

W. H. HORSMAN,
SLUG LOCK.
APPLICATION FILED JUNE 27, 1918.

1,335,966.

Patented Apr. 6, 1920.
2 SHEETS—SHEET 1.

Fig. 1.

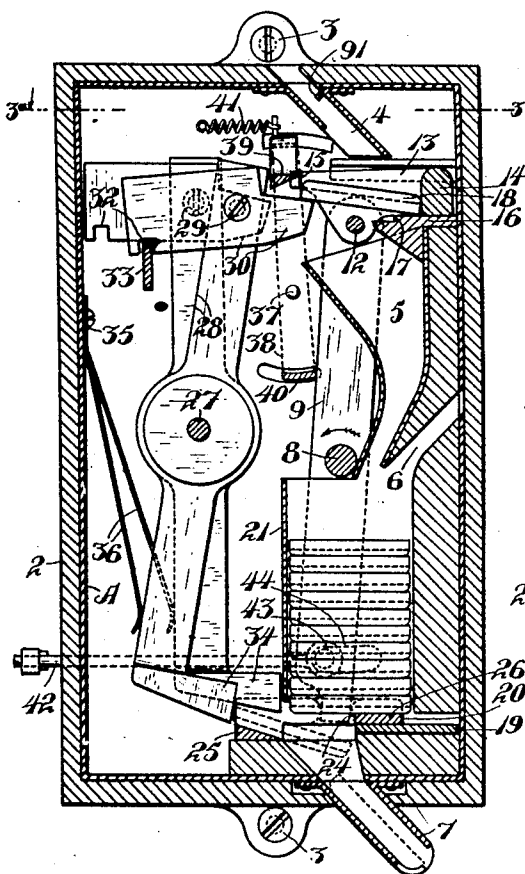
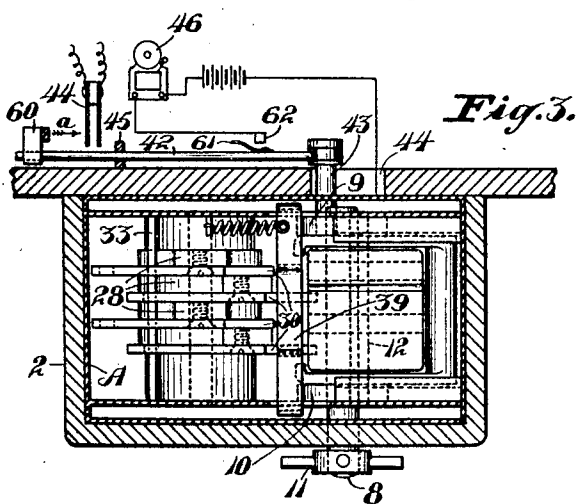
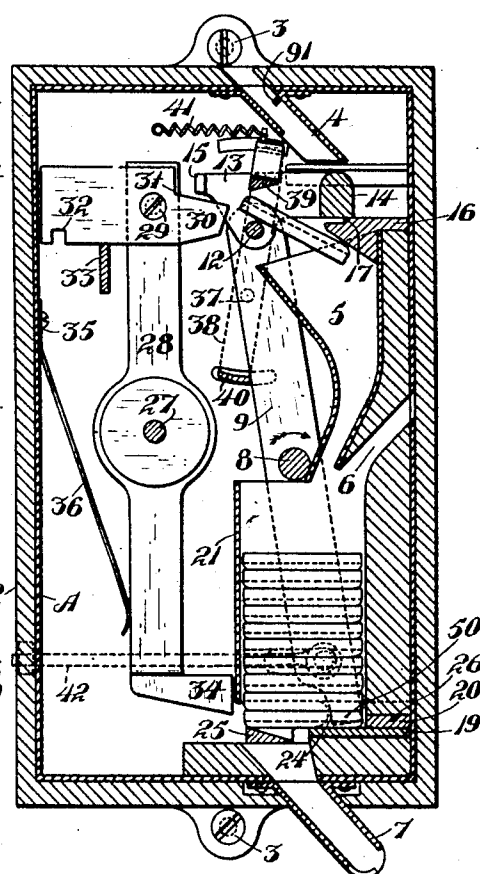


Fig. 2.



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Fig. 4.

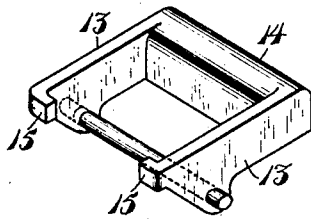


Fig. 5.

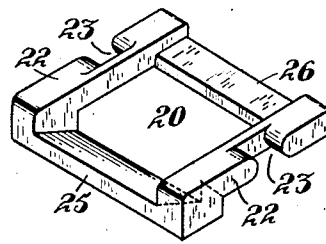


Fig. 6.

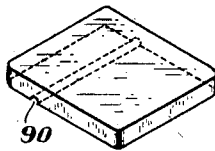


Fig. 7.

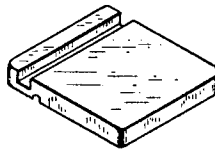


Fig. 8.

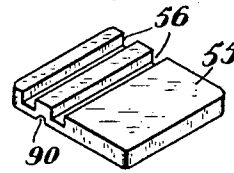


Fig. 9.

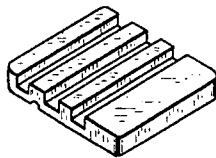
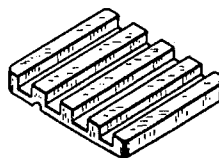


Fig. 10.



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UNITED STATES PATENT OFFICE.

WILLIAM HARRISON HORSMAN, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF ONE-FOURTH TO CLINTON BANCROFT, OF SAN FRANCISCO, CALIFORNIA.

SLUG-LOCK.

1,335,966.

Specification of Letters Patent.

Patented Apr. 6, 1920.

Application filed June 27, 1918. Serial No. 242,191.

To all whom it may concern:

Be it known that I, WILLIAM HARRISON HORSMAN, a citizen of the United States, residing at the city and county of San Francisco and State of California, have invented new and useful Improvements in Slug-Locks, of which the following is a specification.

This invention relates to a slug operated combination lock.

One of the objects of the present invention is to provide a simple substantial keyless combination lock which can be operated only by means of a slug when inserted therein, said lock serving the function of an ordinary lock to the extent that it may be used on safes, doors, lockers, etc., or in any place where a lock is required.

Another object of the invention is to provide a lock of the character described, which may be employed on automobiles for the purpose of locking the ignition switch either in the opened or closed position, and which is furthermore capable of displaying or sounding a warning signal if the lock is tampered with or operated by any unauthorized persons.

Another object of the invention is to provide a receptacle within the lock housing for the reception of a suitable number of slugs, said slugs being stacked within said receptacle one above the other, and all being different in formation; furthermore to provide means for discharging one of said slugs when the lock is locked, and to provide means whereby it will be impossible to open the lock except by the slug last discharged.

Another object of the invention is to provide a combination lock, the combination of which is automatically changed by the last slug discharged; furthermore to provide means for displaying or sounding a warning signal when a wrong slug is inserted and for locking the lock against further operation when the wrong slug is inserted, thus maintaining the warning signal in constant operation until the owner arrives. Further objects will hereinafter appear.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and

claimed, having reference to the accompanying drawings, in which—

Figure 1 is a central vertical section showing the locking mechanism in a locked position.

Fig. 2 is a similar view showing the lock in the unlocked position.

Fig. 3 is a cross section on line 3—3, Fig. 1.

Fig. 4 is a perspective view of the upper carriage.

Fig. 5 is a perspective view of the ejecting slide.

Figs. 6, 7, 8, 9 and 10 are perspective views of different forms of slugs employed.

Referring to the drawings in detail, A indicates the main frame of the lock, and 2, a housing inclosing the same, said housing being adapted to be secured to the dashboard of an automobile by screws 3, or by any suitable means. Secured to the main frame A are four chutes, the upper one indicated at 4 will hereinafter be termed the upper chute, the second one shown at 5, the turning chute, the third one shown at 6, the loading chute, and the lowermost one shown at 7, the discharge chute. Rigidly mounted on a shaft 8 journaled in the frame is an operating lever, which, in this instance, consists of two arms, 9 and 10, said arms being arranged one on each side of the frame. These arms are rigidly secured on the shaft 8, one end of which passes through the frame and the casing 2 to permit it to be provided with an operating handle 11. Connecting the upper ends of the operating levers 9 and 10 is a cross rod 12, and pivotally mounted on said rod is a carriage such as shown in Fig. 4. This carriage consists of a pair of side members 13, an end connecting bar 14 and a pair of inwardly projecting lips 15, which are formed integral with the side members 13. The carriage as a whole is not only pivotally mounted on the rod 12, but it is also slidably mounted on a bracket 16, the forward end of which is provided with a shoulder 17. The carriage is mounted directly below the upper chute 4, and any slug inserted through the chute 4 will drop into the carriage and assume the position shown at 18 in Fig. 1, that is, the forward end of the slug will rest upon the rod 12, while the rear end of the slug will

rest upon the shoulder 16. Slidably mounted on a bearing plate 19 secured in the lower end of the frame A is an ejecting slide generally indicated at 20. See Fig. 5. This
 5 ejecting member is mounted directly below a slug box 21, and consists of a pair of side bars 22 provided with recesses as at 23 for the reception of the lower ends of the respective operating levers 9 and 10 as shown
 10 at 24. The ejecting slide is furthermore provided with an inclined front bar 25, and a rear bar 26. As the ejecting slide is mounted or positioned directly below the slug box 21 and directly above the discharge chute 7, it can readily be seen that its function
 15 is that of ejecting the slugs. The normal position of the ejecting slide when the lock is unlocked being shown in Fig. 2, while the other position which is assumed when the lock is locked, is shown in Fig. 1; the
 20 lowermost slug being ejected as shown in Fig. 1 whenever the lock is locked, said slug when removed serving the purpose of unlocking the lock when inserted in the upper chute, as will hereinafter be described. Piv-
 25 otally mounted on a shaft 27 secured crosswise of the frame A is a plurality of locking levers 28, there being four of said levers employed in the present instance. Pivotally
 30 mounted as at 29 on the upper end of each locking lever is a latch 30, the forward ends of which are offset as at 31, while the rear ends are notched as at 32 to permit the same to engage a locking bar 33, also extend-
 35 ing crosswise of the frame and secured thereto. Suitably secured or formed integral with the lower end of each locking lever is a projecting lug 34, and secured to the main frame as at 35 is a plurality of springs 36,
 40 one for each locking lever, and each adapted to engage its respective locking lever as shown in Figs. 1 and 2; also pivotally mounted on a shaft 37 extending crosswise
 45 of the frame is a pair of arms 38, the upper ends of which are connected by a cam 39, while the lower ends are connected by a bar 40. The arms 38 and the connecting members 39 and 40 will hereinafter be termed
 50 the rocking wedge frame. This frame normally assumes the position shown in Fig. 2 when the lock is unlocked, but is retracted to assume the position shown in Fig. 1 when the lock is locked by means of a spring 41,
 55 which is connected with the upper end of the frame as shown. The lock is otherwise provided with a sliding bolt 42, which is pivotally connected at one end to a pin 43 secured on the operating lever 9, and extending through a slot 44 formed on the
 60 rear side of the main frame, while the opposite end is slidably mounted in a bracket 45. The function of the sliding bolt in the present instance is to open or close a circuit through an ignition switch generally indi-
 65 cated at 44, and its second function is to

provide means for displaying a signal or sounding an alarm through a bell 46 if the lock is tampered with or operated by an unauthorized person. The operation of the lock in general will be as follows:

70 Assuming that the operating levers 9 and 10 have been moved to the position shown in Fig. 1 or from the unlocked to the locked position, it will be seen that said movement
 75 of the operating levers will swing the carriage to the retracted position shown in Fig. 1, and that they will simultaneously move the ejecting carriage from the position
 80 shown in Fig. 2 to the forward position shown in Fig. 1. This movement of the ejecting carriage causes the rear bar 26 to engage the lowermost slug 50, contained
 85 within the slug box and forces it out from under the stack to the position shown in Fig. 1. The forward end of the slug rests upon the inclined cross bar 25, and, will
 90 therefore, drop downwardly and discharge through the chute 7, as the rear end has been moved out of alinement or off the supporting shelf 19. In other words, locking
 95 of the lock causes a slug to be discharged, and it should hereinafter be remembered that the lock can only be opened by the slug discharged when it was last locked. The
 100 owner of the automobile, therefore, places the slug in his pocket or wherever he wishes to keep the same, so that it may be employed for the purpose of opening the lock when desired. Certain of the locking levers
 105 28 are moved into the forward or inclined position shown in Fig. 1 when the lowermost slug is projected, and as only certain locking levers are rocked into said inclined position, it can readily be seen that it depends entirely
 110 upon the formation of the slug discharged which levers are rocked and which remain in the normal vertical position shown. This important feature of the present invention not only permits changing of the combination of the lock, but it does positively change
 115 the combination of the lock whenever a slug is discharged or when the lock is locked.

By referring to Figs. 6, 7, 8 and 9, it will be seen that each slug is differently formed: for instance, Fig. 6 shows a blank slug, Fig.
 115 7 a slug having only one groove, Fig. 8 a slug having two grooves, and Fig. 9 a slug having three grooves, while Fig. 10, shows a slug having four grooves.

We will now suppose that the slug dis-
 120 charged when the lock was locked had two grooves, the operation of discharging the slug as previously described consists in moving the operating levers 9 and 10 from the position shown in Fig. 2 to the position
 125 shown in Fig. 1. The slugs contained in the box 21 all lie in a position where the grooves face upwardly. The lowermost slug when moved forwardly by the ejecting slide, would, therefore, rock two of the locking
 130

levers 28, due to the fact that the blank portion 55 of the slug shown in Fig. 8 would strike the projection lugs 34 on two of the levers 28, and thus rock the same into the inclined position shown in Fig. 1. The other two locking levers are in register or alinement with the two grooves 56 formed in the slug, and would, therefore, not be rocked as the projecting lugs 34 would pass through the grooves. The slug shown in Fig. 8, which we assume was the last slug discharged when the lock was locked, therefore, caused the combination to be set, inasmuch as it moved two of the locking levers to the inclined or forward position shown in Fig. 1. If a slug such as shown in Fig. 7 was last ejected then it can be seen that three of the locking levers would be rocked, and that only one of said levers would remain in normal position, while a slug such as shown in Fig. 6, which is a blank slug, would rock all four of the locking levers. Again the slug shown in Fig. 9, which is provided with three grooves, would only rock one of the locking levers. The combination on the lock is, therefore, changed every time a slug is discharged, as each slug differs in formation, that is, to the extent of the number of grooves employed, or due to the position of said grooves, for instance, a number of combinations would be produced where only one groove is employed by forming the groove on one end or the other of the slug, or by forming it in a central position in alinement with one of the central locking levers, that is, it is possible to produce at least four combinations by merely employing one groove. It is similarly possible to produce a variety of combinations when a two groove slug is employed, as the changing of the position of said grooves causes different locking levers to remain in normal position and others to be rocked.

We have already assumed that the last slug ejected was a two groove slug such as shown in Fig. 8. To open the lock again it is necessary to insert this slug, and it must be remembered that no other slug will open the lock, as will hereinafter be described. The two groove slug shown in Fig. 8 when inserted in the upper chute 4 assumes the position shown in Fig. 1. The handle 11 is now grasped, and the operating levers 9 and 10 move to the forward position shown in Fig. 2. This movement causes the carriage to move forwardly, and the ejecting slide to move back, as shown in Fig. 2. The slug rests on the forward ends of the latches 30, which are carried by the two locking levers that have been moved into the forward position, and as the grooves 56 formed in the slug aline with the latches 30 on the other two levers, which remain in normal position, it can be seen that forward movement of the slug will depress the two latches, which en-

gage the locking bar 33, thus raising the same out of engagement with the locking bar. The release of the latches with relation to the locking bar permits the respective locking levers 28 to return to normal position, as the pressure of the springs 36 engaging the same will immediately swing said levers back to normal vertical position. The depression of the latches 30, which were raised, is caused not only by the blank portion 55 of the slug, but also by the cam member 39, due to the fact that the slug passes under said cam, and also due to the fact that the cam passes over the slug, the movement of the cam over the slug being transmitted from the operating lever 9 by engagement of said lever with the cross bar 40, that is, forward movement of the operating lever 9 transmits a rocking movement to the arms 38, due to the engagement of the arm 9 with the cross bar 40; the cam 39, therefore, swings into the position shown in Fig. 2, and thereby depresses the slug and the latches 30 upon which it rests. These latches, together with the locking levers, carrying the same, are thereby released and return to normal position, and the slug is at the same time released the minute the latches are retracted, the released position of the slug being shown in Fig. 2. The slug thus released will then drop downwardly through the chute 5, and is turned before it reaches the slug box 21, due to the formation of the lower end of the chute 5, that is, the slug when inserted in the chute 4 presents the grooves 56 downwardly, but by reversing the position of the slug when it has passed or dropped through the chute 5, it can be seen that the slugs will assume a position in the slug box where the grooves face upwardly. The locking levers in other words were released and return to normal position, due to the fact that the blank portion 55 of the slug raised the latches, which had been moved forward to locking position, and also due to the fact that the grooves 56 alined with the latches that were standing in normal position. If any other slug had been inserted, it would be impossible to open the lock. This will be more clearly understood when the operation is considered.

We will now assume that the slug shown in Fig. 7 was inserted in place of the correct slug shown in Fig. 8. This slug has only one groove, and when inserted will assume the position shown in Fig. 1. Forward movement of the operating levers will, in this instance, be limited to an approximate half-way position, that is, it will be impossible to rock the operating levers 9 and 10 beyond a vertical position, or a position intermediate the two positions shown in Figs. 1 and 2. This is due to the fact that two of the latches 30 are raised and thrown forwardly, while two of the latches are re-

tracted and stand in horizontal or normal position. The single groove formed in the slug will register with one of the latches, which remain in normal position, but as the second groove is not formed in said slug to register with the second latch, it can be seen that the blank or forward end of the slug will strike the point of the second latch, and thus prevent the carriage and the operating levers from being moved farther. The rear end of the slug will, at the same time, drop downwardly behind the shoulder 17, and thereby prevent the operating levers from being returned to normal position, or from being moved in the opposite direction, this being due to the fact that the shoulder 17 forms a lock in one direction, while the second latch forms a stop in the opposite direction. The same locking operation would take effect whether a one-groove slug, a three-groove slug, or a blank slug was inserted, or whether any other slug having any formation whatsoever was inserted; for instance, if a three-groove slug was inserted such as shown in Fig. 9, then it can readily be seen that the first two grooves would register with the first two latches which remain in normal position, and that the third groove would register with the first of the latches, which stand in raised or locked position. Forward movement of the slug in this instance would only cause one of the raised latches to be depressed, as the second latch is in register with the third groove, and would, therefore, not be depressed. The latch, which is not depressed, would, in that instance serve as a stop to prevent further movement of the slug, and the operating levers, as the rod 12 supporting the carriage would strike the forward end of the latch, which was not depressed, thus locking the operating levers, the carriage, and the slug against further movement, or against return movement, as the rear end of the slug will also, in this instance, drop behind the shoulder 17.

In the foregoing description, it can be seen that no slug but the last one ejected can possibly open the lock, due to the fact that the formation of the slug or the number of grooves provided sets the combination so that it can only be opened by the slug which did set the combination.

The sliding bolt 42, which is projected or retracted by the movement of the operating levers may, of course, move into or out of register with the keeper if the device as a whole is employed as a lock. This feature of the invention is not illustrated in the present instance, as the lock is employed for the purpose of opening or closing a circuit through an ignition switch as shown in 44, and also for displaying a signal or sounding an alarm when the mechanism is tampered with or operated by an unauthorized

person. The ignition switch is closed when the lock is unlocked, due to the fact that the bolt 42 is moved in the direction of arrow *a*. A lug 60 on the bolt will, during this movement, engage one of the contacts of the switch 44, and thus force the contacts together and close a circuit through the ignition circuit. The circuit through the ignition switch is thus established when the lock is unlocked, and it is opened when the lock is locked, due to the fact that the bolt is projected in the opposite direction or away from the switch contacts 44 when the lock is locked. Wrong manipulation of the lock or the insertion of a wrong slug causes the alarm or bell 46 to be sounded, that is, locking of a wrong slug within the mechanism when it drops behind the shoulder 17 takes place when a contact member 61 on the bolt moves into register with a contact member 62. A circuit through the bell is thus established, and an audible alarm will be given until the owner arrives, and he can only break the circuit by removing the outside casing 2. After removing this casing it is possible for him to insert a flat piece of metal through the top of the frame and depress the latches 30, which remain in raised position. The locking levers are thus released and return to normal position, and it is then possible for the owner to rock the operating levers to the forward position, and to release or pass the slug through. The circuit is in this manner broken through the alarm mechanism, and the casing 2 may then be replaced.

While four locking levers are employed in the present instance, I wish it understood that a greater or less number may be employed if desired, a greater number of locking levers being preferable in some instances, as it permits a much larger combination or number of slugs to be employed. I similarly wish it understood that the materials and finish of the several parts of which the lock is constructed may be such as the experience and judgment of the manufacturer may dictate.

I also wish it understood that various changes in form, proportions and minor details of construction may be resorted to within the scope of the appended claims, and that I do not wish to limit myself to the specific design and construction here shown.

It should be noted that the blank side of each slug is provided with one groove as shown at 90. This is provided for the purpose of insuring a correct insertion of the slug in the upper chute and this is accomplished by placing a pin 91 in the chute which will stop a slug from being passed through except when the pin registers with the groove in the blank side.

Having thus described my invention, what

I claim and desire to secure by Letters Patent is—

1. In a combination lock a slug box adapted to receive a plurality of slugs, each having a different formation, means for discharging one of said slugs when the lock is locked, means for unlocking the lock by means of the slug discharged, and means actuated by each slug for automatically changing the combination.

2. In a combination lock a slug box adapted to receive a plurality of slugs, each having a different formation, means for discharging one of said slugs when the lock is locked, means for unlocking the lock by means of the slug discharged, means for maintaining the device locked until introduction of the last slug discharged, and means to automatically change the combination by and upon discharge of each slug.

3. A slug operated combination lock comprising a casing, a slug box within said casing adapted to receive a plurality of stacked slugs, said slugs having different formations, means for discharging the lowermost of said slugs when locking the lock, means for unlocking the lock by means of the slug discharged, and means actuated by each successive slug discharged for changing the combination.

4. A slug operated combination lock comprising a casing, a slug box within said casing adapted to receive a plurality of stacked slugs, said slugs having different formations, means for discharging the lowermost of said slugs when locking the lock, means actuated by said slug and by each successive slug when discharged for changing the combination of the lock, and means for maintaining the device locked until introduction thereof of the last slug discharged.

5. In a slug operated combination lock, a slug receiver for holding a stack of slugs the latter of different formations, means for discharging the lowermost slug upon locking the lock, means actuated by said slug and upon discharge of each successive slug for changing the combination of the lock, means maintaining the lock locked until introduction thereof of the last slug discharged, a signal, and means for effecting a prolonged actuation of the signal upon introduction into the device of a wrong slug.

6. A combination lock adapted to be unlocked by the insertion of a grooved slug, a container within the lock for the reception of said slug and a plurality of other slugs each having different formations, means in the lock for discharging a slug when it is locked, and means actuated by said slug when discharged for changing the combination of the lock so that the lock when locked can only be opened by the last slug discharged.

7. A slug operated lock comprising a casing having a receiving chute for the slug and a discharging chute for the same, a container within the casing adapted to serve as a receptacle for a plurality of slugs, each having a different formation, an operating lever pivotally mounted in the casing, a carriage adapted to receive a slug when inserted, said carriage being pivotally connected to the upper end of the operating lever, an ejecting slide mounted below the slug container adapted to eject the lowermost slug in the container when the lock is locked, said ejecting slide being moved by the operating lever, a combination locking mechanism within the casing adapted to be set by the slug discharged, and means for maintaining the device locked until the last slug discharged is inserted in the receiving chute.

8. A slug operated lock comprising a casing having a receiving chute for the slug and a discharging chute for the same, a container within the casing adapted to serve as a receptacle for a plurality of slugs, each having a different formation, an operating lever pivotally mounted in the casing, a carriage adapted to receive a slug when inserted, said carriage being pivotally connected to the upper end of the operating lever, an ejecting slide mounted below the slug container adapted to eject the lowermost slug in the container when the lock is locked, said ejecting slide being moved by the operating lever, a plurality of locking levers pivotally mounted within the casing one or more of which are adapted to be rocked when a slug is ejected, and means actuated by said locking levers for maintaining the device locked until the last slug ejected is inserted.

9. A slug operated lock comprising a casing having a receiving chute for the slug and a discharging chute for the same, a container within the casing adapted to serve as a receptacle for a plurality of slugs, each having a different formation, an operating lever pivotally mounted in the casing, a carriage adapted to receive a slug when inserted, said carriage being pivotally connected to the upper end of the operating lever, an ejecting slide mounted below the slug container adapted to eject the lowermost slug in the container when the lock is locked, said ejecting slide being moved by the operating lever, a plurality of locking levers pivotally mounted within the casing one or more of which are adapted to be rocked when a slug is ejected, a latch engageable with the slug on the carriage upon actuation of the latter and being pivotally mounted on the upper end of each locking lever, and a locking bar, with which said latches are engageable when the locking levers are rocked.

10. A slug operated lock comprising a casing having a receiving chute for the slug

and a discharging chute for the same, a container within the casing adapted to serve as a receptacle for a plurality of slugs, each having a different formation, an operating lever pivotally mounted in the casing, a carriage adapted to receive a slug when inserted, said carriage being pivotally connected to the upper end of the operating lever, an ejecting slide mounted below the slug container adapted to eject the lowermost slug in the container when the lock is locked, said ejecting slide being moved by the operating lever, a plurality of locking levers pivotally mounted within the casing one or more of which are adapted to be rocked when a slug is ejected, a latch engageable with the slug on the carriage upon actuation of the latter and being pivotally mounted on the upper end of each locking lever, and a locking bar, with which said latches are engageable when the locking levers are rocked, said locking bar maintaining said latches against movement until the proper slug is inserted.

11. In a slug operated combination lock, a series of slugs of varying characters, means for discharging one of the slugs when the lock is locked, means actuated by each slug for automatically changing the combination upon its discharge, means for unlocking the lock by the slug discharged, a signal, and means for effecting a prolonged actuation of the signal upon introduction into the device of a wrong slug.

12. A slug operated lock comprising a casing, a slug receiving chute and a slug discharging chute on the casing, a slug box within the casing adapted to serve as a receptacle for a plurality of stacked slugs, said slugs each having different formations, and also adapted to unlock the device when inserted, an operating lever adapted to lock or unlock the lock, means actuated by said lever for ejecting the lowermost slug in the box when the lock is locked, a carriage movable in unison with the operating lever adapted to receive a slug when inserted through the receiving chute, a bolt movable in unison with the operating lever, means actuated by each slug for automatically changing the combination upon its discharge, and means operable in conjunction with the carriage for locking the operating lever, the carriage and the bolt against complete operation until the proper slug is inserted.

13. A slug operated lock comprising a

casing, a slug receiving chute and a slug discharging chute on the casing, a slug box within the casing adapted to serve as a receptacle for a plurality of stacked slugs, said slugs each having different formations, and also adapted to unlock the device when inserted, an operating lever adapted to lock or unlock the lock, means actuated by said lever for ejecting the lowermost slug in the box when the lock is locked, a carriage movable in unison with the operating lever adapted to receive a slug when inserted through the receiving chute, a bolt movable in unison with the operating lever, means actuated by each slug for automatically changing the combination upon its discharge, means operable in conjunction with the carriage for locking the operating lever, the carriage and the bolt against complete operation until the proper slug is inserted, and means for establishing a circuit through an alarm mechanism when a wrong slug is inserted.

14. A slug operated lock comprising a casing, a slug receiving chute and a slug discharging chute on the casing, a slug box within the casing adapted to serve as a receptacle for a plurality of stacked slugs, said slugs each having different formations, and also adapted to unlock the device when inserted, an operating lever adapted to lock or unlock the lock, means actuated by said lever for ejecting the lowermost slug in the box when the lock is locked, a carriage movable in unison with the operating lever adapted to receive a slug when inserted through the receiving chute, a bolt movable in unison with the operating lever, means actuated by each slug for automatically changing the combination upon its discharge, means operable in conjunction with the carriage for locking the operating lever, the carriage and the bolt against complete operation until the proper slug is inserted, means for establishing a circuit through an alarm mechanism when a wrong slug is inserted, an electric circuit, and means controlled by the movement of the bolt for opening or closing said circuit.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM HARRISON HORSMAN.

Witnesses:

W. W. HEALEY,
M. E. EWING.