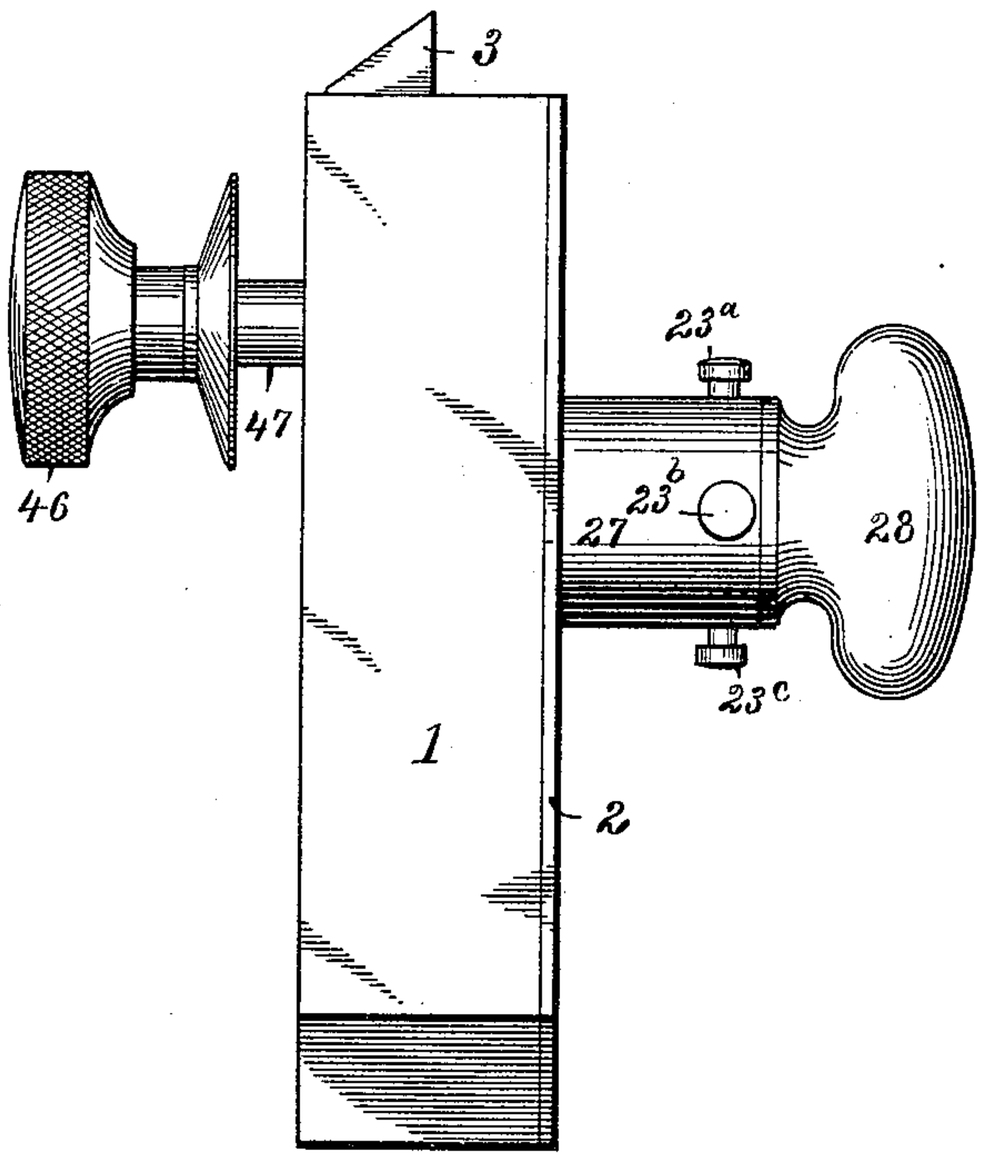
(No Model.) 2 Sheets—Sheet 1.

J. H. CHRISTIE.

PERMUTATION LOCK.

No. 460,559. Patented Oct. 6, 1891.

Fig. 1.



x

Fig. 2.

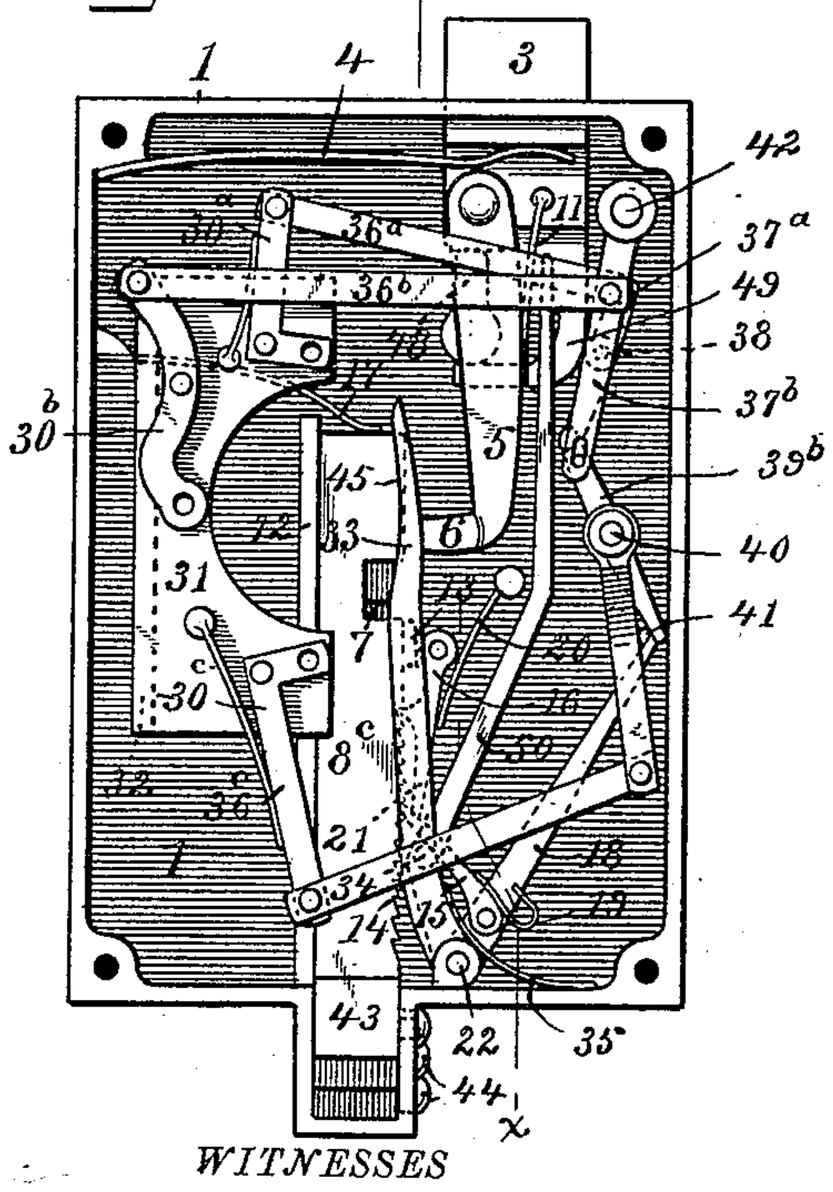
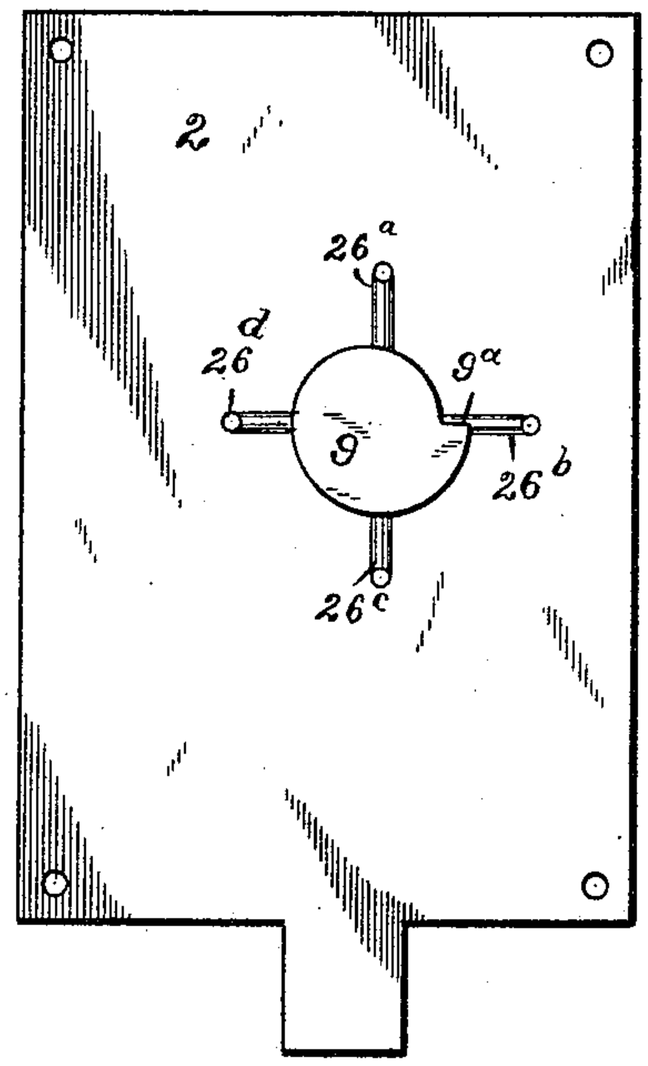


Fig. 3.



WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

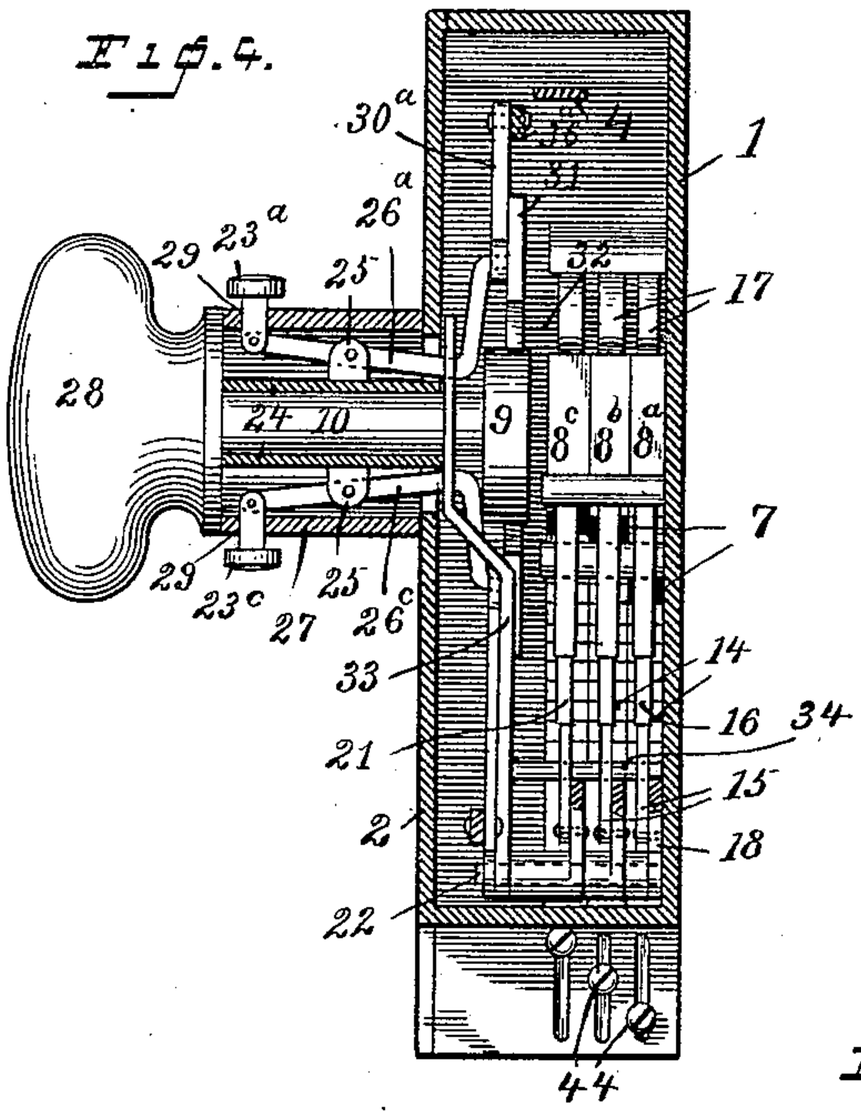

Fig. 5.

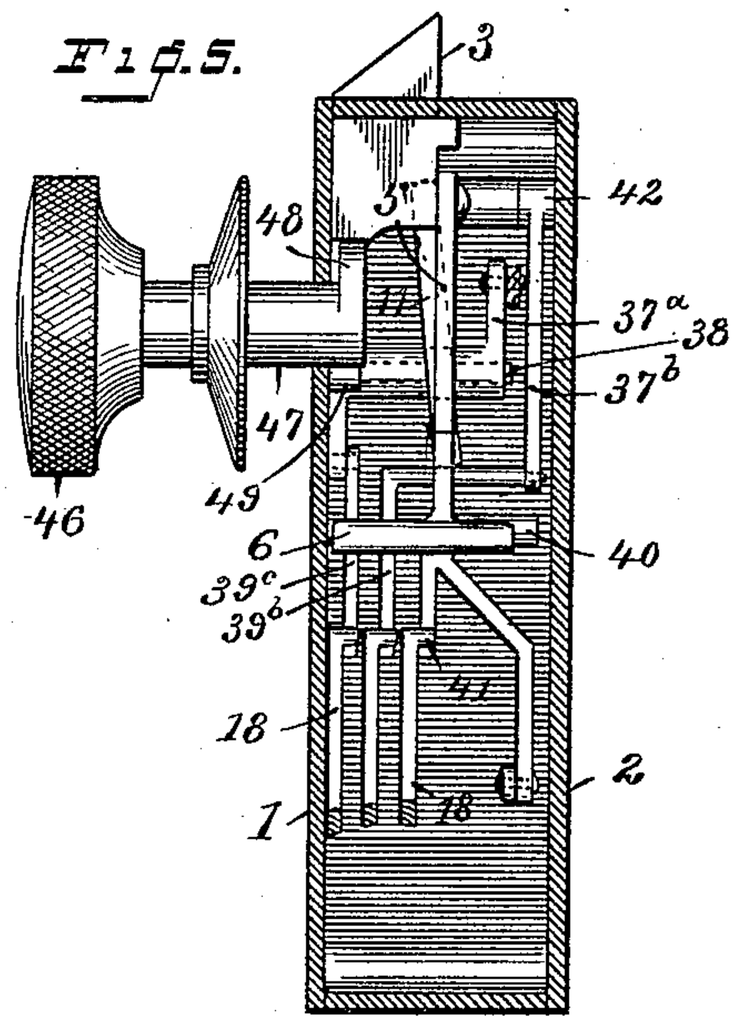

Fig. 6.

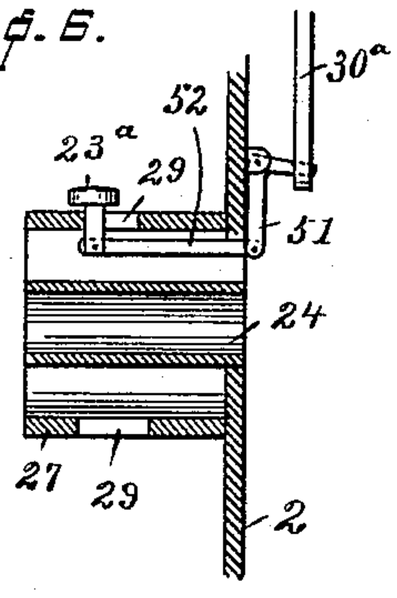

Fig. 8.

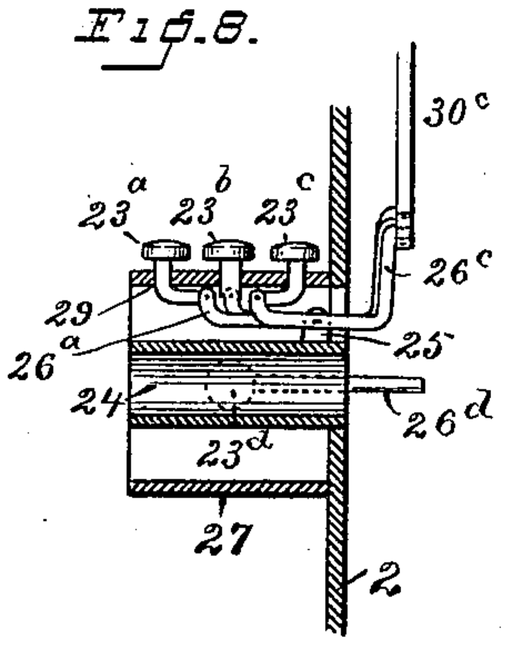

Fig. 7.

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PERMUTATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 460,559, dated October 6, 1891.

Application filed September 24, 1890. Serial No. 365,982. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. CHRISTIE, a citizen of the United States, residing at Stamford, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Permutation-Locks; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to produce a simple, inexpensive, and efficient permutation-lock.

My novel lock is adapted to all the various uses to which locks of this class are applied, but is especially adapted for use upon the doors of dwellings as a substitute for ordinary pass-key locks, and is admirably adapted for use upon the doors and drawers of desks, secretaries, &c.

In the accompanying drawings, forming part of this specification, Figure 1 is an elevation of my novel lock as adapted for use upon the doors of dwelling-houses, complete and ready for attachment; Fig. 2, a plan view with the outer plate of the case removed, illustrating the mechanism of the lock; Fig. 3, an inverted plan view of the outer plate of the case; Fig. 4, a section of the completed lock, the line of the section being indicated by *x x* in Fig. 2, looking toward the left; Fig. 5, a similar view looking toward the right; Fig. 6, a detail sectional view illustrating a slight change in the construction of the actuating mechanism; Fig. 7, a plan view corresponding with Fig. 2, illustrating certain obvious changes in the details of construction of the operating mechanism; and Fig. 8 is a detail sectional view illustrating the actuating mechanism corresponding with the operating mechanism in Fig. 7.

I have deemed it sufficient for the purposes of this specification to illustrate a single form of my novel lock and modifications thereof, it being apparent that the location and arrangement of the actuating mechanism, as well as the arrangement of the operating mechanism, may be readily varied to suit the special requirements of various styles of locks.

1 denotes the case of the lock, and 2 the covering-plate therefor.

3 is a bolt, which in the present instance I have shown as a latch-bolt; 4, a spring for holding the bolt at the thrown position, and 5 a fence, the outer end of which is pivoted to the bolt. At the inner end of the fence is a cross-bar 6, which acts as a stump to engage the gates 7 of sliding tumblers 8, and is also adapted to be engaged by a shoulder 9^a on a cam 9 at the inner end of knob-spindle 10.

11 is a spring acting to hold the fence in contact with the tumblers and to force the stump into the gates when the tumblers are placed in proper position. The tumblers lie between a rib 12 and a stump 13 upon the case, the stump being indicated by dotted lines in Figs. 2 and 7. The tumblers are provided with racks 14, which are engaged by setting-pawls 15 and locking-pawls 16. Springs 17 bear against the inner ends of the tumblers and act to hold them in position to be acted on by the setting-pawls. The setting-pawls are pivoted to levers 18, and are held in operative position by springs 19, which also act to hold said levers in operative position, as will be more fully explained. The locking-pawls slip over the teeth of the racks and permit the tumblers to be moved forward against the power of springs 17 by the setting-pawls, but lock them against backward movement except when both pawls are lifted, as will presently be explained. The locking-pawls are held in the engaged position by springs 20, and each of said pawls is provided with an arm 21, which rests upon one of the setting-pawls, so that when the latter are lifted out of engagement with the rack-teeth the locking-pawls are raised with them. The levers 18, which carry the setting-pawls, are pivoted on a post 22 and are operated through intermediate connections by means of finger-pieces 23^a, 23^b, and 23^c on the outer side of the lock, and in case of a mortise-lock, as shown in the drawings, on the outer side of the door.

33 denotes a lifting-lever, also pivoted on post 22. This lever is provided with an outwardly-extending rod 34, which lies under the setting-pawls, the lever itself being held by a spring 35, in contact with a lever 26^d,

presently to be described, which in turn connects with a finger-piece (not shown) on the outer side of the lock. When lever 26^d is operated, the lifting-lever is raised, and, by means of arm 34, raises the setting-pawls and locking-pawls out of contact with the rack, this movement being against the power of springs 19, 20, and 35.

I wish it understood that the special construction and arrangement of the intermediate connections by which levers 18 are operated is not of the essence of my invention, as it is obvious that the arrangement of these parts may be varied to an almost unlimited extent without departing from the principle of the invention. In the present instance I have shown the knob-spindle as inclosed within a tube 24, which is rigidly attached to the case of the lock and extends outward therefrom. In the form shown in Figs. 1 to 5, inclusive, ears 25 are secured to the outer side of this tube, and levers 26^a, 26^b, 26^c, and 26^d are pivoted to these ears. The outer ends of the levers are inclosed within an outer tube 27, which is also rigidly attached to the case. The shank of the knob 28 is made sufficiently large to close the outer end of tube 27. The shanks of the finger-pieces extend through openings 29 in tube 27 and are pivoted to the outer ends of the levers.

In order that the operation of my novel lock may be clearly understood, I will describe the intermediate mechanism which connects each finger-piece with its corresponding tumbler. For convenience in description, I will refer to the tumblers corresponding with the first three finger-pieces and levers as 8^a, 8^b, and 8^c. As the three setting-pawls 15 and the three levers 18 by which they are carried are just alike, being placed one above the other, as clearly shown in Fig. 4, it is not thought necessary to distinguish them individually. In the form shown in Figs. 1 to 5, inclusive, the inner ends of levers 26^a, 26^b, and 26^c are bent at an angle and then bent forward to engage openings in another set of levers, which I denote, respectively, as 30^a, 30^b, and 30^c. These levers are pivoted to a plate 31, provided with a flange 32, by which it is rigidly secured to the case of the lock. (See Fig. 4; also dotted lines, Figs. 2 and 7.) Lever 26^a is pivoted to lever 30^a. A link 36^a connects lever 30^a with one arm of a lever 37^a. This lever is pivoted on a post 38, the other end thereof being pivoted to one end of a lever 39, which is itself pivoted on a post 40. The other end of lever 39 bears against an enlargement 41 at the end of one of the levers 18, carrying one of the setting-pawls. It will be seen from Fig. 2, in connection with Fig. 3, that when finger-piece 23^a is operated the lever 18, having an enlargement 41, will be pressed downward, which will move the setting-lever carried thereby forward, carrying the corresponding tumbler 8^a forward with it, the corresponding locking-pawl sliding freely over one tooth. The instant pressure is removed from finger-piece 23^a the several levers just described will resume their normal position, the setting-pawl spring 19 being curved and so connected to lever 18 as to move said lever and pawl away from each other—that is to say, the free end of the lever will be moved outward toward the side of the case and the pawl will be moved backward one tooth over the rack on the tumbler. Lever 26^b is pivoted to lever 30^b, which is connected by a link 36^b with a lever 37^b, which in turn is pivoted to a lever 39^b. Lever 37^b is pivoted on a post 42, lever 39^b being pivoted on post 40. The free end of lever 39^b bears upon the enlargement 41 at the end of one of the levers 18, carrying a setting-pawl 15, as is clearly shown in Fig. 5. Each time finger-piece 23^b is operated the intermediate mechanism described, or equivalent mechanism, will move tumbler 8^b forward the length of one rack-tooth. Lever 26^c is pivoted to a lever 30^c, which in turn is connected by a link 36^c with one arm of a branched lever 39^c, the other arm of this lever bearing against an enlargement 41 at the free end of one of the levers 18. It will be seen from the above that each actuation of one of the finger-pieces acts through suitable intermediate mechanism to move the corresponding tumbler one notch inward toward the center of the lock. The outer ends of the tumblers bear against blocks 43, these blocks being locked in position by screws 44. The combination is made up by locking each block in such a position that when the outer end of the tumbler is resting against it a certain number of movements of the corresponding finger-piece will move that tumbler into such a position that the gate will receive the fence. The combination may be changed at any time by loosening the screws and changing the position of the blocks. Suppose, for example, that the lock is set upon the numbers 4 1 3. The operator to open the lock operates finger-piece 23^a four times, which through the intermediate mechanism moves the corresponding tumbler forward four notches and places the gate in position to receive the fence. Finger-piece 23^b is operated once, which places the second tumbler in gate. Finger-piece 23^c is operated three times, which places the third tumbler in gate and permits the fence to drop down into the gates of the three tumblers, the fence, as already stated, being acted upon by spring 11. The special order in which the finger-pieces are operated is wholly immaterial. The bolt cannot yet be retracted, however, owing to the fact that the pawls are still in engagement with the rack. To raise the pawls the operator must operate still another finger-piece. This finger-piece is not shown in the first form, but its corresponding lever 26^d is shown in Fig. 3. This lever is so arranged that when the corresponding finger-

piece is operated the end of the lever will raise lifting-lever 33, and with it the locking-pawl and the setting-pawl.

In order that the operation may be clearly understood I have indicated approximately the point at which the lifting-lever is engaged by lever 26^d by 45. The bolt is then free to be retracted by rotation of knob-spindle 10, shoulder 9^a upon cam 9 engaging cross-bar or stump 6 and acting to retract the bolt against the power of spring 4, the tumblers of course moving with the bolt. The instant the knob is released spring 4 acts to return the bolt to the thrown position. To break the combination the operator simply turns the knob backward, which causes the cam to engage stump 6 and lift the fence out from the gates of the tumblers. As soon as the fence is lifted springs 17 act to force the tumblers back to their normal position—that is to say, a position not in gate—leaving the fence resting upon the faces of the tumblers, as shown in Figs. 2 and 7. Until cam 9 is turned backward, however, the operator has simply to turn the knob forward in the usual way to retract the bolt. In adapting my lock to the doors of dwellings which require to be opened from the inner side without setting up the combination, I provide a knob 46, whose spindle 47 is provided within the lock-case with an arm 48, which in turn engages a hook-shaped arm 49, extending from the inner end of the bolt. It will thus be seen that under ordinary circumstances the door may be readily opened from the inner side by turning knob 46 and from the outer side, after operating the combination, by turning knob 28. Each time a person opens the door from the outer side by setting up the combination he gives knob 28 a turn backward, which breaks up the combination and allows the door to slam shut. In order that a person upon the inner side may open the door at all times, even should the door have happened from any cause whatever to be left in the closed position with the combination set up and the stump in engagement with the gates, I provide an arm 50, which is pivoted on stump 22, is rigidly connected to the arm 34, extending from the lifting-lever, and extends forward into such a position that its free end is engaged by arm 48 on the inside knob-spindle each time the inside knob is turned, so that under any circumstances the lock may be readily opened from the inner side, as the rotation of the inside knob-spindle must act to lift arm 34, and with it both the setting and the locking pawls, thus releasing the tumblers and permitting them to move with the bolt if the stump is in engagement with the gates.

Arm 50 is clearly shown in Figs. 2 and 7, but has been omitted from Fig. 4, in which a portion of it would naturally show, for the sake of clearness.

In the form shown in Fig. 6 bell-crank levers 51 are substituted for the curved levers 26^a, 26^b, and 26^c of the form illustrated in Figs. 1 to 5, inclusive. The thumb-piece in this form is connected to a link 52, and the operation is by a longitudinally sliding movement, instead of by an inward movement, as in the other form.

In Figs. 7 and 8 I have shown a form in which finger-pieces 23^a, 23^b, and 23^c operate as in the form shown in Figs. 1 to 5, inclusive, but are all three arranged upon the top of the outer shell, instead of on different sides of it. The finger-piece 23^d is shown in dotted lines in this form, and the lever 26^d, which operates the lifting-lever, is shown in the same position as in the other form. In Fig. 7 levers 30^a operate as in the first form, although they differ in arrangement from the corresponding levers in said form, being all pivoted on a single stump. Levers 37^a, 37^b, and 37^c are omitted. Links 36^a and 36^b connect with levers 39 and 39^b, and link 30^c connects directly with a lever 18, which in this instance is made shorter than the other two.

As already stated, these special details of construction are not of the essence of my invention, and may be greatly varied without departing from the principle involved.

Having thus described my invention, I claim—

1. The combination, with a series of sliding tumblers having gates and racks, of a bolt having a pivoted fence with a stump adapted to engage the gates when in line, a series of setting-pawls acting to place the tumblers in gate, and suitable operating mechanism for setting up the combination from the outer side of the lock.

2. A series of sliding tumblers having gates and racks and a bolt having a pivoted fence, with a stump adapted to engage the gates when in line, in combination with setting-pawls engaging the racks, locking-pawls engaging the racks and also the setting-pawls, a lifting-lever having an arm engaging the setting-pawls, finger-pieces on the outer side of the lock, and intermediate connections between said finger-pieces and the setting-pawls and lifting-levers.

3. The combination, with sliding tumblers having gates and racks, pawls engaging said racks, and mechanism for actuating the pawls and placing the tumblers in gate, of adjustable blocks 43, against which the tumblers engage, as and for the purpose set forth.

4. The tumblers having racks and gates, pawls engaging the racks, and mechanism for actuating the pawls, in combination with a bolt having a pivoted fence, with a stump adapted to engage the gates, and an arm 49, and an inside knob-spindle having an arm 50, adapted to engage arm 48, so that the bolt may be retracted from either side of the door.

5. The combination, with a series of sliding tumblers having gates and a spring-bolt having a pivoted fence, and a cross-bar serving as a stump to engage the tumblers when in gate, of mechanism, substantially as shown and described, for setting up the combination,

and a spindle having at its inner end a cam 9, with a shoulder 9^a, said shoulder being adapted to engage the stump to move the bolt to the retracted position when the combination is set up, and the cam to engage the stump to lift it out of the gates when the spindle is turned in the opposite direction.

6. The combination, with a series of sliding tumblers having gates and racks, setting-pawls by which the tumblers are moved forward in setting up the combination, locking-pawls, and springs 17, acting to return the tumblers to their normal position when the bolts are lifted, of a bolt having a pivoted fence, with a cross-bar serving as a stump to engage the gates when in line, and a spindle having a cam with a shoulder 9^a, whereby the bolt may be retracted when the stump is in engagement with the gates and the pawls are lifted out of engagement with the rack.

7. A series of sliding tumblers having gates and a bolt having a pivoted fence, with a stump adapted to engage the gates, in combination with setting-pawls, actuating mechanism therefor which moves the tumblers in setting up the combination, locking-pawls, a lifting-lever having an arm 34, adapted to raise both sets of pawls, and finger-pieces on the outer side of the lock which engage, respectively, the mechanism acting upon each tumbler and also the lifting-lever, so that when the finger-pieces have all been operated the stump will be in engagement with the gates and the pawls lifted.

8. A series of sliding tumblers having racks and gates and a bolt having a pivoted fence, with a stump adapted to engage the gates, in combination with setting-pawls, actuating mechanism therefor, substantially as described and shown, locking-pawls, and a lifting-lever having an arm adapted to raise said setting and said locking pawls, finger-pieces on the outer side of the lock engaging the lifting-lever and the intermediate mechanism which actuates the setting-pawls, and a spindle having a cam, with a shoulder adapted to engage the stump to retract the bolt and also acting to lift the stump when turned in the opposite direction.

9. The combination, with the sliding tumblers having gates and racks, the setting-pawls, the locking-pawls, and the lifting-lever having an arm 34, of a bolt having a pivoted fence, with a stump adapted to engage the gates, an arm 49, a spindle having a cam, with a shoulder adapted to engage the stump to retract the bolt when the combination is set up, a pivoted arm 50, connected to arm 34, and a spindle having an arm 48, adapted to engage arms 49 and 50, whereby the door may be opened from the inner side.

10. In a lock, the combination, with a series of sliding tumblers having racks, of setting-pawls adapted to engage said racks, levers 18, by which the setting-pawls are carried, finger-pieces on the outer side of the lock, and intermediate mechanism connecting said finger-pieces with levers 18, whereby the tumblers are actuated in setting up the combination.

11. In a lock, a series of sliding tumblers having racks, setting-pawls engaging said racks, locking-pawls engaging the racks and also the setting-pawls, mechanism, substantially as described and shown, for actuating the setting-pawls, and a lifting-lever having an arm acting to raise both sets of pawls.

12. In a lock, a series of sliding tumblers having gates, and springs 17, acting to hold said tumblers out of gate, in combination with a bolt having a pivoted fence, with a stump to engage the gates, and a spindle having a cam, with a shoulder which engages said stump when the latter is in the gates to retract the bolt, said cam acting, when the spindle is turned in the opposite direction, to lift the stump from the gates.

13. In a lock, the combination, with a series of sliding tumblers having racks and gates and setting-pawls engaging said racks, of finger-pieces on the outer side of the lock, intermediate mechanism connecting each finger-piece with a tumbler, a lifting-lever adapted to lift the setting-pawls out of engagement with the racks, springs acting to force the tumblers backward, and adjustable blocks which determine the movement of the tumbler and permit change of combination.

14. In a lock, a series of sliding pawls having gates and racks, a series of setting-pawls engaging the racks, a series of levers 18, which carry the setting-pawls, a series of locking-pawls, a lifting-lever having an arm acting to raise both sets of pawls, a series of finger-pieces on the outer side of the lock, and intermediate mechanism, substantially as described and shown, connecting certain of the finger-pieces with the tumblers, respectively, another of said finger-pieces acting to raise the lifting-lever.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN H. CHRISTIE.

Witnesses:
A. M. WOOSTER,
ARLEY I. MUNSON.