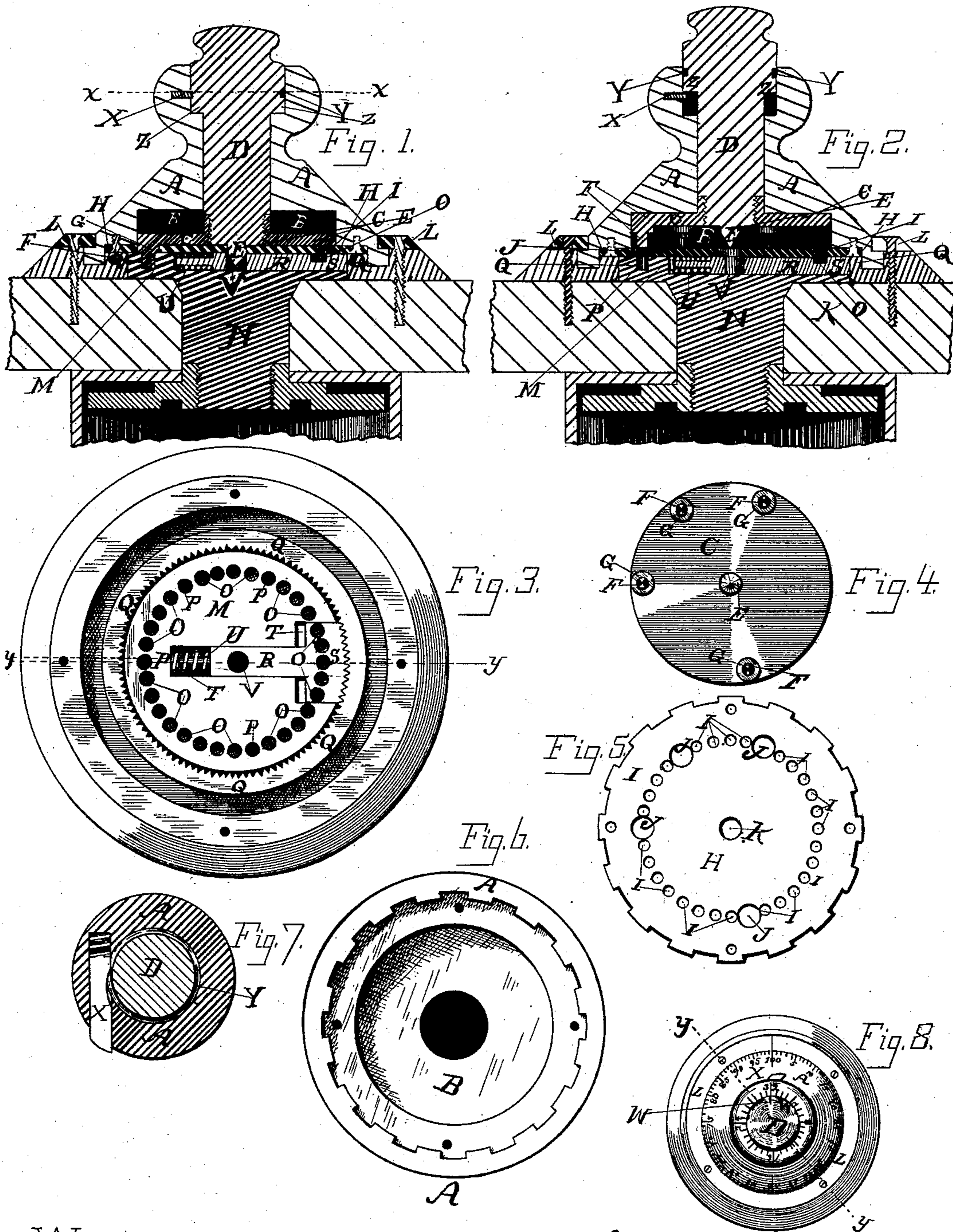


(Model.)

C. HILL.
PERMUTATION LOCK.

No. 389,703.

Patented Sept. 18, 1888.



Witnesses.

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PERMUTATION-LOCK.

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To all whom it may concern:

Be it known that I, CHARLES HILL, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Improvement in Permutation-Locks, of which the following is a specification.

Permutation-locks are usually constructed with a nest of three or more tumblers movably mounted upon a common arbor, and a driving-tumbler fixedly mounted upon an arbor which extends to the outside of the safe. The several tumblers have studs projecting from their faces in such a manner that when the outer arbor is turned the stud projecting from the face of the driving-tumbler will come into contact with the stud of the outer one of the movable tumblers, which is turned thereby, and which, by means of the stud upon its opposite face, turns the next tumbler, and so on until the whole nest of tumblers is turned. Then by turning the outer arbor first in one direction and then in the other, regard being had to the figures upon a dial fixed upon the outer arbor to serve as a guide to the proper point at which to stop and turn in the opposite direction, the several tumblers are brought into such a position that the dog-slot in each is brought into line with the path of the tumbler-dog, which is thus allowed to slip back and allow the bolts to be thrown back. It is customary in using such locks to not throw on the entire combination during business hours, but to simply turn the driving-tumbler a slight distance, leaving the other tumblers in position to allow the dog to slip back, so that by turning to the last number in the combination the safe may be opened. This practice is objectionable in that any one may open the safe without difficulty by noticing at what number the dial is left when the safe is opened, and for this reason it is frequently found necessary to turn on the entire combination every time the owner of the safe leaves it. Another difficulty also arises in cases where the "day-lock," as it is called, is depended upon. It frequently occurs that some one will inadvertently turn the knob and throw on the entire combination, thus often necessitating the expenditure of considerable time in the midst of business hours.

The object of my invention is to obviate these difficulties. This I accomplish by means

of the device described herein and illustrated in the accompanying drawings, in which—

Figures 1 and 2 are vertical cross-section views of my improved lock on line *y y*, Figs. 3 and 8, respectively. Fig. 3 is a plan of the escutcheon, showing the head of the driving-arbor and the mechanism whereby it is locked in any position desired. Fig. 4 is a view of the bottom of the stud-plate which unlocks the driving-arbor and connects it with the dial-knob. Fig. 5 is the perforated plate which is secured to the dial-knob and prevents the stud-plate from turning in the dial-knob when the studs are pushed through the perforations to unlock and turn the driving-arbor. Fig. 6 is a plan of the under side of the dial-knob, showing the seat of the stud-plate and that of the perforated plate. Fig. 7 is a cross-section of the dial-knob and stud-plate arbor on line *x x*, Fig. 1, illustrating the device for locking the stud-plate arbor. Fig. 8 is a plan view of the dial-knob escutcheon and securing-ring.

The dial-knob A is hollow and has a cavity, B, on its under side, in which a circular stud-plate, C, secured to an arbor, D, plays up and down. From the under side of the stud-plate C studs E and F G project downward. One of these studs, E, is conical in form, and projects from the center of the plate, while the others, F G, are cylindrical, having a shoulder, G, next to the plate, and are arranged at intervals in the line of a circle concentric with the stud-plate C. A plate, H, having perforations I J K therein, is rigidly secured in a seat in the underside of the dial-knob. One of the perforations, K, is in the center of the plate and corresponds in size with the stud E. The other perforations are arranged at equal intervals in a circle corresponding to the circle in which the studs F are arranged. A number of these perforations, I, correspond in size with the smaller portion of the studs F; but others of the perforations, J, correspond in size, number, and position with the shoulder or offset portion G of the studs F.

The head M of the driving-arbor N is provided with holes O P, equal in diameter to the smaller portion of the studs F and corresponding in number and arrangement with the perforations I J in the plate H.

The depth of the cavity B in the dial-knob is equal to about three times the thickness of the perforated plate H, and is such that the stud-plate C may be raised high enough to draw the studs out of the perforations in the plate H.

The shoulder G of the studs F is equal in length to the thickness of the perforated plate H, and the smaller portion thereof is equal in length to twice the thickness of the perforated plate. The holes O in the arbor-head are equal in depth to the thickness of the perforated plate, and the holes P are twice as deep. The deep holes P correspond in number and arrangement with the studs F.

An annular projection, Q, from the escutcheon, serrated upon its inner side, is provided to form a seat for the arbor-head M. A locking-bolt, R, having a head, S, serrated to correspond with the ring Q, is mounted in a seat, T, in the arbor-head, so as to allow the bolt to play back and forth to bring the head thereof into contact with and free it from the serrated ring. A spring, U, is provided to press the serrated bolt-head against the serrated ring Q, so that when the bolt is not forced back from the serrated ring the driving-arbor is securely locked and prevented from turning. A hole, V, is made in the bolt R at such a point that when the bolt is thrown back far enough to withdraw it from the serrated ring the hole will be at the center of the arbor-head.

Now it will be observed that when the deep holes P in the arbor-head are brought into alignment with the large perforations J in the plate H, and the studs F G are inserted in the larger and deep holes thus formed, the central conical stud, E, will be allowed to enter the hole V in the bolt, and, coming into contact with the walls of the hole, the oblique face of the stud will force the bolt back and withdraw it from the serrations, thus leaving the driving arbor and tumbler free to move. This position of the several parts is shown in Fig. 1, and is the position in which the parts must be to allow the safe to be unlocked. When it is desired to lock the safe during business hours, the driving-tumbler is first turned to any number desired by the person locking the safe, thus turning on the day-lock. The stud-plate arbor is then drawn out, thus withdrawing the studs from the driving-arbor head and from the hole V, so that the bolt-spring U is allowed to force the serrated bolt-head against the serrated ring and lock the driving arbor and tumbler in the position they at that moment occupy. When the studs are fully withdrawn from the arbor-head, the dial-knob may be turned in any direction without affecting the lock, and when the studs are withdrawn from the perforated plate H the stud-plate C may be turned in any direction. Then, in order to unlock the safe, the stud-plate arbor must be turned until the studs coincide with the large perforations J, into which they are pushed, and the dial is then turned until

the studs coincide with the deep holes P in the arbor-head, into which they are then inserted, thus drawing back the serrated bolt and leaving the tumbler free to turn. If there were no guide to follow, this would be a labor requiring considerable time, for the small portion of the studs will pass through the perforations in the plate and enter the holes in the arbor-head to the depth of the more shallow holes, so that one attempting to unlock the safe would be unable to determine whether he had pushed the studs into the large perforations or not until after making the complete circuit of the dial to find the deep holes in the arbor-head, and if he has not placed the studs in the large perforations when the studs enter the deep holes they will not be allowed to enter deeper than the bottom of the shallow holes by reason of the shoulders on the studs; and in case he chances to insert the studs in the large holes he is obliged to hunt for the deep holes, and after finding them and releasing the tumbler he must next find the number of the day-lock. This will give sufficient security in any case in which the day-lock is depended upon.

In order to facilitate the operation of unlocking the safe, I provide figures around the head of the dial-knob and place an index-mark, W, on the head of the stud-plate arbor. Then a person acquainted with the number at which the mark W must stand in order to bring the studs in line with the large perforations has only to turn to that number and push the stud-arbor in. Then by turning the dial to the number at which it stood when the studs were withdrawn from the arbor-head the studs will be brought into line with the deep holes in said arbor-head and allow the conical stud to force back the bolt.

It will be seen that by this device all danger of turning on the full combination by any one who meddles with the knob is obviated, as the knob is wholly disconnected from the tumblers of the lock.

The locks when manufactured may be variously constructed by arranging the studs in different positions, so that one having the number at which the stud-arbor of one lock should stand to unlock will have no clue as to the number for any other lock.

I provide a small spring-bolt, X, to secure the stud-arbor in either its inserted or its withdrawn position. The bolt X extends into a groove, Y, cut around the arbor, and holds the arbor when it is inserted, and a slight arc of a circle is cut out of the edge of the bolt at such a point that when the bolt is pressed in the arbor is permitted to be withdrawn until the bolt enters the cavity underneath the shoulder Z of the stud-arbor, thus holding the arbor in its withdrawn position and allowing it to turn around freely.

The perforated plate H is provided with notches around its periphery, which fit into corresponding notches in the dial-plate, so that

the relations between the large perforations and the figures upon the dial-plate may be changed, thus allowing one to change the number at which the stud-arbor must stand in order that the studs will enter the large perforations.

The securing-ring L is fastened to the face of the escutcheon of the lock by means of screws and fits over the outer rim of the dial-knob, as shown in Figs. 1 and 2, thus securing the knob to the escutcheon and allowing it to be taken off from the door of the safe by simply removing the securing-ring L. It will be observed, however, that this gives no access to the lock, as the driving-arbors of safe-locks are enlarged at the outer end, as shown in the drawings, so that they cannot be forced through the door into the safe, even though the knob be removed.

Now, having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a permutation-lock, a driving-arbor provided with holes of different depths in the head thereof, in combination with a plate having studs attached thereto and an arbor carrying said plate, having a movement to and from the driving-arbor, the studs being fixed to the plate so as to correspond in relative position with the deep holes in the driving-arbor, whereby the studs are allowed to be inserted their full length into the arbor-head only when they are all inserted into deep holes in said arbor-head.

2. In a permutation-lock substantially such as described, the combination of the arbor-head M, locking-bolt R, seated therein, the hole V in said bolt, and the movable conical stud having its motion to and from the hole, whereby the bolt is made to assume a determinate position when the stud is inserted in the hole and is left free to be moved by a spring when the stud is withdrawn from such hole.

3. The combination, in a permutation-lock, of the driving-arbor provided with holes in the head thereof, the dial-knob free from such arbor, a perforated plate attached thereto in juxtaposition with but free from the head of the driving-arbor, and movable studs fitting the perforations, and also fitting holes in the driving-arbor, whereby the dial-plate and driving-arbor can be connected with or separated from each other, as may be desired.

4. The combination, in a permutation-lock, of the dial-knob A, the perforated plate H, attached thereto, the movable stud-plate C, the studs E and F G, affixed thereto, the driving-arbor N, having holes in the head thereof, the locking-bolt R, having the hole V therein, and the escutcheon provided with retaining notches or seats, into which the locking-bolt may catch to lock the driving-arbor.

5. In a permutation-lock substantially such as described, the notched perforated plate H, having perforations of different sizes therein, the dial-knob having a notched seat for such perforated plate, and the stud-plate having studs extending therefrom corresponding in their relative position with the large perforations in said plate H, all being in combination substantially as set forth, the base of the studs equal in diameter to the large perforations, and the extremities of the studs equal in size to the small perforations, whereby the longitudinal play of the studs is limited by the plate at all times except when the studs are all inserted in the large perforations.

6. In a permutation-lock substantially such as described, the combination of the stud-arbor D, shoulder Z, and groove Y, and the spring-bolt X, substantially as and for the purpose set forth.

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Witnesses:

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