

(No Model.)

4 Sheets—Sheet 1.

J. A. HENRY.
PERMUTATION LOCK.

No. 583,748.

Patented June 1, 1897.

Fig. 1.

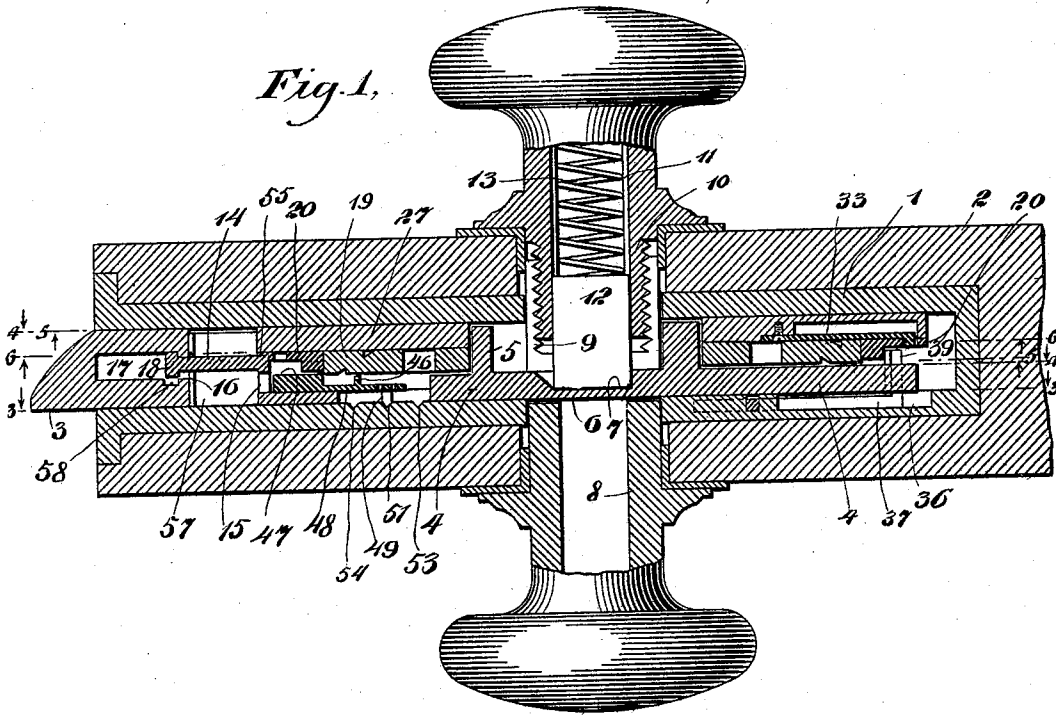
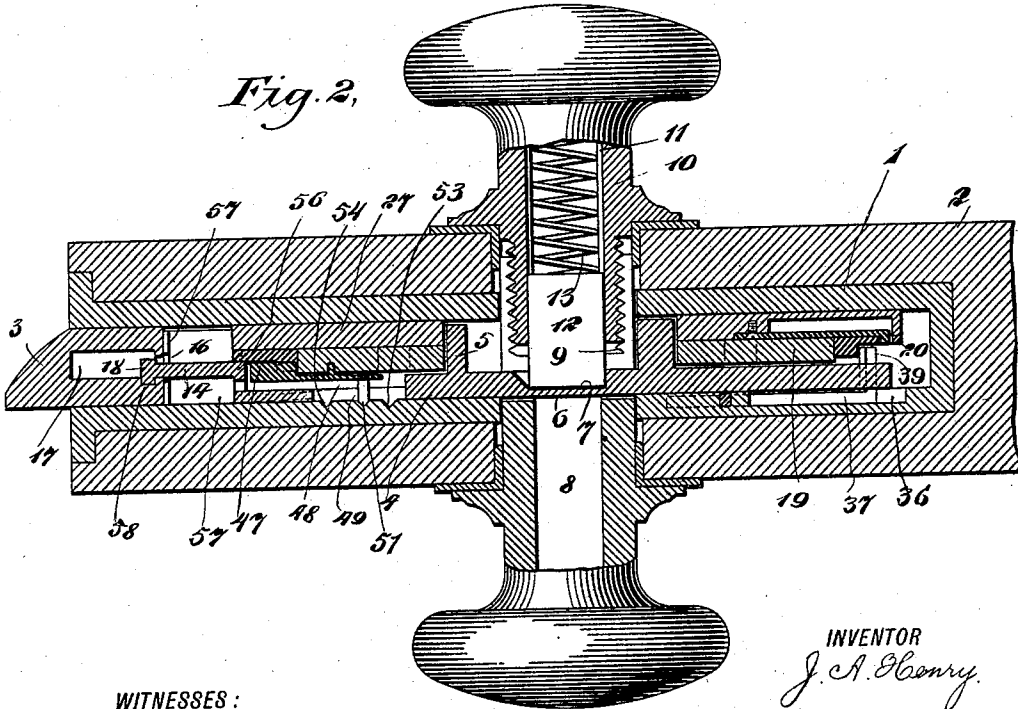


Fig. 2.



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Fig. 3,

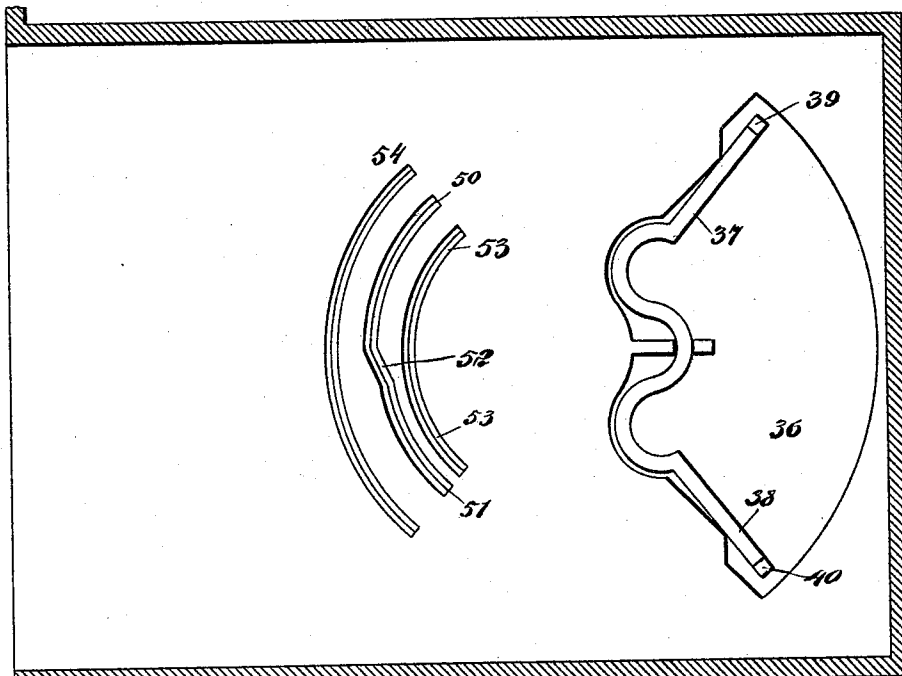
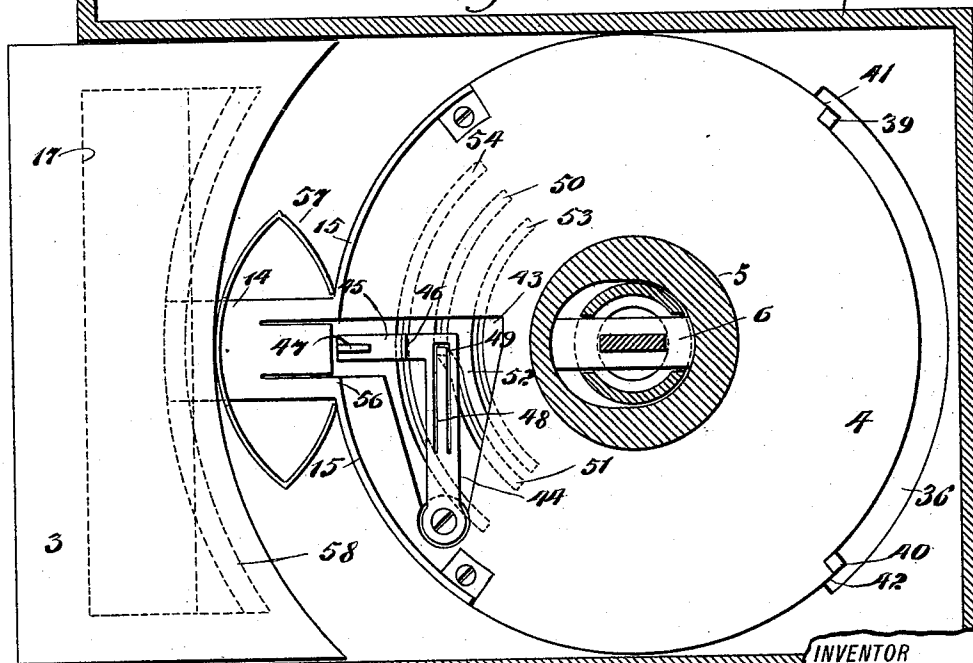


Fig. 4,



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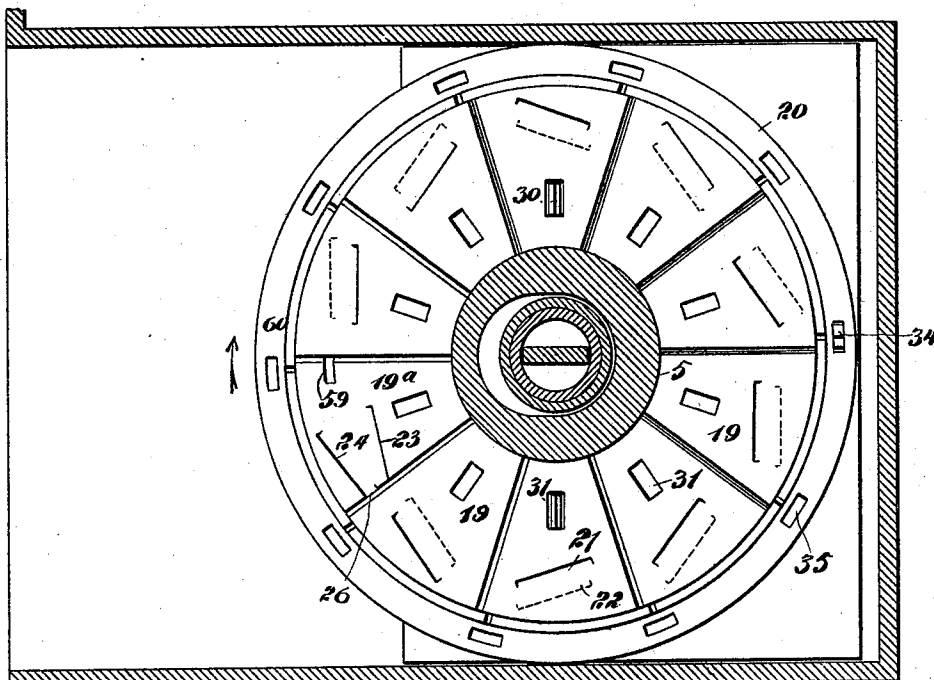
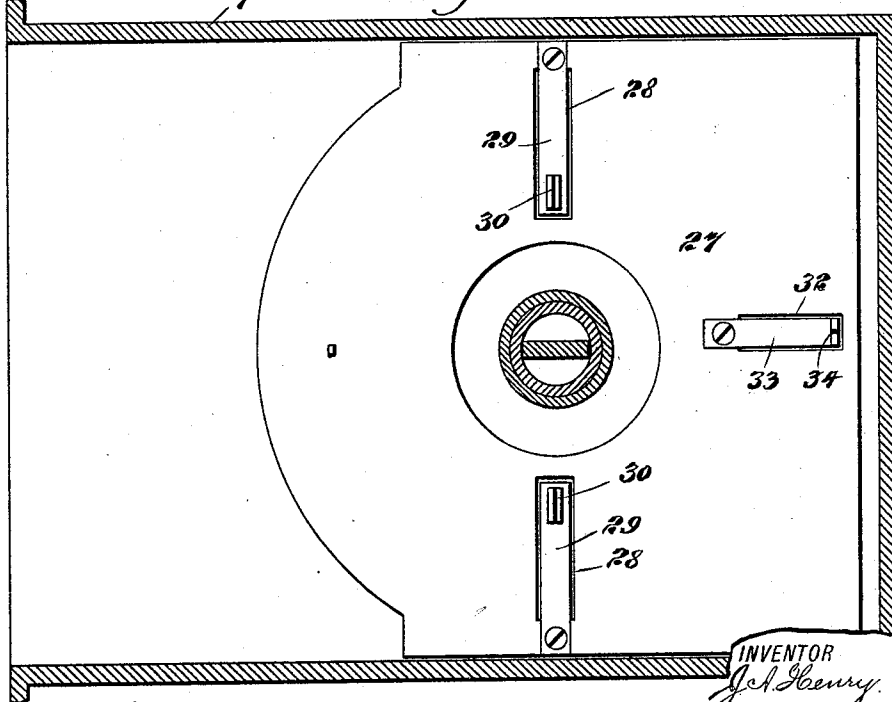


Fig. 6.



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Fig. 7.

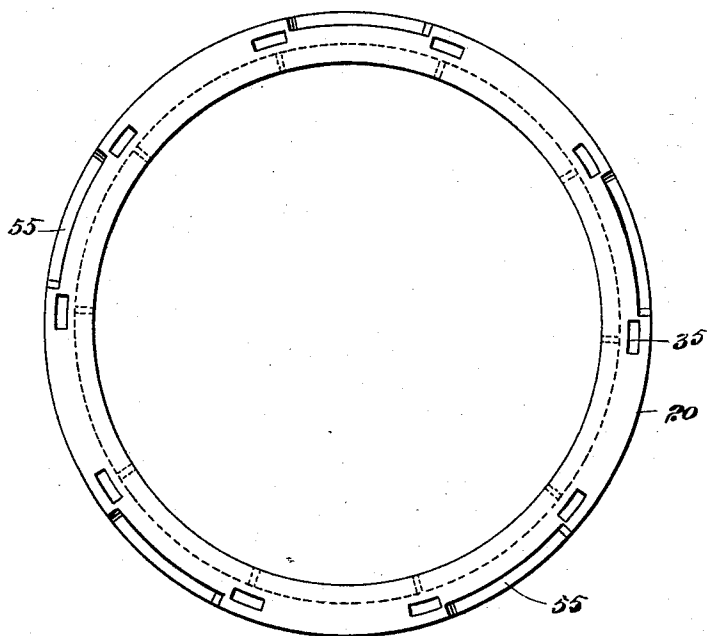


Fig. 8.

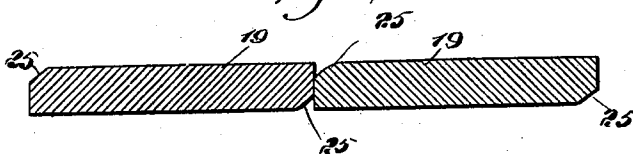


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOHN A. HENRY, OF NEW YORK, N. Y.

PERMUTATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 583,748, dated June 1, 1897.

Application filed November 14, 1896. Serial No. 612,043. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. HENRY, of New York city, in the county and State of New York, have invented a new and Improved Permutation-Lock, of which the following is a full, clear, and exact description.

This invention relates to permutation-locks particularly adapted for use in connection with the doors of dwellings, but its use will not be confined thereto, as it will be obvious that it may be applied in other places.

The object is to provide a lock of comparatively simple construction, that may be readily manipulated to throw it into a locked or unlocked position, and also to so construct it that it may be employed as an ordinary latch.

I will describe a lock embodying my invention, and then point out the novel features in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a longitudinal section of a lock embodying my invention and showing the parts in one position. Fig. 2 is a similar section, but showing the parts in another position. Fig. 3 is a section on the line 3 3 of Fig. 1. Fig. 4 is a section on the line 4 4 of Fig. 1. Fig. 5 is a section on the line 5 5 of Fig. 1. Fig. 6 is a section on the line 6 6 of Fig. 1. Fig. 7 is a plan view of a portion of the lock. Fig. 8 is a sectional detail of tumbler-plates employed, and Fig. 9 is another sectional detail of the tumbler-plates employed.

Referring to the drawings, 1 designates a lock-casing designed to be inserted in a mortise in a door 2 in the usual manner, and in the outer end of this casing 1 is arranged to slide a latching and locking bolt 3, beveled on one side so that it may spring into its keeper, as in ordinary locks.

Arranged within the casing is a plate 4, which for convenience in description I will term the "lower" plate. This lower plate 4 has an upwardly-extended tubular boss 5, the opening of which is elongated in the direction of the length of the casing, and this opening extends through the plate 4. The opening

extended through the plate 4, however, is divided longitudinally by a bridge-piece 6, provided on its inner side with a recess 7.

The tubular spindle 8 of one of the turning-knobs is bifurcated at its inner end, and these bifurcate portions 9 pass through openings at the side of the bridge-piece 6. These bifurcate portions 9 are threaded on the inner side to engage an exterior thread of the spindle 10, attached to the other knob. This spindle 10 is tubular and is provided on its inner side with opposite grooves 11, in which a key-block 12 may move. This key-block 12 is designed to engage at one end in the recess 7, and, as here shown, the recess at its forward end is beveled for a purpose hereinafter to be described. The block 12 is held yieldingly in the recess by means of a spring 13, engaging with said block and with a wall at the end of the spindle 10.

Extended from the front edge of the circular plate 4 is a spring-yielding draw-bar 14. As here shown, this draw-bar 14 is on a plane somewhat higher than the plate 4, and it is attached thereto by spring-arms 15, as plainly indicated in Fig. 4. The free end of the draw-bar 14 extends through a longitudinal slot 16, formed through the inner side of the bolt 3 and providing communication with a chamber 17, extending longitudinally in said bolt. The end of the draw-bar 14 within the chamber 17 is provided with a head 18, adapted to engage against the inner walls of the slot 16.

Mounted on the plate 4 is a series of segmental tumbler-plates 19. These tumbler-plates are removably mounted on said plate 4, and their inner ends bear loosely against the boss 5, and these several tumbler-plates are held in place by means of an actuating-ring 20, surrounding said plates. Each one of the plates 19, excepting the plate 19^a, which I will term for convenience the "initial" plate, is provided on its opposite sides with channels 21 and 22. These channels 21 and 22 are parallel one with the other and are arranged at a tangent or diagonally with relation to the axis of the plates. It will be seen that the channels 21 and 22 are arranged in different orbits with relation to the axis of the plates, the object of which is to provide

for changing a combination, which may be done by reversing one or more of the plates, as will be fully described hereinafter.

The initial plate 19^a is never intended to be reversed. It is here shown as provided on its under side with channels 23 24, which diverge from one edge of the plate and extend substantially to the longitudinal center thereof. The several plates 19 are beveled on their obliquely opposite edges, as indicated at 25 in Fig. 8, the other obliquely opposite edges being at right angles to the faces of the plates to form shoulders for engagement with a moving lug. One edge of the plate 19^a is beveled at a point extended midway between the outer ends of the channels 23 24, as indicated at 26 in Fig. 9. The object of this bevel 26 is to allow the moving lug (to be hereinafter described) to move freely from said plate 19^a to the adjacent plate 19.

Arranged in the casing 1, above the tumbler-plates just described, is a fixed plate 27, having at opposite sides depressions or openings 28, in which spring-plates 29 may move. These spring-plates 29 are secured at one end to the plate 27, and at their inner ends are provided with downwardly-extended lugs 30, designed to engage in openings 31, formed through the several tumbler-plates. These lugs 30 are rounded or tapered, so that under suitable pressure the tumbler-plates may be rotated relatively to the plate 27. The rounded or tapered surfaces, of course, by engaging against the walls of the openings 31 will force the spring-plates into the recesses 28, so that the tumbler-plates may ride or move upon the lugs. At the rear edge the plate 27 is provided with a recess 32, in which is mounted to move a spring-plate 33, having at its free end a lug 34, beveled from its central point outward. This lug 34 is designed to engage in any one of a series of openings 35, formed through the ring 20. This lug 34 will form a retarding or temporary stopping device for the ring 20, but obviously with suitable pressure the ring 20 may be rotated out of engagement with the lug.

Seated in a depression 36 in the bottom plate of the casing 1 is a spring comprising two diverging arms 37 and 38. These spring-arms 37 and 38 are provided at their ends with upwardly-extended fingers 39 40, adapted for engagement, respectively, with shoulders 41 and 42, formed on the periphery of the plate 4 at its rear edge. The end walls of the recess 36 are designed to form stops against which the spring-arms 37 and 38 may engage to prevent their movement too far in an outer direction. These spring-arms 37 and 38 are designed to return the plate 4 to its normal position after having been turned in either direction by means of the spindles.

The forward edge of the plate 4 is provided with an opening 43, and pivotally connected at one end to the plate 4 is an arm 44, having extended from its free end and radially with relation to the plate 4 a spring-yielding finger

45, having on its upper side a transversely-disposed lug 46 and a longitudinally-disposed lug 47. The lug 47 is at the end of the finger 45 and the lug 46 is intermediate of its ends.

The arm 44 has a spring-yielding tongue 48, from the free end of which a pin 49 extends downward to and is adapted to engage in a segmental slot 50 51. It will be seen that the portion 50 of this slot is at a greater distance from the axis of the plate 4 than is the portion 51 of said slot. The adjacent ends of these portions 50 and 51 are joined by a tangential slot 52. This slot is substantially V-shaped in cross-section, and the pin 49 is correspondingly shaped at its end. Within the radius of the slot 50 51 a slot 53 is formed in the wall of the casing, and outside the radius of said slot 50 51 is a segmental slot 54, also formed in the wall of the casing. These slots 53 54 are concentric throughout their length with the axis of the plate 4.

The upper side of the ring 20 is provided at its periphery with a series of segmental channels 55, these channels having their end walls inclined from each end toward the center. These channels are designed to receive the inner end 56 of the draw-bar 14, as shown in Figs. 1 and 2. It will be seen that the fixed plate 27 is curved on its outer edge, and bearing against this curved outer edge are the free ends of a substantially C-shaped spring 57, the opposite side or body portion of which bears against the inner concaved edge of the bolt 3. The body portion of this spring 57 is provided with an opening through which the draw-bar 14 may pass. The slot 16 through the inner side of the bolt 3 is somewhat wider than the thickness of the draw-bar 14, so that said draw-bar may be moved transversely of said slot, and one wall of the chamber 17 is provided with a recess 58, into which the head 18 of the draw-bar 14 may enter. As the key-block 12 engages with the walls of the recess 7 in the plate 4 it is obvious that upon turning the knobs and spindles the said plate 4 will also be rotated.

A rotation of the plate 4 by turning the spindles will cause the draw-bar 14 to move in the arc of a circle. It may be here stated that the limit of movement is substantially that of the width of a tumbler-plate at a point a short distance inward from its outer end. This movement of the draw-bar in the arc of a circle will cause its head portion, bearing against the inner wall of the slot 16, Fig. 1, to move the bolt 3 inward, so that a door may be opened. Upon releasing a knob one of the spring-arms 37 or 38 will return the plate 4 to its normal position, and of course the spring 57 will return the bolt 3 to its normal position. When the parts are in the position indicated in Fig. 2, they are in what may be termed the "locking" position—that is, it will require a predetermined manipulation of the tumbler-plates to free the head 18 of the draw-bar out of the recess 58. It may be here noted that this recess 58 extends length-

wise of the bolt 3 in the arc of a circle concentric with the axis of the plate 4. Therefore when said head portion of the draw-bar is in said recess the plate 4 may be rotated in either direction without imparting motion to the bolt 3.

In the operation, as the tumblers are now set as seen in Fig. 5, the knob must be turned to the left to the limit of its movement. Then by a return movement of the knob the several tumblers will be rotated one step by means of the lug 46 engaging with the shoulder portion at the edge of a plate, and then another movement of the knob to the left must be made and the several tumblers again rotated one step by the return movement of the plate 4. The next four motions of the plate 4 must be to the right, and then two motions are made to the left, and after this two motions are made to the right, and then by bringing the plate 4 to center the lug 46 will move into a recess 59, formed in one edge of the initial plate 19^a, and at the same time the lug 47 will engage in a radial recess 60, formed in the ring 20. At this time the end 56 of the draw-bar 14 will engage the raised surface of the ring 20 between the channels 55, and this ring 20, bearing upon the spring-yielding draw-bar 14, will force the head of said draw-bar into the recess 58, and therefore the knobs or spindles may be rotated at will without imparting motion to the bolt 3.

It may be here stated that should it be desired to change a combination by reversing one or more of the tumbler-plates the several parts must be in this position or as indicated in Fig. 2. Then while the door is open the several movable parts may be moved rearward into the lock-casing by pushing on the bolt 3. This inward movement of the parts, which is provided for by the elongated opening through the plate 4, will force the block 12 upward, and then the spindle 10 may be screwed out of engagement with the spindle 8, and then upon removing the other spindle the works may be drawn out of the casing, so that access may be had to the tumbler-plates for the purpose of reversing them.

By reference to the drawings, Fig. 5, it will be seen that the tumblers are arranged to a certain scheme of numbers, determined by the diagonal channels. The number is two, four, two, two, making ten movements in all, which are necessary to bring the lugs 46 and 47 into the proper position. Should a false move be made—that is, for instance, three initial turns to the left—the lug 46 will engage in one of the diagonal channels 21 or 22, and thus the arm 44 will be swung out of its orbit, consequently moving the pin 49 out of the channel 50 or 51, within which it may be, and this pin 49 will then be moved into engagement with one of the channels 53 or 54, and then, of course, the lock cannot be operated to bring the lugs into proper position without first rotating the tumblers by either right or left movement of the knob until the

passage of the tumbler 19^a under the lug 46 returns said lug to central position by the influence of converging channels 23 24, but observe that as the true or central position of the lug 46 in its orbit is maintained while the pin 49 is moving in branch 50 of the middle channel in case, Fig. 4, a continuous turning of the knob to the left would keep the works in motion without affecting the draw-bar 14, because such left turn of the knob confines the pin 49 to the branch 51 and holds the lug 46 out of line of the opening 59 in the tumbler 19^a. Therefore the proper motion of the knob is to the right continuously not more than ten times, when the lug 46 is bound to be brought back to center, the superior influence of the lug 46 restoring the pin 49 to middle channel in the case. The cutting away of the shoulder on the tumbler 19^a at 26, Fig. 9, will keep the lug 46 from further engagement, and the tumblers will stand at the point of beginning or zero. To start the series of numbers, the knob must be turned to the left, which will enable the lug 46 to engage the point of the shoulder on the tumbler 19^a just inside the cutting before mentioned.

Each change of mechanism from latch to lock or from lock to latch is accomplished by the same movements and by the same passage of the range of numbers as prearranged. There is no reverse arrangement to the scheme of numbers.

When by correct rotation of the spindle the lug 46 is kept at central position until it can fall into a suitable opening in the tumbler 19^a, the lug 47 will of course engage with the ring 20 to carry it forward one step, as before fully explained; but said lug 47, although actuating the ring 20 and securing an automatic change from lock to latch, or vice versa, is kept clear of engagement with the backward-extending hub of the spring-bar 14, which rests upon the flat portion of the ring 20. It is only when the ring 20 raises the bar 14 coincidentally with the fall of the lug 47 into its recess that the line of resistance is formed by which pressure on the bolt-head can lift the key-block 12 from its seat.

It will be noted that the several tumbler-plates and also the ring 20 will at all times be turned to the right or in the direction of the arrow shown in Fig. 5, and as the ring 20 is provided with notches 60 equal in number to the plates one of said notches will at all times be in a position to receive the lug 47. Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A permutation-lock, comprising a casing, a latch-bolt movable in said casing, a plate having draw-bar connection with said bolt, spindles for rotating said plate, a series of tumbler-plates loosely arranged on the first-named plate and having diagonally-disposed guide-slots on their opposite sides, a ring surrounding said tumbler-plates and having a series of notches, an angle-arm piv-

otally connected with the first-named plate and having a lug to engage in one of the notches of the ring, and also having a lug to engage in a notch of one of the tumbler-plates, and a pin on said angle-arm for engaging in an arc slot formed in the wall of the lock-casing, substantially as specified.

2. A permutation-lock, comprising a rotary plate arranged in the lock-casing and having an opening elongated in the direction of the lock-casing, a recessed bridge across said elongated opening, a tubular spindle passing through said plate, another tubular spindle passing through the lock-casing and having a screw-thread engagement with the first-named tubular spindle, a spring-impelled block movable in the second-named tubular spindle and adapted for engagement in a recess formed in the bridge, a spring-yielding draw-bar connected to the rotary plate and engaging in a latch-bolt movable in the casing, a series of tumbler-plates mounted on the rotary plate and having diagonally-disposed grooves on their opposite faces, a ring surrounding said tumbler-plates and having a series of recesses, an arm pivoted to the rotary plate, a finger extended from said arm radially of the plate, a lug on said finger for engaging in a notch formed in one of the tumbler-plates, and another lug on said finger for engaging in one of the notches in the ring, substantially as specified.

3. A lock, comprising a series of tumbler-plates having diagonally-disposed channels on their opposite sides, a rotary plate on which said tumbler-plates are loosely placed, means for moving all of said tumbler-plates, retarding devices for holding said tumbler-plates during a reverse movement of the rotary plate, a latch-bolt movable in the lock-casing, a spring-yielding draw-bar extended from the rotary plate into the latch-bolt, the said draw-bar having a head portion adapted to engage against a longitudinally-disposed shoulder or wall within the latch-bolt and also adapted

for engagement in an arc slot or recess in said latch-bolt, a finger movable radially with relation to the rotary plate, a lug on said finger adapted for engagement in a notch formed in one of the tumbler-plates, a lug on said finger forward of the first-named lug, and a ring surrounding the tumbler-plates, the said ring having a series of notches into either one of which the last-named lug is designed to engage, substantially as specified.

4. In a permutation-lock, the combination with actuating-spindles, of a series of independent tumbler-plates each having a beveled edge, and each having a diagonally-disposed guide or recess on its face, substantially as specified.

5. In a permutation-lock, the combination with actuating devices, of a series of independent tumbler-plates, each having diagonally-disposed guide-recesses on its opposite faces, and each having its obliquely opposite edges beveled, substantially as specified.

6. In a permutation-lock, the combination with a rotary plate, tumbler-plates thereon, and a latch-bolt with which the rotary plate engages, of spindles detachably connected together, one of said spindles being passed through an elongated opening in the rotary plate, and a two-armed spring seated in the lock-casing and engaging at its ends with shoulders formed at the periphery of the rotary plate, substantially as specified.

7. In a lock, the combination with actuating devices, substantially such as described, of a latch-bolt movable in the casing, the said bolt being chambered and provided within the chamber with a straight shoulder portion and a curved shoulder portion, each of said shoulder portions being adapted for engagement with the actuating devices, substantially as specified.

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Witnesses:

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