame-plate 133. The pawl 190 is formed with a lateral extension 192 that overhangs its nose and also overlies the laterally extending nose of the companion pawl 189, with sufficient clearness between them to permit the idle riding of the pawl 189 over its ratchet when the segment 142 is moving into a printing position. The pawl 189, as clearly shown in Fig. 19, is fast with the pivoted armature 193 of a segment-release magnet 194 secured between the frame-plates 133 and 135 opposite the clock-controlled magnet 148. The pawls 189 and 190 are normally drawn downwardly into engagement with their respective ratchets by springs 195 and 196, respectively, (Fig. 19); and the arms 181 and 182 which carry the actuating pawls of the segments 142 and 143 are normally held in raised position by springs 197 and 198, respectively, (Fig. 18). From the foregoing it will be plain that the energizing of the magnets 185 and 186 will effect a step-by-step swinging of the segments 142 and 143 to printing position, depending upon the number of impulses transmitted through said magnets; while a subsequent impulse transmitted through the magnet 194 will raise both detent pawls 189 and 190, permitting the segments to swing outwardly, under the force of spring 171, to normal position in which they abut against the stops 175 and 176.

199 designates the printing platen disposed beneath and transversely of the several printing wheels and segments and carried on the free end of an arm 200 pivoted on a cross-pin 201. To the under side of the platen 199 is pivoted an adjustable thrust-link 202 resting upon the short arm of a pivoted armature lever 203 pertaining to a twin spool printing magnet 204. The printing platen 199 is normally urged downwardly by a spring 205 (Fig. 16) anchored to a cross-pin 206.

Between the type-wheels and segments and the printing platen extends a paper ribbon 207 and an inking ribbon 208, the former extending between receiving and delivery spools 209 and 210, respectively, and the latter extending between receiving and delivery spools 211 and 212, respectively. The receiving spools 209 and 211 are simultaneously actuated from the armature 213

of a twin spool magnet 214 by means of an arm 215 rigid with the armature 213, an upwardly extending arm 216 pivoted to the free end of the arm 215 and at its upper end having a pin 217 guided in a slot 218 of the frame-plate 133, and pawls 219 and 220 pivotally mounted on the arm 216 and cooperating with the ratchet 220^a and 221 fast with the spools 209 and 211, respectively. Pivoted on the cross-pin 206 is a lever 222 (Fig. 18) the free end of one arm of which engages the under side of the armature 203 and the free end of the other arm of which engages the under side of the armature 213, from which it is apparent that the downward swing of either armature will raise the opposite armature. Hence, when the magnet 204 is energized to effect the printing, the armature 213 and the pawls 219 and 220 are simultaneously raised to take a fresh hold on the ratchets of the receiving spools; and the subsequent energizing of the magnet 214 draws the armature 213 and the pawls connected therewith downwardly, thus effecting the feed and winding-up of the printing and inking ribbons.

Secured to the frame-plate 133 centrally between the magnets 185 and 186 (Fig. 19) is a binding-post carrier 223 (Fig. 19) carrying a group of binding-posts to facilitate distribution of the circuits to the several electro-magnets of the recording mechanism, as will be more fully explained in describing the electrical connections between the lock mechanism and the recording mechanism.

In Fig. 27 I have shown one practical arrangement of electrical transmission between one of the locks and the recorder. Referring thereto, E designates a battery or other source of electrical energy, preferably located somewhere adjacent to the recording mechanism, from the positive pole of which extends a main circuit wire F to a binding-post n on the plate 223 of the recorder, and from the negative side of which extends another main circuit wire G to the binding-post q on the plate 223. From the binding-post n a single circuit wire F′ conducts the current from the battery to the several contact devices of the lock through a binding-post u on the carrier 130 of the latter, and branch wires F^2 and F^3; while other branch wires F^4 and F^5 conduct the current from binding-post n through magnet 148, to the clock-controlled contacts of the recorder.

The clock-controlled circuit which sets the time wheels of the recording machanism may be traced as follows: battery E, wire F, binding-post n, wire F^4, magnet 148, wire F^5, contacts 149, 150, wire a, binding-post q, and wire G to battery.

The circuit through which the key-indicating segment (letter segment) is set to printing position comprises battery E, wire F, binding-post n, wire F′, binding-post u, wire F^2, contacts 77, 76, wire b, binding-post w, wire b', binding-post p, wire b^2, magnet 185, wire b^3, binding-post q, and wire G to battery.

The circuit through which the lock-indicating segment (number segment) is set to printing position comprises battery E, wire F, binding-post n, wire F′, binding-post u, wire F^2, contacts 94, 93, wire c, binding-post x, wire c', binding-post s, wire c^2, magnet 186, wire c^3, binding-post q, and wire G to battery.

The segment-release circuit may be traced as follows: battery E, wire F, binding-post n, wire F′, binding-post u, wire F^2, contacts 120, 119, wire d, binding-post v, wire d', binding-post r, wire d^2, magnet 194, wire d^3, binding-post q and wire G to battery.

The printing circuit comprises battery E, wire F, binding-post n, wire F′, binding-post u, wire F^3, contacts 111, 110, wire e, binding-post z, wire e', binding-post t, wire e^2, magnet 204, wire e^3, binding-post q, and wire G to battery.

The ribbon shift circuit comprises battery E, wire F, binding-post n, wire F′, binding-posts u, wire F^3, contacts 114, 113, wire f, binding-post y, wire f', binding-post o, wire f^2, magnet 214, wire f^3, binding-post q, and wire G to battery.

In its most complete form my invention contemplates and includes the use of one or more night-watchman's boxes adapted to be actuated by a watchman's key and electrically connected with the recording mechanism. These boxes, of course, contain no lock mechanism, but contain differential means for setting to printing position the numeral-printing segment 143 of the recording mechanism, and means for effecting the printing, the release of the numeral segment and the shifting of the paper and inking ribbons similar in principle to the corresponding devices already described in connection with the locks; the watchman's boxes being identified by the same series of numerals or other symbols that are used to identify the several locks of the system, and hence making practicable the use of a single printing segment to record the use of both the locks and the boxes. In Figs. 28, 29, 30 and 31, I have illustrated a simple and practical watchman's box mechanism, which may, of course, be placed either on the inside or the outside of the building, and wherein 224 designates the casing of the box secured to a wall 225 and having an opening on its inner side to receive one end of a fixed cylinder 226 passed through the wall 225, within which cylinder is a rotatable cylinder 227 having a key-way 228 adapted to receive the watchman's key W. The rotary cylinder 227 has a reduced extension 229 which extends

across the box-casing 224 and is rotatably supported at its farther end on a stud 230. Also rotatably mounted in and transversely of the box-casing 224 below the shaft 229 is another shaft 231, fast on which is a ratchet-ring 232. Fast on the shaft 229 is a cam 233 similar in form and function to the cams 54 and 105. As the shaft 229 is turned by the key, the cam 233 engages the lower edge of a pivoted arm 234, raising the same against the pull of a tension-spring 235 that is anchored at its lower end to the bottom wall of the casing. To the free end of the arm 234 is pivoted a depending rack-bar 236, the teeth of which engage the teeth of the ratchet-ring 232, being maintained in engagement with the latter by a spring 237. The swinging of the arm 234 is of such extent as to effect one complete rotation of the shaft 231 at each downward movement of the rack-bar 236; and backward movement of the shaft 229 is prevented by a ratchet 238 fast on said shaft and a spring-actuated detent 239 coöperating with said ratchet.

In the particular watchman's box herein illustrated, which would be known as box No. 6 and would, when actuated, throw the printing segment 143 to a position to print the numeral 6, there is provided fast on the shaft 231 a vibrator-disk 240 containing on its periphery a series of five adjacent teeth, as clearly shown in Fig. 28, the remaining portion of the periphery of said disk being smooth or blank. Coöperating with this disk 240 is a circuit-closer in the form of a depending pivoted arm 241 provided with a V-shaped tooth 241′ adapted to ride over the periphery of the disk 240 and, of course, be vibrated by the five teeth of said disk as the latter rotates. The lower end of the arm 241 carries a lateral pin or stud 242 adapted to engage one of a pair of contact-strips 243 and 244 and close an electric circuit between said strips; the arm 241, in the present instance, effecting a series of five successive rapid closures of the circuit, and consequently the transmission of five rapid electrical impulses to the magnet 186 which actuates the numeral segment 143 of the recording mechanism. Also fast on the shaft 231 are disks 245, 246, and 247, on the periphery of which are single teeth 245′, 246′, and 247′, respectively, set at spaced intervals around the axis of the shaft 231, as clearly shown in Fig. 28. Coöperating with the disks 245, 246, and 247 are depending pivoted arms 248, 249, and 250, respectively, structurally identical with the arm 241 and each having a V-shaped tooth engaging the periphery of one of the disks 245, 246, and 247. These arms carry at their lower ends laterally projecting pins 251, 252, and 253, respectively. The pin 251 engages one of a pair of depending contact-strips 254, and 255; the pin 252 engages one of a pair of depending contact-strips 256, 257; the pin 253 engages one of a pair of depending contact-strips 258 and 259. The contact 254, 255 is in the circuit of the printing magnet 204, and is closed by the tooth 245′; the contact 256, 257 is in the circuit of the paper and inking ribbon feed magnet 214; and the contact 258, 259 is in the circuit of the segment-releasing magnet 194.

From the foregoing it will be manifest that at each revolution of the shaft 231, the numeral segment 143 will first be set to proper printing position to record the particular watchman's box actuated; and the printing of the record, the feed of the paper and inking ribbons, and the release of the numeral segment will then be successively performed, all of these operations taking place at each application of the watchman's key W to the box.

Inasmuch as the numeral segment normally stands at the "1" printing position, the watchman's box corresponding to this particular number will not require the toothed disk 240 and the circuit-closing mechanism actuated thereby, nor the disk 247 and the circuit-closing mechanism of the segment-releasing magnet actuated thereby. Box No. 2 will contain a vibrator-disk 240 having one tooth, box No. 3 a disk 240 having two teeth, box No. 4 a disk 240 having three teeth, box No. 5 a disk 240 having four teeth, and box No. 6 (which is herein shown) a disk 240 having five teeth; these disks, 240, provided with a numerically graduated series of teeth, being conventionally illustrated in Fig. 31. The disk 240 is geared to a train 260 of speed multiplying gears and pinions and a fan 260′, for the same purpose attributed to the similar mechanism in the locks. It may here be noted, also, that since the numeral segment normally stands at the "1" printing position, lock No. 1 of a series of locks belonging to the system will not require any numeral segment shifting mechanism; but for the sake of uniformity in manufacture and installation, and to make the locks interchangeable by merely changing the numerical segment selector (plate 84), this will preferably be taken care of by simply omitting the selector-plate 84 from the mechanism of lock No. 1, or making it so narrow as not to be brought into play by any of the keys.

The circuit wires of the several contact devices in the watchman's boxes may, of course, be led into and connected with the circuit wires of the corresponding contact-devices belonging to locks having corresponding numbers or otherwise correspondingly identified. In Fig. 33 I have shown in diagram a complete system employing a recording mechanism, a series of five locks, and a series of five watchman's boxes, the

locks being identified by the numbers 1 to 5 inclusive, and the watchman's boxes being similarly identified. The circuit connections between the several locks and the actuating magnets of the recording mechanism correspond with the circuit connections above described and shown in Fig. 27 between a single lock and the recording mechanism, with the omission of the detail binding-post arrangement and distribution on the recorder; and by reference to Fig. 33 it will be seen that the several watchman's boxes are connected into the circuit wires of the corresponding locks in such a manner as to effect the properly timed actuation of the number-segment magnet, the printing magnet, the ribbon-feed magnet, and the segment-release magnet upon the operation of each box. More specifically, one side of all the several contacts of the watchman's box is connected into the main lead wire F′ by a wire F^6; the other side of the segment-setting contact is connected by a wire c^4 into the circuit wire c; the other side of the printing contact is connected by a wire e^4 into the printing circuit wire e'; the other side of the ribbon-feed contact is connected by a wire f^4 into the circuit wire f'; and the other side of the segment-release contact is connected by a wire d^4 into the circuit wire d'.

While I have shown in Figs. 27 and 33 one practical arrangement of the wiring between the several locks and watchman's boxes and the actuating devices of the recording mechanism, it will be understood that the details of such wiring constitute no part of the present invention but may, and will, of course, be varied to suit the exigencies of each particular installation and the ideas of the person in charge of such installation.

From the foregoing it will be apparent that the chief novel improvements in the art which my present invention presents consist; first, in a mechanism whereby a differentially movable key-designating printing member of the recording mechanism may be set to correct printing position by and from any one of a plurality of differential keys over a single circuit upon the principle of transmitting to the actuating magnet of the movable printing member numerically differentiated pulsations or electrical impulses, according to the particular key used, each individual impulse acting to advance the printing member by a single step; and second, in a differential mechanism embodied in a plurality of locks belonging to a single system whereby, by means such as those last above mentioned, a differentially movable printing member bearing type corresponding with the identifying symbols of the several locks of the system, may be set to correct printing position to produce a record showing which one of the several locks was actuated at any given time. It will be manifest to those skilled in the art that the particular details of mechanism for effecting these results in accordance with the above-described principles of operation may be very considerably modified without involving any departure from these principles or sacrificing any of the advantages secured thereby; and hence, in the appended claims, I have sought to set forth in broad terms the essential instrumentalities for embodying these principles and without substantial limitation as to the specific forms and arrangement of such instrumentalities.

I claim—

1. In a recording door-lock, the combination with a lock, of a recording mechanism mounted outside the lock casing and including a movable key-designating member bearing type corresponding to the identifying symbols of a plurality of differential keys, electrically actuated means for shifting said key-designating member by one or more successive steps to any of a plurality of different printing positions, an electric circuit between said electrically actuated means and said lock, a plurality of differential keys, key-controlled selective mechanism for effecting the transmission of numerically differentiated successive electrical impulses over said circuit according to the key used, and means for producing a printed record from said key-designating member.

2. In a recording door-lock, the combination with a lock, of a recording mechanism mounted outside the lock casing and including a movable key-designating member bearing type corresponding to the identifying symbols of a plurality of differential keys, electrically actuated means for shifting said key-designating member by one or more successive steps to any of a plurality of different printing positions, an electric circuit between said electrically actuated means and said lock including a pair of normally open contacts in the latter, a plurality of differential keys, key-controlled selective mechanism in said lock for effecting numerically differentiated successive closures of said contacts according to the key used, and means for producing a printed record from said key-designating member.

3. In a recording door-lock, the combination with a lock, of a recording mechanism mounted outside the lock casing and including a movable key-designating member bearing type corresponding to the identifying symbols of a plurality of differential keys, mechanism including a magnet for shifting said key-designating member by one or more successive steps to any of a

plurality of different printing positions, a spring connected to said key-designating member and opposing such shifting movement thereof, detent mechanism for retaining said key-designating member in shifted position, a detent-releasing magnet, paper and inking ribbons, receiving spools on which the same are mounted, mechanism including a magnet for actuating said receiving spools, a printing platen, mechanism including a magnet for actuating the latter, independently operable circuit connections between the recording mechanism and the lock including all of said magnets and a plurality of contact devices in said lock pertaining respectively to the circuits of said several magnets, a plurality of differential keys, key-controlled selective mechanism in said lock for effecting numerically differentiated successive closures of the contact device pertaining to the actuating magnet of said key-designating member, and mechanism in said lock for effecting the subsequent successive closures of the contact devices pertaining to said printing magnet, spool-actuating magnet, and detent-release magnet.

4. In a recording door-lock system, the combination with a plurality of locks, of a single recording mechanism adapted to serve all of said locks and including a movable lock-designating member bearing type corresponding to the identifying symbols of the several locks, electrically actuated means for moving said lock-designating member to any of a plurality of different printing positions, independently operable circuit connections between said electrically actuated means and the several locks, key-actuated differential means in the several locks, respectively, for transmitting through said circuit connections and electrically actuated means differential movements to said lock-designating member of the recording mechanism, and means for producing a printed record from said lock-designating member.

5. In a recording door-lock system, the combination with a plurality of locks, of a single recording mechanism adapted to serve all of said locks and including a movable lock-designating member bearing type corresponding to the identifying symbols of the several locks, electrically actuated means for shifting said lock-designating member by one or more successive steps to any of a plurality of different printing positions, independently operable circuit connections between said electrically actuated means and the several locks, key-controlled differential means in the several locks for effecting the transmission of numerically differentiated electrical impulses over said circuit connections according to the lock operated, and means for producing a printed record from said lock-designating member.

6. In a recording door-lock system, the combination with a plurality of locks, of a single recording mechanism adapted to serve all of said locks, and including a movable lock-designating member bearing type corresponding to the identifying symbols of the several locks, electrically actuated means for shifting said lock-designating member by one or more successive steps to any of a plurality of different printing positions, independently operable circuit connections between said electrically actuated means and the several locks including a pair of normally open contacts in each of the latter, key-controlled means in the several locks for effecting numerically differentiated successive closures of said contacts in the several locks, and means for producing a printed record from said lock-designating member.

7. In a recording door-lock system, the combination with a plurality of locks, of a single recording mechanism adapted to serve all of said locks and including a movable key-designating member and a movable lock-designating member, a plurality of differential keys pertaining to each lock of the system, electrical actuating mechanism for said key-designating member including key-controlled means in each lock for transmitting differential movements to said key-designating member according to the key used, electrical actuating mechanism for said lock-designating member including differential key-controlled means in the several locks for transmitting differential movements to said lock-designating member according to the lock operated, and means for producing a printed record from said key-designating and lock-designating members.

8. In a recording door-lock system, the combination with a plurality of locks, of a single recording mechanism adapted to serve all of said locks and including a movable key-designating member and a movable lock-designating member, a plurality of differential keys pertaining to each lock of the system, electrically actuated means for shifting said key-designating member by one or more successive steps to any of a plurality of different printing positions, electrically actuated means for shifting said lock-designating member by one or more successive steps to any of a plurality of different printing positions, independently operable circuit connections between both said electrically actuated means and each lock of the system, including two pairs of normally open contacts in the latter, key-controlled selective mechanism in each lock for effecting from a single turning movement of the key numerically differentiated successive closures of the contacts in the circuit of the

actuating means of the key-designating member, differential key-controlled means in the several locks for effecting from the same movement of the key numerically differentiated successive closures of the contacts in the circuit of the actuating means of the lock-designating member, and means for producing a printed record from said key-designating and lock-designating members.

9. In a recording door-lock system, the combination with a plurality of locks, and a plurality of watchman's boxes, of a single recording mechanism adapted to serve all of said locks and watchman's boxes and including a movable member bearing type corresponding to the identifying symbols of a plurality of differential keys, and a movable member bearing type corresponding to identifying symbols common to both said locks and watchman's boxes, a plurality of differential keys pertaining to each lock of the system, electrical actuating mechanism for said key-designating member including key-controlled means in each lock for transmitting differential movements to said key-designating member according to the key used, electrical actuating mechanism for said lock and watchman's box-designating member including differential key-controlled means in the several locks and corresponding differential key-controlled means in the several watchman's boxes for transmitting differential movements to said lock and watchman's box-designating member according to the lock or watchman's box operated, and means for producing a printed record from said members.

10. In a recording door-lock system, the combination with a plurality of locks, and a plurality of watchman's boxes, of a single recording mechanism adapted to serve all of said locks and watchman's boxes and including a movable member bearing type corresponding to the identifying symbols of a plurality of differential keys, and a movable member bearing type corresponding to identifying symbols common to both said locks and watchman's boxes, a plurality of differential keys pertaining to each lock of the system, electrically actuated means for shifting said key-designating member by one or more successive steps to any of a plurality of different printing positions, electrically actuated means for shifting said lock and watchman's box-designating member by one or more successive steps to any of a plurality of different printing positions, independently operable circuit connections between both said electrically actuated means and each lock of the system including two pairs of normally open contacts in the latter, key-controlled selective mechanism in each lock for effecting from a single turning movement of the key numerically differentiated successive closures of the contacts in the circuit of the actuating means of the key-designating member, differential key-controlled means in the several locks for effecting from the same movement of the key numerically differentiated successive closures of the contacts in the circuit of the actuating means of the lock and watchman's box-designating member, other circuit connections between the actuating means of the lock and watchman's box-designating member and the several watchman's boxes of the system, including a pair of normally open contacts in each of the latter, differential key-controlled means in the several watchman's boxes for effecting numerically differentiated successive closures of the contacts therein, and means for producing a printed record from said members.

11. In a recording door-lock, the combination with a lock, of an electrically actuated recording mechanism located externally of the lock casing and including a movable printing segment, mechanism including a magnet for imparting a step-by-step movement to said printing segment, a normally open circuit including said magnet between said recording mechanism and said lock, a vibratory circuit-closer in said lock, a key, and key-controlled mechanism for imparting a vibrating movement to said circuit-closer.

12. In a recording door-lock, the combination with a lock, of an electrically actuated recording mechanism located externally of the lock casing and including a movable printing segment, mechanism including a magnet for imparting a step-by-step movement to said printing segment, a normally open circuit including said magnet between said recording mechanism and said lock, a vibratory circuit-closer in said lock, a plurality of differential keys, and key-controlled mechanism for vibrating said circuit-closer, said last-named mechanism including a key-controlled selective mechanism determining the number of vibratory movements imparted to said circuit-closer and hence the number of pulsations transmitted over the circuit at each actuation of a key.

13. In a recording door-lock, the combination with a lock, of an electrically actuated recording mechanism located externally of the lock casing and including a movable printing segment, mechanism including a magnet for imparting a step-by-step movement to said printing segment, a circuit between said recording mechanism and said lock including said magnet and a pair of normally separated contact strips in the lock casing, a vibratory circuit-closer at its free end engaging one of said contact strips, a rotary toothed vibrator-disk engaging said circuit-closer, a key, and key-controlled

mechanism for effecting a rotary movement of said vibrator-disk.

14. In a recording door-lock, the combination with a lock, or an electrically actuated recording mechanism located externally of the lock casing and including a movable printing segment, mec anism including a magnet for imparting a step-by-step movement to said printing segment, a circuit between said recording mechanism and said lock including said magnet and a pair of normally separated contact strips in the lock casing, a vibratory circuit-closer at its free end engaging one of said contact strips, a rotary toothed vibrator-disk engaging said circuit-closer, a plurality of differential keys, and key-controlled mechanism including key-controlled selective mechanism, for effecting rotary movements of said vibrator-disk of varying extents determined by the key used.

15. In a recording door-lock, the combination with a lock, of an electrically actuated recording mechanism located externally of the lock casing and including a movable printing segment, mechanism including a magnet for imparting a step-by-step movement to said printing segment, a circuit between said recording mechanism and said lock including said magnet and a pair of normally separated contact strips in the lock casing, a vibratory circuit-closer at its free end engaging one of said contact strips, a rotary toothed vibrator disk engaging said circuit-closer, a plurality of keys graduated as to length, spring-impelled means to rotate said vibrator-disk, and means effecting the idle movement and governing the extent of active movement of said spring-impelled means, including a plurality of pivoted segments disposed in lateral juxtaposition and graduated as to width, and a rotatable key-actuated cam for swinging said segments normally disposed in engaging relation to one of the latter and shiftable laterally into engaging relation to any of the others by and according to the key used.

16. In a recording door-lock, the combination with a plurality of locks, of an electrically actuated recording mechanism including a movable key-designating segment and a movable lock-designating segment, mechanism including a magnet for imparting a step-by-step movement to said key-designating segment, mechanism including a magnet for imparting a step-by-step movement to said lock-designating segment, independently operable normally open circuits each including one of said magnets between said recording mechanism and each of said locks, two vibratory circuit-closing devices in each lock respectively pertaining to said circuits, a plurality of differential keys pertaining to each lock, key-controlled differential mechanism in each lock for actuating one of said vibratory circuit-closing devices, and key-controlled differential mechanism in the several locks for actuating the other of said vibratory circuit-closing devices.

17. In a recording door-lock, the combination with a lock-casing, a bolt slidably mounted therein, a knob for actuating said bolt, a recording mechanism located externally of said lock-casing, a movable key-designating segment, a printing platen, and a ribbon-feed mechanism, magnets for actuating said segment, printing platen and ribbon-feed mechanism, respectively, independently operable circuit connections between the recording mechanism and the lock-casing including said magnets, key-controlled means for closing the circuit pertaining to the actuating magnet of the key-designating segment, and knob-actuated means for successively closing the circuits pertaining to the actuating magnets of the printing platen and ribbon-feed mechanism.

18. In a recording door-lock, the combination of a lock-casing, a bolt slidably mounted therein, a knob for actuating said bolt, a recording mechanism located externally of said lock-casing, a movable key-designating segment, a printing platen, and a ribbon-feed mechanism, magnets for actuating said segment, printing platen, and ribbon-feed mechanism, respectively, independently operable circuit connections between the recording mechanism and the lock-casing including said magnets, key-controlled means for closing the circuit pertaining to the actuating magnet of the key-designating segment, knob-actuated means for successively closing the circuits pertaining to the actuating magnets of the printing platen and ribbon-feed mechanism, and means for locking the bolt against movement until after the closure of the key-segment actuating circuit.

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Witnesses:
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