

Feb. 19, 1924.

F. W. SPROWLES ET AL

1,483,993

PERMUTATION LOCK

Filed July 31, 1922

3 Sheets-Sheet 1

Fig. 1

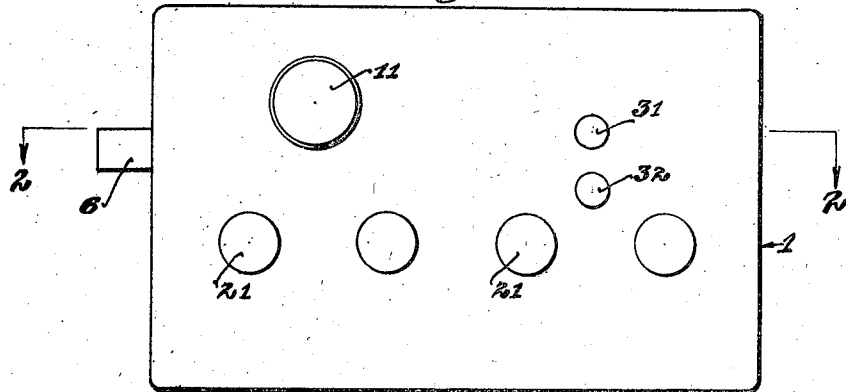
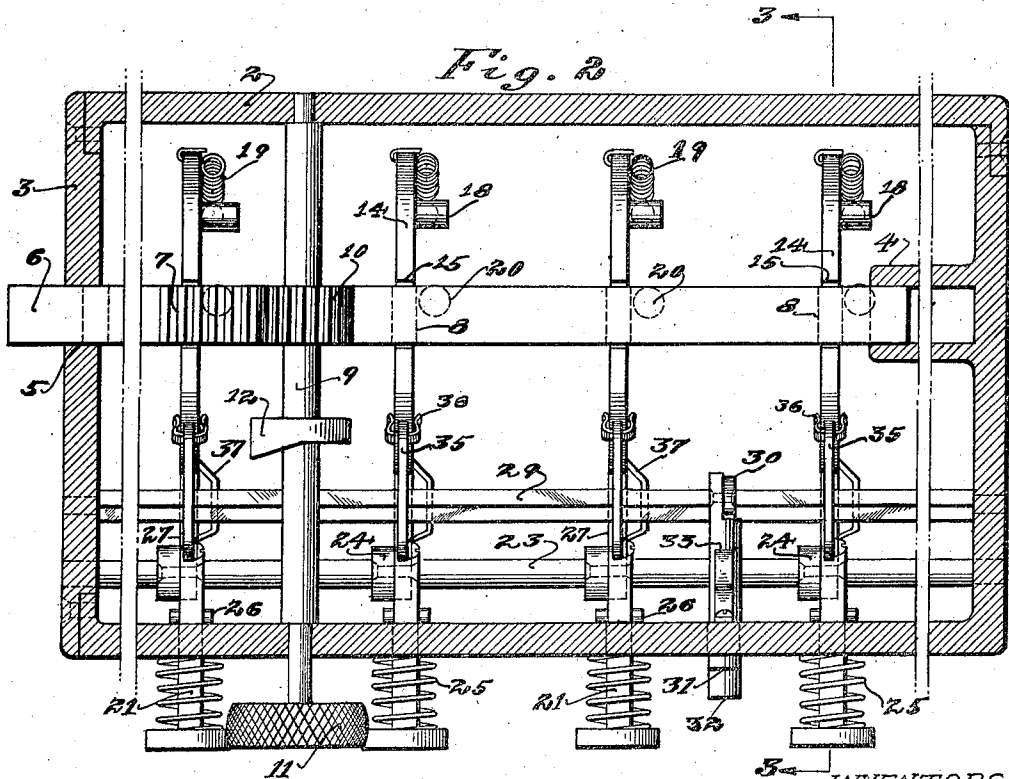


Fig. 2



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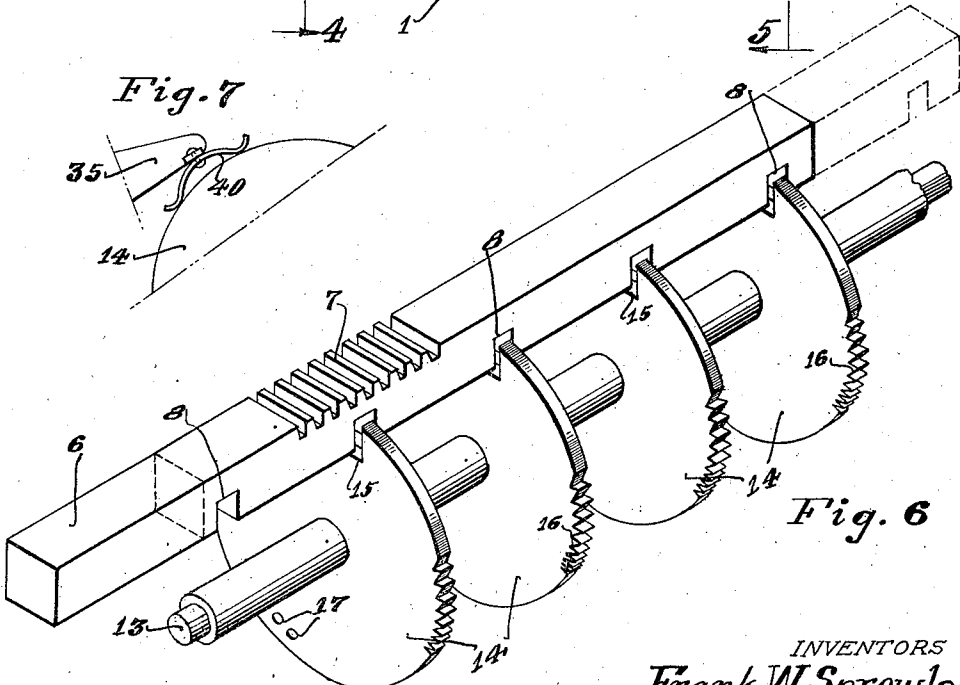
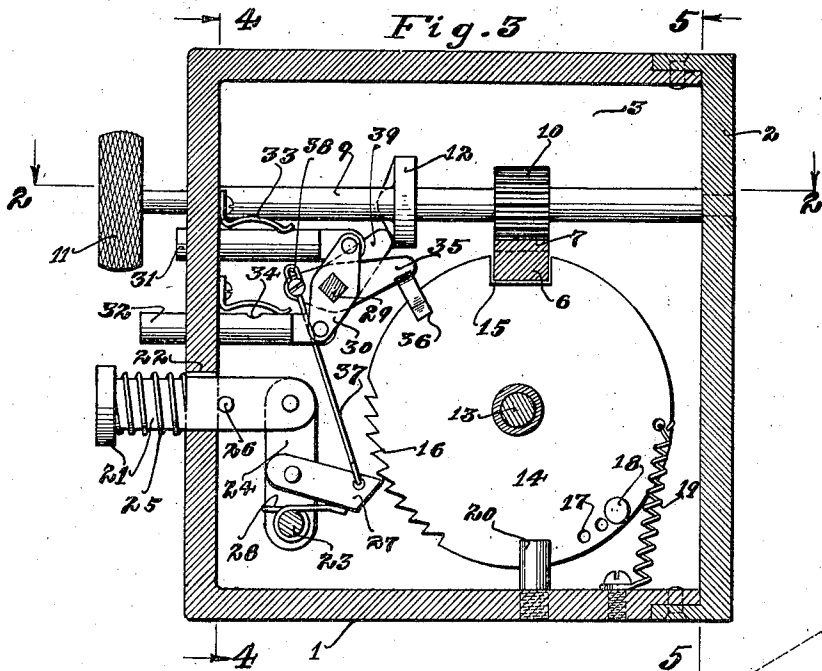
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

Fig. 4

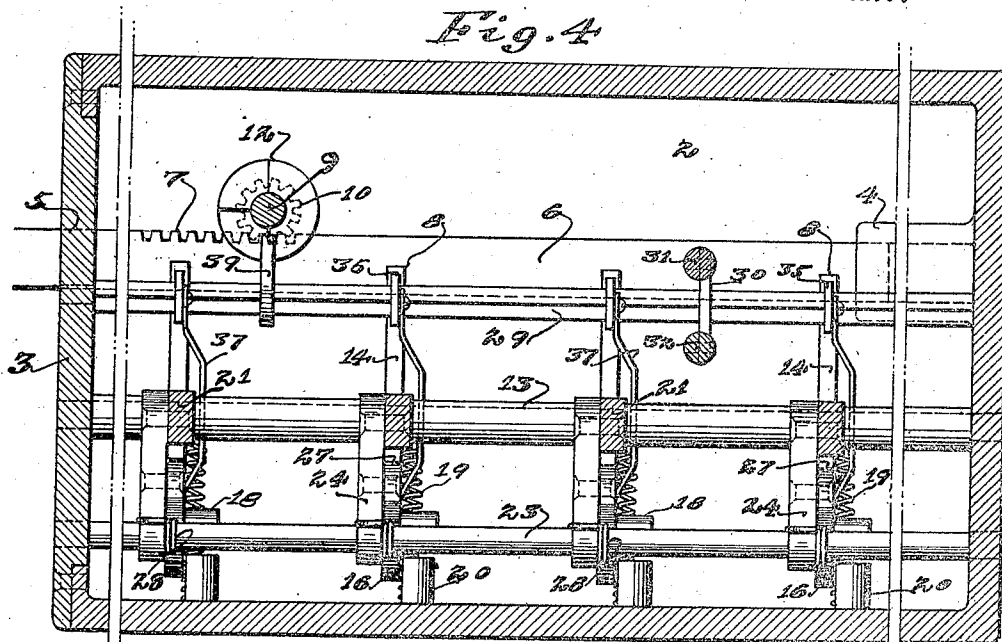
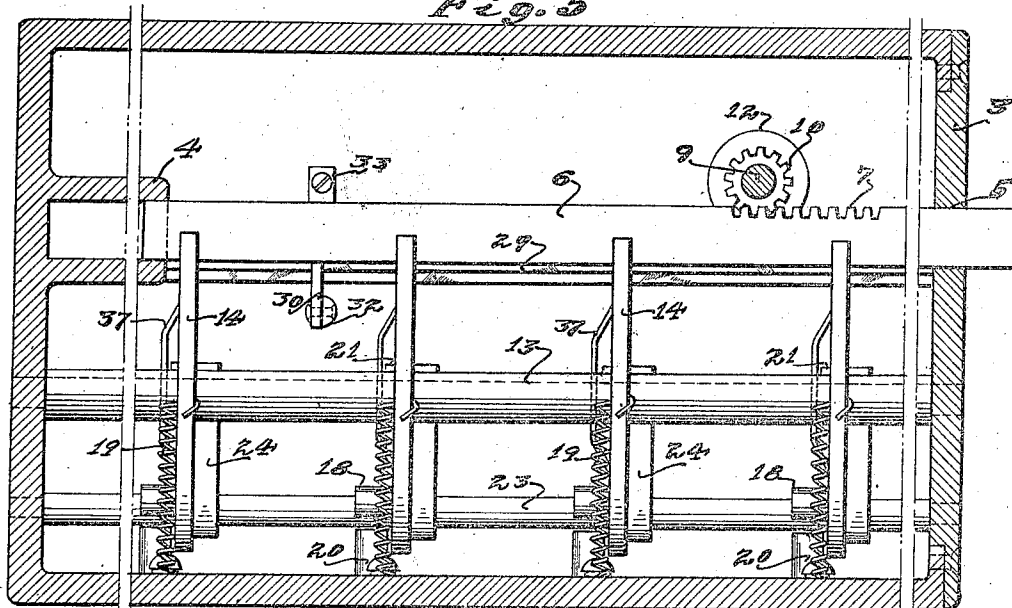


Fig. 5



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UNITED STATES PATENT OFFICE.

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PERMUTATION LOCK.

Application filed July 31, 1922. Serial No. 578,554.

To all whom it may concern:

Be it known that we, FRANK W. SPROWLES and WILLIAM C. FAUNCE, citizens of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Permutation Locks, of which the following is a specification.

This invention relates to locks and more especially to permutation locks.

Among the objects of the invention are to provide a lock which may be readily adjusted for operation by different combinations, which may be readily operated without key or dial by one familiar with the combination for which it is adjusted but cannot be operated by one unfamiliar with the combination, and to provide means for locking the bolt in idle or locking position.

These objects, and other advantageous ends which will be described hereinafter, we attain in the following manner, reference being had to the accompanying drawings in which—

Figure 1 is a front elevation of a lock constructed in accordance with the invention,

Figure 2 is a horizontal sectional view taken on the plane of the section line 2—2 of Figures 1 and 3,

Figure 3 is a vertical sectional view taken on the line 3—3 of Figure 2,

Figure 4 is a vertical sectional view taken on the line 4—4 of Figure 3,

Figure 5 is a vertical sectional view taken on the line 5—5 of Figure 3,

Figure 6 is a perspective view showing the bolt and tumblers, and

Figure 7 is a fragmentary side elevation showing a modified form of friction brake.

In the drawings, 1 is a casing, preferably rectangular and provided with removable walls 2 and 3 through which the device may be assembled and access had thereto. One end of the casing is provided with an inwardly extending hollow projection 4 and the other end with an opening 5. A bolt 6, preferably of rectangular cross section, slides in projection 4 and opening 5, and is provided on its upper face, preferably near one end, with a rack 7, and on its bottom face with a series of transverse grooves 8, preferably five in number, the inner of which is located adjacent the inner end of the bolt.

A transverse shaft 9 is journaled horizontally in the front and back walls of the casing and has a pinion 10 fixed thereto in position to mesh with rack 7, while its outer end carries a knurled head 11 by which it may be turned to project or retract the bolt. It also carries a double-action cam 12.

A rod 13 is fixed in the ends of the casing parallel to and directly beneath bolt 6. A number of flat circular tumblers 14, preferably four, are rotatably mounted upon rod 13 and maintained in spaced relation to correspond with the spacing of grooves 8. Each tumbler is provided with a peripheral notch 15, corresponding in outline to the cross section of bolt 6, a series of ratchet teeth 16 in its periphery and a number of apertures 17 spaced from its periphery and preferably arranged in an arc concentric with the arc of teeth 16. Notches 15 are normally held out of alignment with bolt 6 by weighted stop pins 18 removably inserted in apertures 17, or by contractile springs 19 connected with the tumblers and the bottom of the casing. Rotation of the tumblers is limited by abutments 20 anchored in the bottom of the casing alongside each tumbler and adapted to engage the stop pins.

Plungers 21, preferably of rectangular cross section, corresponding in number to the number of tumblers, are slidable through openings 22 in the front of the casing and project into the casing. A bar 23 is fixed in the ends of the casing and has a series of vertical links 24 pivotally connecting it with the inner ends of the plungers. The plungers are held outward by springs 25, their outward movement being limited by pins 26 engaging the inner face of the front wall of the casing.

Pawls 27 are pivoted to links 24, project inwardly to engage teeth 16 and are normally held in engagement by springs 28 mounted on bar 23 and pressing upwardly on the pawls.

A squared shaft 29 is mounted to turn in the ends of the casing above plungers 21 and has a cross arm 30 fixed thereon. Upper and lower push pins 31 and 32 are mounted in apertures in the front of the casing above the plungers have their inner ends pivotally connected to the ends of cross arm 30. By pushing one pin inward,

the shaft may be rocked in one direction and by pushing the other pin inward, it may be rocked in the other direction. Springs 33 are fixed to the front of the casing and engage notches 34 in the pins to hold rocker shaft 29 in fixed positions at the limits of its movements. Levers 35 are fixed to shaft 29 adjacent each tumbler 14 and have transverse resilient brake shoes 36 at their inner ends to frictionally engage tumblers 14 and hold them against turning, as shown in Figure 3. The shorter arms of levers 35 are connected to pawls 27 by links 37 having slotted connection with the levers as indicated at 38 so that the levers or pawls may move slightly without affecting the position of the other. An arm 39 is fixed to shaft 29 for engagement by cam 12 to rock shaft 29 upon turning shaft 9 in either direction to project or retract the bolt and simultaneously release the brakes to permit the tumblers to turn and lock bolt 6 in locked or unlocked positions. If desired, levers 35 may be provided with resilient brake shoes 40 extending lengthwise of the levers to engage the edges of the tumblers 14 as shown in Figure 7, instead of crosswise to straddle the tumblers and frictionally engaging the sides thereof. All of the tumblers and operating means therefor are alike in construction and the description and illustration in Figure 3 will suffice for all. Tumbler shown in Figure 3 is set by inserting pin 18 in the top aperture 17 and when pin 18 is against abutment 20, pawl 23 is in the lowest notch of teeth 16. In this position, four depressions of plunger 21 are required to step the tumbler and bring notch 15 into alignment with bolt 6. By changing the position of pin 18 to the second aperture 17, three depressions will be required to bring notch 15 into alignment with bolt 6 and by inserting pin 18 in the third or lowest aperture 17, two depressions will be required to effect the same result. By varying the number of notches 16 and the number of apertures 17, as well as the relations of notch 15 thereto, the number of depressions required to bring notch 15 into alignment with bolt 6 may be varied from one up to an indefinite number.

In operation of the device, assuming that the bolt 6 is retracted or drawn to the position shown in dotted lines in Figure 6, the four forward grooves 8 of the bolt will line up with tumblers 14, and if brakes 36 are released by pressing pin 32 or turning cam 12, weights 18 and springs 19 will immediately turn the tumblers in a clockwise direction until stop pins 18 engage abutments 20. In this position, notches 15 will be out of alignment with bolt 6 and the tumblers will hold the bolt against movement. As springs 25 normally hold plungers 21 out-

wardly and springs 28 hold pawls 27 in position to engage notches 16 in the tumblers, when brake shoes 36 are released by pressing pin 32, shaft 29 will be rocked, the inner ends of levers 35 will be raised and the outer ends lowered and, through links 37, cause downward movement of pawls 27 against springs 28. This will clear the pawls from the path of teeth 16 and permit free turning of the tumblers. Springs 33 will alternately engage notches 34 in pins 31 and 32 to hold the brake shoes in operative and released positions. These parts may be operated automatically upon turning shaft 9 by its head 11 to retract the bolt when pinion 10 is turned in an anticlockwise direction in mesh with rack 7. When shaft 9 is turned, cam 12 will engage arm 39 and exert upward pressure thereon to raise it and rock shaft 29 so that pawls 27 will be moved downwardly and automatically released and the tumblers will immediately lock the bolt in an unlocked or drawn position.

In the locking operation, brake shoes 36 are first applied, stop pins 18 having been set in one of the apertures 17 of each tumbler to set the combination, and the four outer grooves 8 of the bolt being in position to permit the tumblers to turn, plungers 21 are pressed inwardly to step the tumblers by engagement of pawls 27 with teeth 16, the required number of times to bring notches 15 in alignment with bolt 6, in which position tumblers are held by the brakes. Assuming the combination to be 4-2-3-4, the pins 18 of the tumblers 14 will have been set to require a corresponding number of depressions of plungers 21 to bring notches 15 into alignment with bolt 6. Then, upon turning head 11 and shaft 9 in a clockwise direction, pinion 10 will be correspondingly turned into mesh with rack 7 to project the bolt to the full line position shown in Figure 6, for locking the bolt as shown. At the limit of movement of the bolt, the brakes are released by pressing on pin 32, or automatically by engagement of cam 12 with arm 39 upon turning shaft 9, thus automatically moving pawls 27 downwardly out of path of teeth 16, so that the tumblers will turn through the four inner grooves 8 of the bolt and lock the bolt in a projected or locked position in engagement with a suitable keeper.

The device shown in Figure 3 is arranged so that pawl 27 will engage with the first lower notch 16 of the adjacent tumbler 14 when stop 18 is against abutment 20 and the bolt is in drawn or locking positions. Four depressions of plungers 21 are then required to turn tumbler 14 the proper degree to bring notch 15 in the path of bolt 6. By varying the position of pin 18, the distance which the notch 15 moves away

from the bolt is changed and may be regulated so that the number of depressions of the plunger required to turn the tumbler and bring notch 15 in alignment with the bolt by engagement of pawl 27 with the teeth 16, may be varied to alter the combination of the lock but the distance between a notch or tooth 16 and a corresponding aperture 17 remains the same for each tumbler owing to the fixed position of the notches 15, so that the latter may be brought in the path of the bolt 6 to permit sliding of the bolt. In the form shown, the limit is four but by providing the proper number of notches 16 and apertures 17, the limit may be raised and the number of combinations indefinitely varied. While the lock is especially adapted for use in connection with automobiles to connect or disconnect the steering wheel hub with the post, it is to be understood that the lock may be applied to various other uses.

While we have described our invention as taking a particular form, it will be understood that the various parts of my invention may be changed without departing from the spirit thereof, and hence we do not limit ourselves to the precise construction set forth, but consider that we are at liberty to make such changes and alterations as fairly come within the scope of the appended claims.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. In a permutation lock; a casing; a bolt slidable therein; means for actuating the bolt, and means automatically movable into the path of the bolt for holding the bolt in locked and unlocked positions.

2. In a permutation lock; a movable bolt; means for shifting the bolt; tumblers normally locking the bolt against movement; means for moving the tumblers to release the bolt; means for holding the tumblers against movement, and means for automatically releasing the holding means when the bolt reaches locked or unlocked positions.

3. In a permutation lock; a movable bolt; means for shifting the bolt; tumblers normally locking the bolt against movement; means for moving the tumblers to release the bolt; means for holding the tumblers against movement, and means automatically operative upon movement of the bolt at the limits of its movement for releasing the tumbler holding means.

4. In a permutation lock; a movable bolt; means for shifting the bolt; tumblers normally locking the bolt against movement and normally positioned to hold the bolt against movement; means for moving the tumbler to release the bolt; means for holding the tumblers against retrograde move-

ment when shifted to permit movement of the bolt, and means for simultaneously releasing the holding and moving means to permit the tumblers to hold the bolt against movement.

5. In a permutation lock; a movable bolt; means for shifting the bolt; tumblers normally locking the bolt against movement; means for operating the tumblers to release the bolt; and means co-operative between the bolt actuating means and the tumbler operating means for automatically releasing the locking means upon movement of the bolt to locked or unlocked position.

6. In a permutation lock; a casing; a bolt slidable therein; means to shift the bolt to projected or retracted positions; means for locking the bolt when shifted to either of said positions and means automatically operative upon actuation of the bolt to set the holding means.

7. In a permutation lock; a movable bolt having notches; means for shifting the bolt; tumblers normally locking the bolt against movement and having notches adapted to align with the bolt; means for moving tumblers to bring their notches in alignment with and release the bolt, and brake shoes for holding the tumblers against movement.

8. In a permutation lock; a movable bolt; a set of rotatable tumblers adapted to move into the path of the bolt to hold it against movement when drawn or projected and to be moved to positions permitting movement of the bolt; means for rotating the tumblers; releasable means for holding the tumblers against rotation; adjustable means for limiting the rotation of the tumblers, and means for automatically releasing the holding means when the bolt reaches either locked or unlocked position.

9. In a permutation lock, the combination of a casing; a sliding bolt; a set of rotatable tumblers mounted in the casing adapted to move into the path of the bolt to hold it against movement when drawn or projected; means for stepping the tumblers to move them into position to permit the bolt to be drawn or projected; means to hold the tumblers against movement, and means for automatically releasing the holding means upon the bolt being drawn or projected to permit the tumblers to move into the path of the bolt.

10. In a permutation lock, a movable bolt having a rack on one face and a series of grooves in another face; a shaft having a pinion engaging the rack; a set of rotatable tumblers adapted to move into the path of the bolt through the grooves and having notches to align with the bolt whereby the bolt may be shifted; means for operating the tumblers; means to hold the tumblers against movement, means to turn the tum-

blers upon release of the holding means to move the notches out of alignment with the bolt whereby the bolt will be held against movement; and cam means on said shaft
5 for automatically releasing said holding means when said bolt reaches locked or unlocked positions.

11. In a permutation lock, the combination of a casing; a bolt slidable in the casing and having uniformly spaced grooves
10 its bottom face; tumblers rotatable in the casing, having edge notches, and being of a number one less than the number of grooves in the bolt; the tumblers having
15 notches to align with the bolt and adapted to move into the grooves to lock the bolt in projected or drawn positions; means for turning the tumblers in one direction; adjustable means for limiting the turning of
20 the tumblers with the notches out of alignment with the bolt; plungers having pawls engaging the notches to turn the tumblers upon depression of the plungers; means for moving the bolt; brake means including a
25 rock shaft having brake shoes having connection with the pawls and adapted to engage the tumblers to hold the tumblers against turning, and means to rock the shaft for releasing the brake means and pawls to
30 permit the tumblers to be turned into the

grooves of the bolt to hold the latter against movement in either direction.

12. In a permutation lock; a movable bolt; tumblers normally locking the bolt
35 against movement; pawls for moving the tumblers to release the bolt; brake shoes mounted to prevent retrograde movement of the tumblers during movement by said
40 pawls; and means for simultaneously releasing said pawls and said brake shoes.

13. In a permutation lock; a movable bolt; means for shifting said bolt; tumblers
45 normally locking the bolt against movement; pawls for moving the tumblers to release the bolt; brake shoes mounted to prevent retrograde movement of the tumblers during movement by said pawls; means for simultaneously releasing said pawls and
50 said brake shoes; and a cam associated with said bolt shifting means for automatically operating said releasing means when the bolt reaches locked or unlocked positions.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

FRANK W. SPROWLES.
WILLIAM C. FAUNCE.

Witnesses:

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JOHN E. BURCH.