No. 844,448. PATENTED FEB. 19, 1907.

L. B. GAYLOR.

PERMUTATION LOCK.

APPLICATION FILED SEPT. 5, 1906.

Fig. 1.

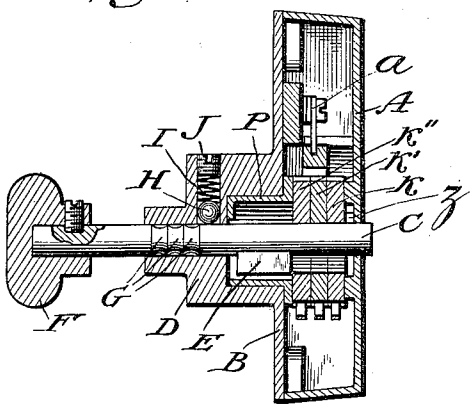


Fig. 2.

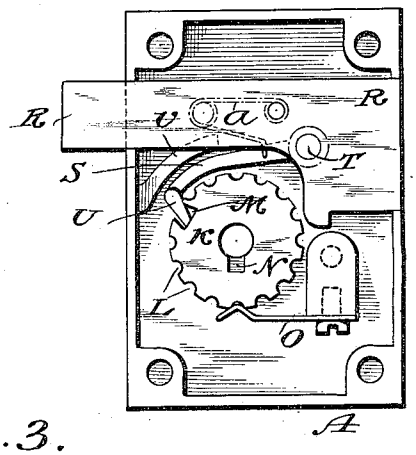


Fig. 3.

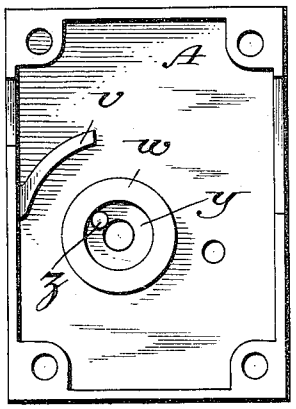


Fig. 4.

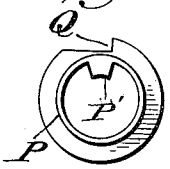


Fig. 5.

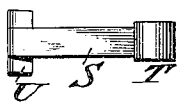
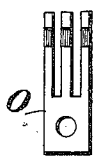


Fig. 6.



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UNITED STATES PATENT OFFICE.

LEONARD B. GAYLOR, OF BOSTON, MASSACHUSETTS.

PERMUTATION-LOCK.

No. 844,448. Specification of Letters Patent. Patented Feb. 19, 1907.

Application filed September 5, 1906. Serial No. 333,314.

To all whom it may concern:

Be it known that I, LEONARD B. GAYLOR, a citizen of the United States, and a resident in the city of Boston, county of Suffolk, State of Massachusetts, have invented a new and useful Improvement in Permutation-Locks, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 illustrates a vertical sectional view of the invention, certain of the parts being shown in elevation. Fig. 2 illustrates a view of the interior of the lock, the face-plate having been removed. Fig. 3 illustrates a view of the interior of the lock-casing, the interior mechanism and the face-plate having been removed. Fig. 4 illustrates an endwise elevation of the dog-lifting tumbler. Fig. 5 illustrates a plan view of the locking-dog. Fig. 6 illustrates a plan view of the phonetic indicating-springs which coact with the tumblers.

A is the main casing of the lock.

B is the face-plate.

C is a spindle rotatably supported by the casing and by the hub-like projection D, which forms part of the face-plate. The spindle is provided with a bit E and knob or thumb-piece F and with three grooves G. A metallic ball H or equivalent device actuated by a spring I, held in place by a screw J, engages with the grooves G in the spindle in a manner about to be described.

K K′ K″ are three tumblers. They each have notches in their peripheries (fifteen in each are shown in the present instance) and one slot M, adapted to receive the locking-dog. They likewise are provided with a recess or keyway N, through which the bit of the spindle may pass.

O is a plate of resilient metal (see Fig. 6) made into three separate springs, as shown, which engage, respectively, with the notches in the edges of the respective tumblers. They have sufficient stiffness to make a plainly-perceptible click audible to the operator and adapted to be physically felt by him through the spindle when they drop into the notches of the tumblers.

P (see Figs. 1 and 4) is what may be called a "hollow" tumbler. It has no notches on its periphery, nor any spring; but it has a recess Q in its periphery somewhat like the slots M, excepting that it is cut away on the left side, as shown. This hollow tumbler P sets in a chamber made in the hub-like part of the face-plate, as shown in Fig. 1.

R is the bolt.

S is the locking-dog pivoted to the bolt at T and provided with a transverse terminal piece U, which is adapted to enter the slots M in the peripheries of the tumblers.

The main casing A has cast with it a stop V, against which the dog abuts for locking the lock, and likewise an inwardly-projecting boss W, which is reamed out, as at Y, and in the cavity thus formed is set a fixed pin Z.

A spring *a* is supported upon the bolt R and engages with the locking-dog S, as shown in Fig. 2.

The operation is as follows: The last preceding unlocking will of course, unless the parts have been disturbed, which is not supposed to have taken place, have left the tumblers in such position that the locking-dog R, or rather its terminal piece U, will rest in the slots M in the tumblers and likewise in the recess Q in the hollow tumbler P. Now, therefore, to lock turn the spindle and through it the tumblers to the right, thus pushing the bolt R into its locking position and bringing the slots M all directly on top. The spindle C by means of the knob F is then pulled out as far as it will come, so that the bit E thereof slides through the keyways N in the tumblers K K′ K″ and through the hollow tumbler P. The spindle is then turned to the right, which results in turning the hollow tumbler in the same direction, because of the engagement of the bit on the spindle with the inwardly-projecting lug P′ on the tumbler, and this throws the terminal U of the locking-dog R upwardly, because of its engagement with the inclined side of the recess Q in the hollow tumbler P, thus lifting it out of the slots M in the several tumblers. The spindle is then reëngaged with the other tumblers and turned once or twice to mix them up. Now to unlock press in the spindle by means of the knob and turn to the right or left, as may be, until the bit on the spindle finds its way through the slots M in the several tumblers and entering the annular recess Y is turned to the right until its bit brings up against the stop or pin Z, thus establishing a starting-point for all the tumblers. Now to secure the combination (for example, "547") pull the knob out slightly until the ball H drops into the first groove G in the spindle C. This may readily be detected by feeling, be-

cause the ball actuated by spring I interposes some resistance to the longitudinal movement of the spindle. This outward movement of the spindle frees the bit E from contact with the stop-pin Z. Now turn the knob five clicks to the left, which brings the slot M of the first tumbler K into proper registration with the locking-dog. Then pull the knob outwardly to the next groove G, which will be ascertained as before. This movement frees the tumbler K, but leaves the tumblers K′ and K″ in engagement with the bit E of the spindle. Then turn four clicks to the right. The slot of the tumbler K′ is thus brought into proper registration. Then pull the knob out to the last groove G, which frees the tumbler K′, leaving only the tumbler K″ in engagement therewith. Then turn seven clicks to the left, which brings the slot of the tumbler K″ into registration. Then pull the knob all the way out and give another turn to the left, which causes the bit E to engage and partially rotate the hollow tumbler P in such manner that the recess Q in it is also brought into registration with the slots in the other tumblers, and the terminal U of the locking-dog thereupon drops into them, and upon now turning the knob the bolt will be shot back and the lock opened.

It will of course be understood that when the bolt R is in its locked position and the dog lifted out of the slots M in the tumblers that then the dog abuts against the end of the stop V, thus preventing backward movement of the bolt, and also that the slots in the tumblers are so located relative to the several springs O at the time of making up the combination as to correspond with the numbers of the combination.

The operation of unlocking, as above described, seems somewhat complex, because the successive acts and movements have been described in detail. As matter of fact, however, it is exceedingly simple, taking a few seconds only to perform.

It is well known that with but three tumblers upward of one hundred thousand combinations can be secured. Obviously, however, the invention can be practiced with a less or greater number of tumblers.

A peculiarly valuable feature of my invention is that my lock is not only of the "keyless" variety, so called, but also its construction may be such that the spindle and knob or equivalent structure for operating it may be inclosed within a cup-like recess in a hub or boss larger than that shown in the drawings, and thus be protected against accident. Another peculiarly valuable feature is that it is never necessary to use the sense of sight in operating it. On the contrary, touch and hearing, one or both, are the only senses called into action during the operation of the lock. Thus it is adapted to use in localities where suitable light to operate an ordinary permutation-lock could not be readily secured. This is a matter of consequence, because not only is it frequently necessary to operate the lock at night or in the dusk, but also in perhaps one-half the localities where such locks are desired sufficient light is not available.

It will be obvious to those who are familiar with this art that extensive modifications may be made in the details of mechanical construction and yet the essentials of the invention be retained. I therefore do not limit myself to the details described and shown.

I claim—

1. In a lock a longitudinally-movable bitted spindle, independently-rotatable slotted and notched tumblers supported on the spindle, adapted to movement in both directions, a fixed stop which determines the starting-point of the tumblers, a bolt, a locking-dog connected with the bolt and arranged to enter the slots in the tumblers and a spring which engages with the notches in each tumbler.

2. In a lock a longitudinally-movable bitted spindle, independently-rotatable slotted tumblers supported on the spindle each adapted to unlimited rotation independently of the others in both directions, a fixed stop which determines the starting-point of the tumblers, a bolt and a locking-dog connected with the bolt and arranged to enter the slots in the tumblers.

3. In a lock a longitudinally-movable bitted spindle provided with grooves, a spring-actuated device adapted to engage in the grooves, independently-rotatable slotted tumblers supported on the spindle, a fixed stop which determines the starting-point of the tumblers, a bolt and a locking-dog carried by the bolt adapted to enter the slots in the tumblers.

4. In a lock a longitudinally-movable bitted spindle provided with grooves, a spring-actuated device adapted to engage in the grooves, independently-rotatable slotted and notched tumblers supported on the spindle, a fixed stop which determines the starting-point of the tumblers, a bolt, a locking-dog connected with the bolt and adapted to enter the slots in the tumblers and a spring which engages with the notches in each tumbler.

5. In a lock a longitudinally-movable bitted spindle provided with grooves, a fixed stop against which the bit may strike, a device to engage in the grooves, and retard the movement of the spindle, slotted tumblers adapted to rotation in both directions, a bolt and a locking-dog carried by the bolt.

6. In a lock a longitudinally-movable bitted spindle provided with grooves, a fixed stop against which the bit may strike, a device to engage in the grooves and retard the

movement of the spindle, slotted and notched tumblers adapted to rotation in both directions, a bolt, a locking-dog carried by the bolt, and a spring which engages with the notches in each tumbler.

7. In a lock a longitudinally-movable bitted spindle, independently-rotatable slotted tumblers supported upon the spindle and adapted to be successively actuated and left at rest by the rotation and step-by-step withdrawal of the spindle, one of which tumblers is provided with an open-sided recess adapted to lift the locking-dog, the locking-dog itself and a bolt with which the dog engages.

8. In a lock a longitudinally-movable bitted spindle, independently-rotatable slotted and notched tumblers supported upon the spindle and adapted to movement in both directions, one of which tumblers is provided with an open-sided recess adapted to lift the locking-dog, the locking-dog itself, a bolt with which the dog engages and springs which engage with the notches in the tumblers.

9. In combination with a lock of the class stated, a longitudinally-movable spindle, tumblers supported upon the spindle adapted to be successively rotated in both directions and left at rest by the outward movement of the spindle and a fixed stop which determines the starting-point for the tumblers.

10. In combination with a lock of the class stated, a longitudinally-movable spindle provided with grooves, a device adapted to engage in the grooves to retard the movement of the spindle, combination-tumblers equal in number to the grooves in the spindle and supported by and independently rotatable in both directions upon the spindle, a fixed stop and a tumbler adapted to lift the dog likewise operated by the spindle.

11. In combination with a lock of the class stated, a longitudinally-movable spindle provided with grooves, a device adapted to engage in the grooves to retard the movement of the spindle, combination-tumblers slotted for the locking-dog and having notches on their peripheries and equal in number to the grooves on the spindle supported by and independently rotatable in both directions upon the spindle, another tumbler adapted to lift the dog likewise supported by the spindle, a fixed stop which determines the starting-point of the tumblers and springs for each of the combination-tumblers which engage with the notches in their peripheries.

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

LEONARD B. GAYLOR. [L. S.]

Witnesses:

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WILLIAM N. KENYON.