April 8, 1924. 1,489,958

H. A. MULFORD ET AL

LOCK

Filed June 8, 1922 3 Sheets-Sheet 1

Fig. 1.

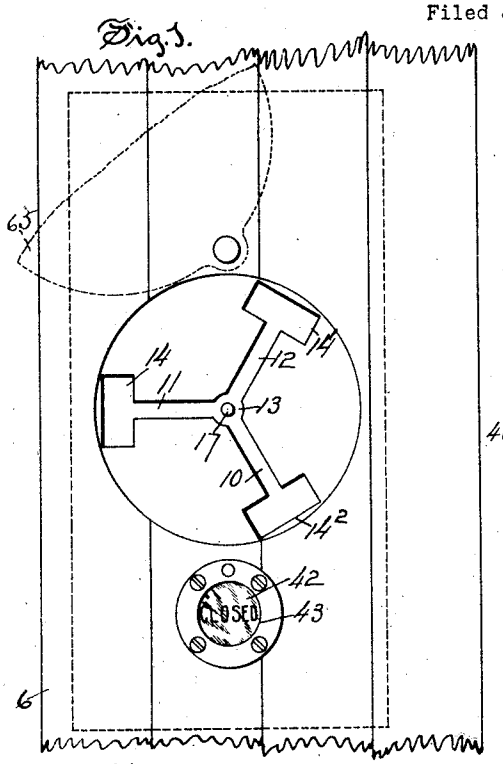


Fig. 2.

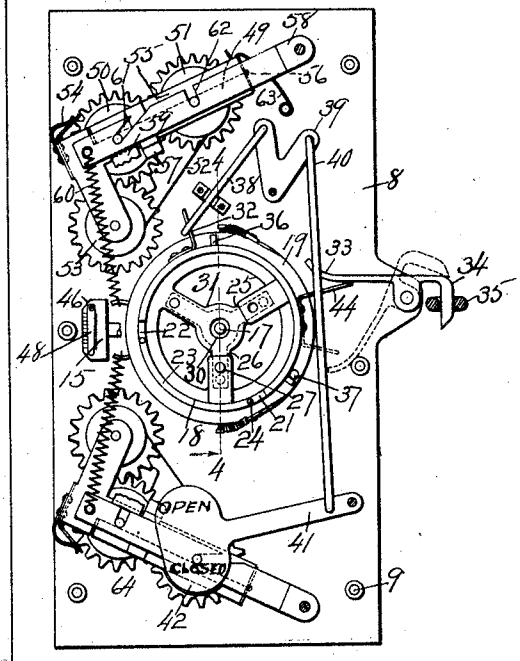


Fig. 3.

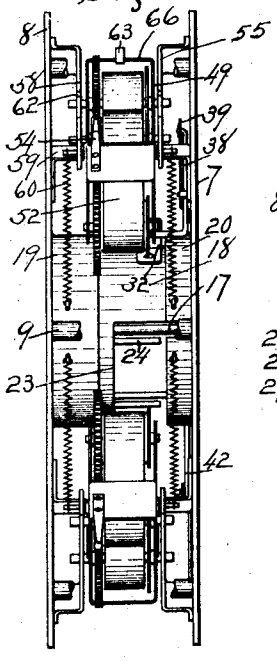


Fig. 4.

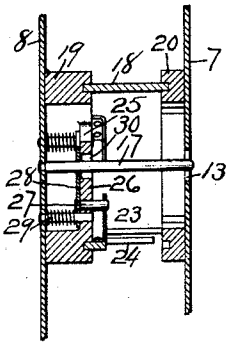


Fig. 5.

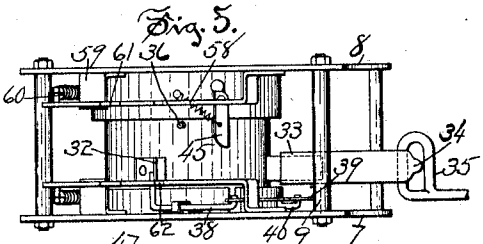
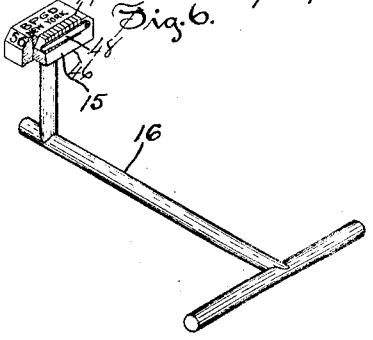


Fig. 6.



Harry A. Mulford, Gustave Fickirk, INVENTORS.
by Arthur G. Jenkins, ATTORNEY

April 8, 1924. 1,489,958

H. A. MULFORD ET AL

LOCK

Filed June 8, 1922 3 Sheets-Sheet 2

Fig. 7.

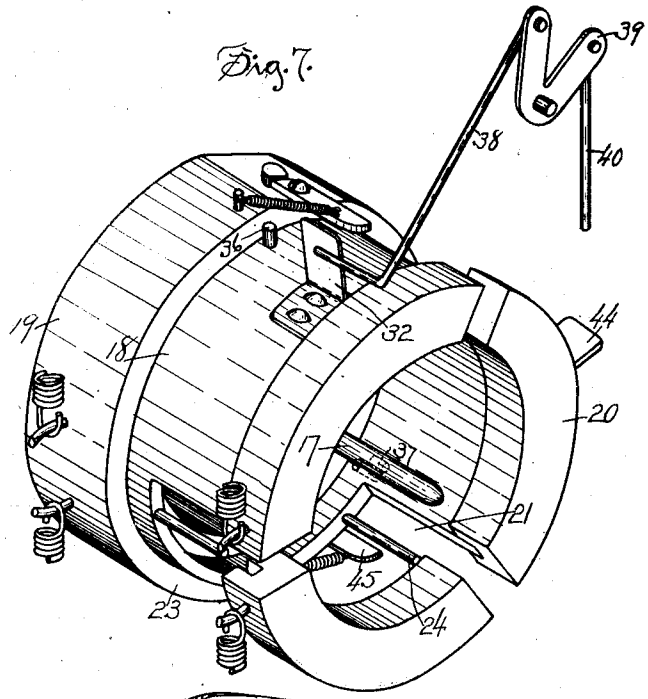
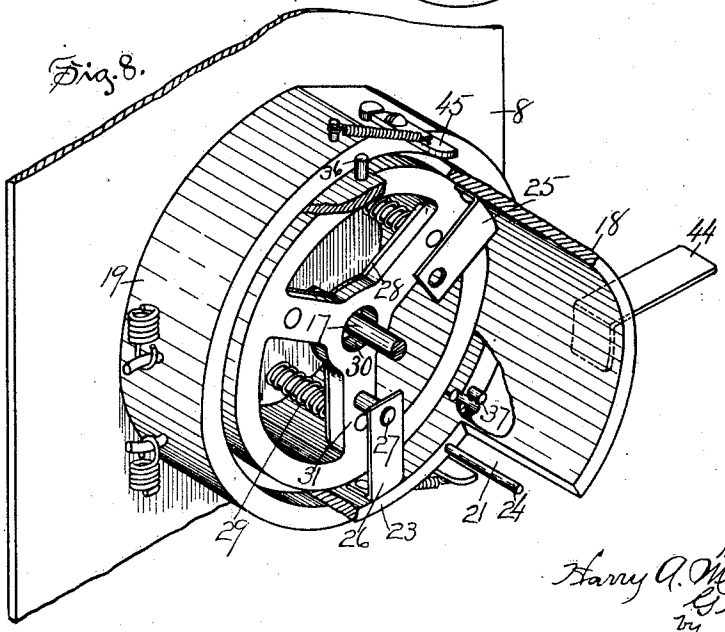


Fig. 8.



INVENTORS.
Harry A. Mulford.
Gustave Hickich.
by
Arthur B. Jenkins.
ATTORNEY

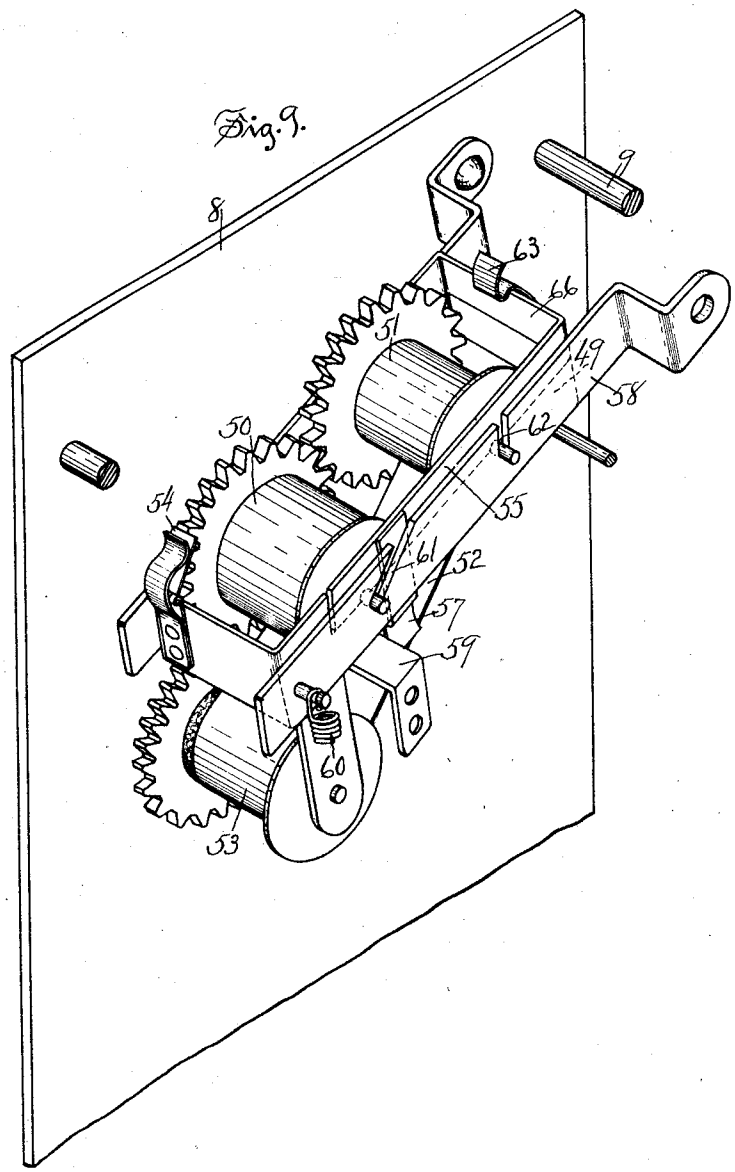
April 8, 1924. 1,489,958

H. A. MULFORD ET AL

LOCK

Filed June 8, 1922 3 Sheets-Sheet 3

Fig. 9.



INVENTOR
Harry A. Mulford,
Gustave Hickish,
By
Arthur B. Jenkins.
ATTORNEY

Patented Apr. 8, 1924. 1,489,958

UNITED STATES PATENT OFFICE.

HARRY A. MULFORD AND GUSTAVE HICKISH, OF HARTFORD, CONNECTICUT.

LOCK.

Application filed June 8, 1922. Serial No. 566,692.

To all whom it may concern:

Be it known that we, HARRY A. MULFORD and GUSTAVE HICKISH, each a citizen of the United States, and residents of Hartford, in the county of Hartford and State of Connecticut, have invented new and Improved Locks, of which the following is a specification.

Our invention relates to the class of devices more especially employed for securing the closures, as doors and the like, of openings from unauthorized release, and an object of our invention, among others, is to provide a device of this class that shall not only effectively secure the closure, but shall, at the same time, make a record to denote the operation of the key to lock or unlock the closure, as well as the time and place of such locking and unlocking, either or both.

One form of device embodying our invention and in the construction and use of which the objects herein set out, as well as others, may be attained, is illustrated in the accompanying drawings, in which—

Figure 1 is a view of a portion of the outside of a structure bounding an opening to be closed, and showing our improved lock supported thereby.

Figure 2 is a view of the lock structure, with the parts in the same position as in Figure 1, but with the lock plate nearest to the observer removed, and with parts broken away to show construction.

Figure 3 is a view in side elevation of the lock structure, with parts broken away to show construction.

Figure 4 is a view in section through a portion of the lock structure on a plane denoted by the dotted line 4—4 of Figure 2.

Figure 5 is a top view of the lock structure with the upper recording mechanism removed.

Figure 6 is a detail view illustrating the construction of the key.

Figure 7 is a detail perspective view, scale enlarged, illustrating the construction of the controlling and actuating cylinder.

Figure 8 is a similar view, but with a portion of said cylinder removed to further illustrate its construction.

Figure 9 is a perspective view, scale enlarged, illustrating the recording mechanism.

The great loss suffered at the present time by reason of thefts of freight from cars while in transit or while lying in yards demonstrates the great need for means not only to securely fasten the doors of such cars but also for means that shall accurately record the time and place where each opening and closing of such doors takes place, whereby any unauthorized opening of such doors may be determined within definite bounds, and while our invention is not limited in its application to use for securing the doors of freight cars, or similar closures, yet as it is especially adapted for such purpose we have employed such a use for the purpose of illustrating and describing our invention herein.

In the accompanying drawings the numeral 6 indicates a portion of the side of a structure, as a freight car, bounding a portion of one side of an opening, as that of a door, into the structure, which opening is considered as located at the right hand of the observer of the structure shown in Figures 1 and 2. Our improved lock comprises front and back plates 7 and 8, respectively, spaced apart by posts 9 located in such positions as may be desired to rigidly secure the lock parts. The front plate is provided with key holes 10—11—12, each comprising a part of a central hole 13 in said plate, each of the key holes terminating at their outer ends in what may be termed enlarged bit openings 14 for the reception of the bit 15 of a key 16. The stem of this key is provided with a central opening, as is usual in key construction within which a key post 17 projecting from the back plate 8 is received when the key is placed in position in the lock.

A controlling and actuating cylinder 18 is rotatably mounted between the front and back plates, as illustrated herein this cylinder being an open ended barrel mounted in grooves in supporting rings 19—20 secured to the back and front plates, respectively. This cylinder has key receiving slots 21—22, in the construction herein shown these slots being provided by cutting away a portion of the wall of the cylinder as at 23 and introducing pins 24 spaced a slight distance from the edge of said cut-away portion, and as illustrated in Figure 2 of the drawings.

A cylinder locking mechanism comprises two locking arms 25—26 secured to the walls of and projecting into the cylinder, as shown in Figure 4, these arms having holes to receive a locking pin 27 projecting from a locking plate 28 comprising arms mounted on springs 29 surrounding plate guide posts

projecting from the back plate 8, as shown in Figure 4.

When the key is inserted upon the post 17 its bit passes into the bit opening 14, into which opening said bit must be inserted each time the key is operatively placed in the lock, the end of the key passing into an opening 30 in a spider comprising radially extending arms 31, as shown in Figures 2 and 8 of the drawings. Passing through this opening the end of the key is pressed against the locking plate 28 moving it inward against the tension of the springs 29 and withdrawing the locking pin 27 from the hole in the locking arms 25—26 in which it may be engaged. Said arms being secured to the cylinder the latter is now free to be rotated by pressure of the key in an effort to turn it in one direction.

Assuming that the parts are in the position shown in Figure 2 the key is inserted in the key hole 11, the bit passing into the opening 14 and the cylinder being unlocked as just above described the key is rotated to the right or in a clockwise direction. In this rotation a latch operating finger 32 projecting from the side of the cylinder comes in contact with the tail 33 of a locking latch 34 pivotally mounted between ears projecting from the back and front plates of the lock and in position to engage a keeper 35, as a loop or other similar device firmly secured to the car door. When the cylinder has been rotated as above described to operate the latch to unlock it, a stop pin 36 projecting from the side of the cylinder encounters a lug 37 projecting from the edge of the ring 19 and stops rotation of the drum in this direction. In this position the key bit will be opposite the bit opening 14′ so that the key may be removed.

When the cylinder is at rest and with the parts in locked position, as shown in Figure 2, the finger 32 rests against the bent end of an indicator actuator rod 38, the opposite end of said rod being connected to an indicator bell crank lever 39 pivotally supported on the front plate 7 and having a connecting rod 40 extending to an indicator arm 41 also pivotally mounted on the plate 7 and having an indicator disc 42 at its end upon which are disposed characters, as the words "Open" and "Closed" to indicate the condition of the lock mechanism. When the parts are locked, as illustrated in Figure 2, said disc is in its raised position and the word "Closed" thereon is displayed through the opening 43. When the key has been rotated to unlock the parts as above described the finger 32 releasing the indicator mechanism the disc falls by its weight, and the word "Open" is displayed through the opening 43.

In order to lock the mechanism the key is inserted as before in the keyhole 11 with the bit through the opening 14 and is pressed inwardly to unlock the cylinder as before described. The key is now rotated to the left or contra-clockwise and a locking finger 44 is passed into contact with the tail 33 of the locking latch and the latter is forced into engagement with its keeper, said locked position being illustrated in Figure 2. When the parts are thus locked the key is removed thru the key slot 10 and opening 14^2.

In order to prevent reverse movement of the key and consequently of the cylinder and the lock members thereon detents 45 are pivotally mounted on the ring 19 and project into the path of movement of the stem of the key, these detents being spring pressed in one direction as by means of a spring, as is common in such structures, the spring holding the detent against a stop. One edge of each detent is rounded for engagement of the key stem and the detent, being swept out of the path of the key by said stem as the latter passes the detent, is drawn again into the path of said stem and will prevent backward movement thereof.

It is the arrangement of these detents that compels the key to be always inserted in the keyhole 11 when the lock is to be operated, for the reason that these detents prevent rotation of the cylinder if the key is inserted in any key slot other than the slot 11. For instance, if the door is in its closed position there are only two key slots in which the key may be inserted, to wit: the slots 14 and 14^2, the uncut portion of the cylinder preventing insertion of the key in the slot 14^1. If the key be inserted in the key slot 14^2 the detent at the lower side of the cylinder will prevent movement of the key to rotate the cylinder in a direction to unlock the door. If the door is unlocked the key may only be inserted in the key slot 14 and 14^1, for the reason above stated, and in this event the detent at the top part of the cylinder will prevent rotation of the key to lock the door.

The key 16 has a recording bit 46 that may be arranged in any suitable manner to removably receive type to denote the place and time of operation of the key. As shown herein a recess 47 is formed in the side of the bit and within which recess the type may be located, a locking bar 48 pivotally mounted to close one side of the recess serving to clamp and lock the type securely in place. The recess is undercut on the side opposite the bar and the type are of dove-tailed shape on one side to fit the recess as an aid in holding the type in place.

The recording mechanism comprises a recording frame including side bars 49 supporting ribbon rolls 50—51 about which a ribbon 52 is wound. This ribbon passes partially around an impression roll 53, all of which rolls have intermeshing pinions, as clearly illustrated in Figures 2 and 9 of the drawings. A detent 54 in engagement with

the teeth of one of the pinions prevents any backward movement of the mechanism.

In the detailed construction herein illustrated the side bars 49 are made in two sections, a main section and a swinging section, divided by a plane passing through the axes of the pivots of the ribbon rolls 50 and 51, and as shown in Figures 2 and 9 of the drawings, each of said sections being joined by end bars, as shown in Figure 9. The swinging section 55 is pivotally attached to the main section as by a hinge 56 connecting the end bar of the main section and the end bar 66 of the swinging section. From this it will be noted that the sections 55, swinging on the hinge 56 may be separated from the main section comprising the bars 49 and connecting piece to allow the insertion of the spindles of the ribbon rolls, or the removal of the ribbon rolls for obvious purposes, this being done when the recording frame is removed from a recording frame support to be hereinafter described. The swinging section 55 is retained in place as by means of a spring latch 57 secured to the swinging section and having its end bent to form a shoulder to engage the under edge of the above mentioned support and thereby retain the swinging section in place. This recording frame support above referred to comprises supporting bars 58 pivotally attached at one end to the front and back plates 7 and 8 and supported at their front ends upon rests 59 secured to the front and back plates. Springs 60 are employed to yieldingly retain the supporting bars against the rests. The recording frame is removably attached to the supporting bars 58 as by extending the spindles of the rolls 50 and 51 so that they will enter slots 61 and 62 in the supporting bars 58, the slots 61 being diagonally arranged as shown in Figure 2 of the drawings whereby it will be noted that the recording frame must be lifted to remove the spindle of the roll 51 from the slot 62 before the spindle of the roll 50 may be removed from the slot 61. A spring latch 63 is employed to retain the recording frame in its normal position whereby it will be readily seen that it is secured against removal from the supporting bars 58.

From the above description it will be noted that when the parts are in the position shown in Figure 2 and the key is inserted and is rotated to the right, as hereinbefore described, the bit 46 will pass into contact with the recording strip or ribbon upon the ribbon rolls, and the bars 58 will move upwardly under the tension of the springs 60, thus allowing the bit to pass underneath the roll 53. The periphery of this roll is flexible or yielding to permit an impression to be made upon the ribbon by perforating it, the characters upon the bit of the key and the type thereon having points or penetrating projections arranged to form the characters desired to designate the date and place at which the key is used. The operation just described will leave a record of the date and the place at which the door was opened, the rotating movement of the key described being an opening movement.

In the lower part of the frame another recording mechanism generally designated by the numeral 64 is arranged, this mechanism being substantially the same in construction and operation as that hereinbefore described and for this reason a further and detailed description of this latter mechanism is omitted herein.

When the door has been opened the rotation of the key to the left as hereinbefore described to effect a locking movement of the mechanism will make an impression upon the ribbon on the impression roll of the lower mechanism showing the date and the place at which the key was operated for locking the door after it has been opened.

A cover 65 as shown in dotted lines in Figure 1 may be employed to cover the key slots if desired.

In accordance with the provisions of the patent statutes we have described the principles of operation of our invention, together with the device which we now consider to represent the best embodiment thereof; but we desire to have it understood that the device shown is only illustrative and that the invention may be carried out by other means and applied to uses other than those above set out.

We claim—

1. A lock including mechanism having a plurality of slots to receive a key, said mechanism including means to control the direction of movement in each operation of said key against returning movement, and means independent of said mechanism to indicate a designated operation of said key.

2. A lock including mechanism to receive a key and including means to control the direction of movement in each operation of said key by engagement with said key and also means to be controlled by said key, and means independent of said mechanism to indicate a designated operation of said key.

3. A lock including mechanism to be operated by a key, locking means for said mechanism to be released by the shank of said key, and means independent of said lock to indicate a designated operation of said key.

4. A lock mechanism including a key controlling cylinder arranged to receive a key, said mechanism also including a lock operated by the shank of said key to release the cylinder for rotation, and means independent of said mechanism to indicate a designated operation from said key.

5. A lock mechanism including a cylinder

arranged to receive a key, means to engage said key for preventing returning rotation of said cylinder backwardly with respect to the direction of operative rotation of said key, said lock mechanism including means to be operated by said key to release the cylinder for rotation, and means independent of said mechanism to indicate a designated operation of said key.

6. A lock mechanism including a key controlling cylinder arranged to receive a key, means to permit operative engagement of the key with the cylinder in one position, means for preventing returning rotation of the cylinder backwardly with respect to the direction of operative rotation of said key after it has operated the mechanism, means for permitting release of said key with the cylinder in another position, and means independent of said mechanism to indicate a designated operation of said key.

7. A lock mechanism including a key controlling cylinder, means to permit operative engagement of the key with said cylinder in one position, means for locking the cylinder against rotation, means operated by the shank of said key to release said cylinder for rotation, means to permit release of said key with the cylinder in another position, and means independent of said mechanism to indicate a designated operation of said key.

8. A lock including a case having a keyhole comprising a plurality of openings, a cylinder arranged to be operatively engaged by a key inserted through one of said openings, means for preventing rotation of said cylinder backwardly with respect to the direction of operative rotation of said key after it has operated the mechanism, means operated by said key to release said cylinder for rotation and to permit removal of the key through another of said openings, and means independent of said mechanism to indicate a designated operation of said key.

9. A lock comprising a case having a central keyhole with a plurality of key slots radiating therefrom, a cylinder arranged to receive a key inserted through one of said slots, means for preventing rotation of said cylinder backwardly with respect to the direction of operative rotation of said key, means operated by said key to release said cylinder for rotation, means for limiting rotation of said cylinder to permit removal of the key through another of said slots, and means independent of said mechanism to receive an impression of said key.

10. A lock including a case having a central key opening with a key receiving pin therein and a plurality of key slots radiating from said central opening, a cylinder to receive a key inserted through one of said slots, means for preventing rotation of said cylinder backwardly with respect to the direction of operative rotation of said key, means to limit the rotation of said cylinder to permit removal of the key through another of said slots, and means independent of said mechanism to receive an impression from the operation of said key.

11. A lock including a case having a central opening with key slots radiating therefrom, said slots including a single key receiving slot and a plurality of key releasing slots for the release of a key after alternative operations of the cylinder, a key cylinder arranged to receive a key inserted through one of said slots, means to permit rotation of the cylinder in one direction and to prevent its rotation in an opposite direction whereby said key may be inserted through one of said slots and removed through another of said slots.

12. A lock including a key controlling cylinder, a cylinder lock positioned for operation by an extension on the shank of said key to release said cylinder, means upon said cylinder to receive said key for operation of said cylinder, and means to indicate a designated operation of said key.

13. A lock mechanism including a cylinder, a supporting ring having a key controlling means mounted thereon to control the operations of a key, and latch mechanism arranged to be operated by said cylinder.

14. A lock having a case, a mechanism including a rotatably mounted key controlling cylinder, means for positioning the cylinder to permit removal of a key therefrom through one of a plurality of openings in said case, and a latch positioned to be operated by said cylinder.

15. A lock having a case, a mechanism including a rotatably mounted key controlling cylinder, means upon said cylinder to receive a key, means for determining the limit of rotation of said cylinder to position the key in line with an opening in said case, and means upon said cylinder for operation of a lock.

16. A lock including a key controlling cylinder, means upon said cylinder to receive a key, an indicator to denote the condition of the cylinder, a finger projecting from said cylinder, a connection between said finger and indicator for operation of the latter, and other means positioned for operation by said finger.

17. A lock mechanism including a key controlling cylinder, means upon said cylinder to receive a key, a closure locking means to be operated by said cylinder, and a recording mechanism mounted in the path of movement of the bit of said key.

18. A lock mechanism including a key controlling cylinder, means upon said cylinder to receive a key, a closure locking

means to be operated by said cylinder, and a recording mechanism yieldingly mounted in the path of movement of the bit of said key.

19. A lock mechanism including a key controlling cylinder, means upon said cylinder to receive a key, a closure locking means to be operated by said cylinder, a pivotally mounted frame, and a recording mechanism removably mounted in said frame and including a recording member mounted in the path of movement of said key.

20. A lock mechanism including a key controlling cylinder, means upon said cylinder to receive a key, a closure locking means to be operated by said cylinder, a recording frame removably supported, and recording rolls removably mounted in said frame, one of said rolls being mounted in the path of movement of said key.

21. A lock mechanism including a key controlling cylinder, means upon said cylinder to receive a key, a closure locking means to be operated by said cylinder, a recording mechanism including a yieldingly mounted frame, rolls mounted in said frame, and a ribbon extending about said rolls and in the path of movement of the bit of said key.

22. A lock mechanism including a key controlling cylinder, means located in different positions upon the cylinder to receive a key, means to prevent operation of said key when inserted in other than a certain one of said key receiving means when the cylinder is in one position, and means to permit release of said key for operation of the cylinder.

23. A lock mechanism including a key controlling cylinder, a plurality of key receiving slots, means for preventing backward rotation of the cylinder when the key is inserted in other than the proper slot for operating the cylinder, and means to permit release of the key after such operation.

24. A lock mechanism including a key controlling cylinder cut away on one edge to provide key receiving means, the uncut part of the cylinder preventing insertion of the key, and a plurality of slots for engagement of a key with and disengagement from said cylinder.

HARRY A. MULFORD.
GUSTAVE HICKISH.