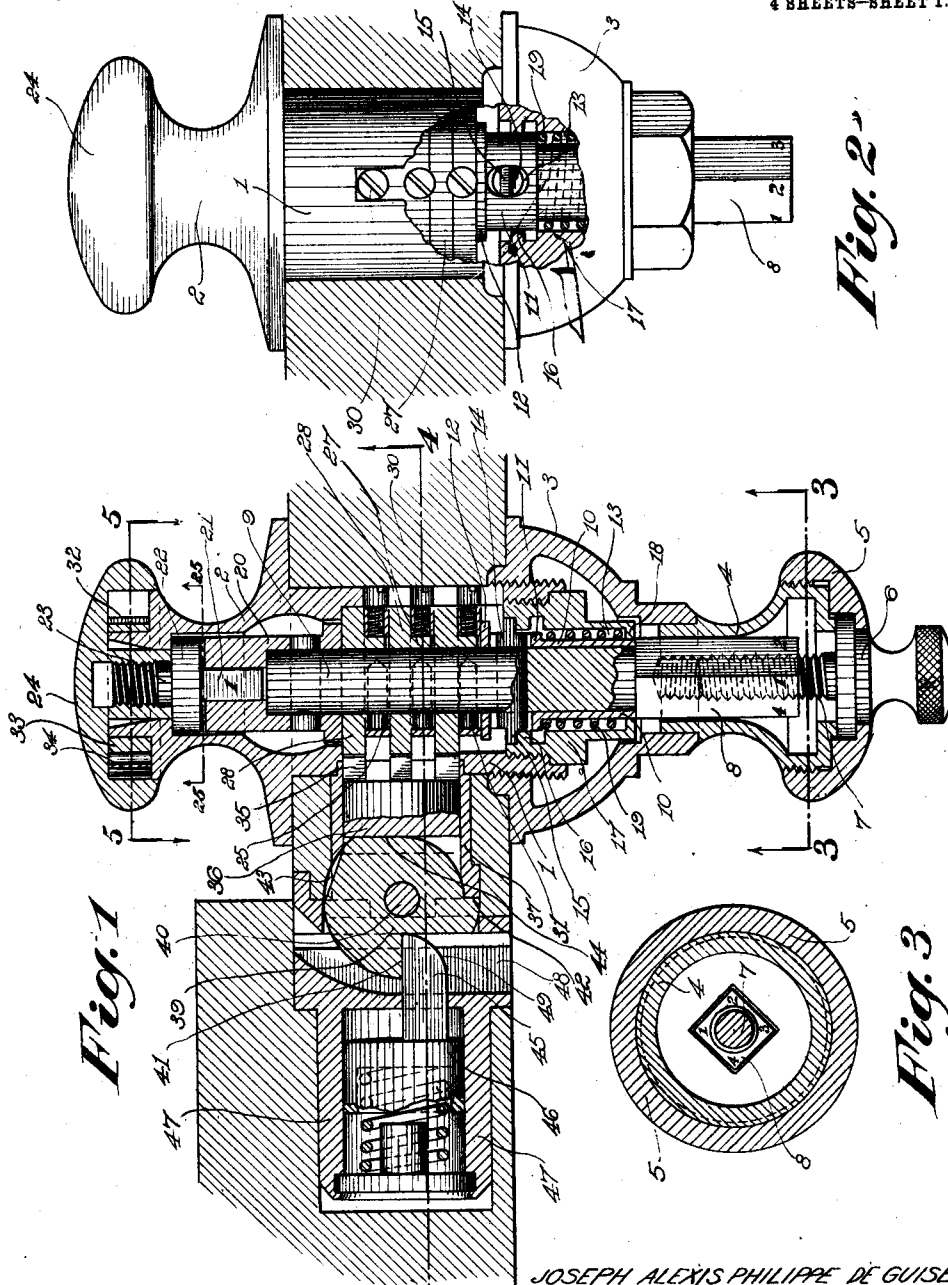


APPLICATION FILED AUG. 5, 1912.

1,060,234.

Patented Apr. 29, 1913.

4 SHEETS-SHEET 1.



Witnesses:

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COMBINATION LOCK.
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4 SHEETS—SHEET 2.

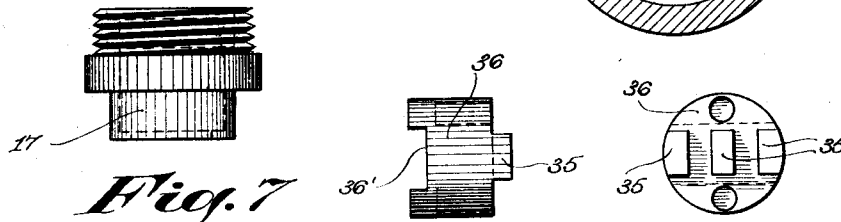
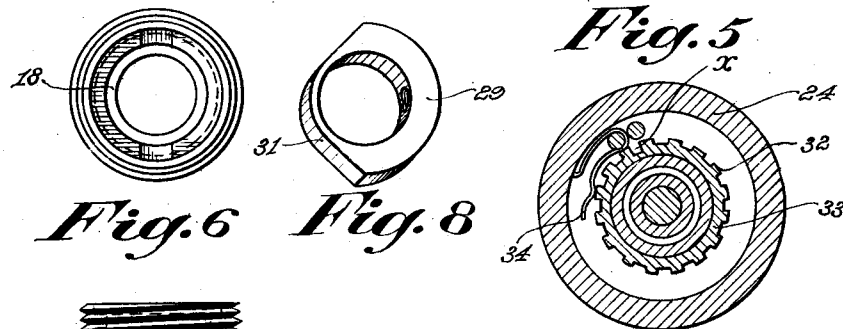
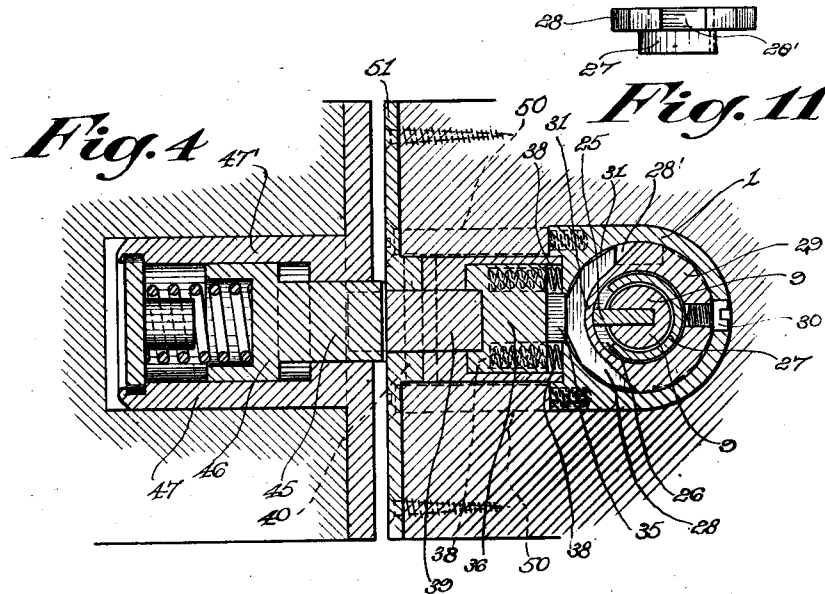


Fig. 9 Fig. 10

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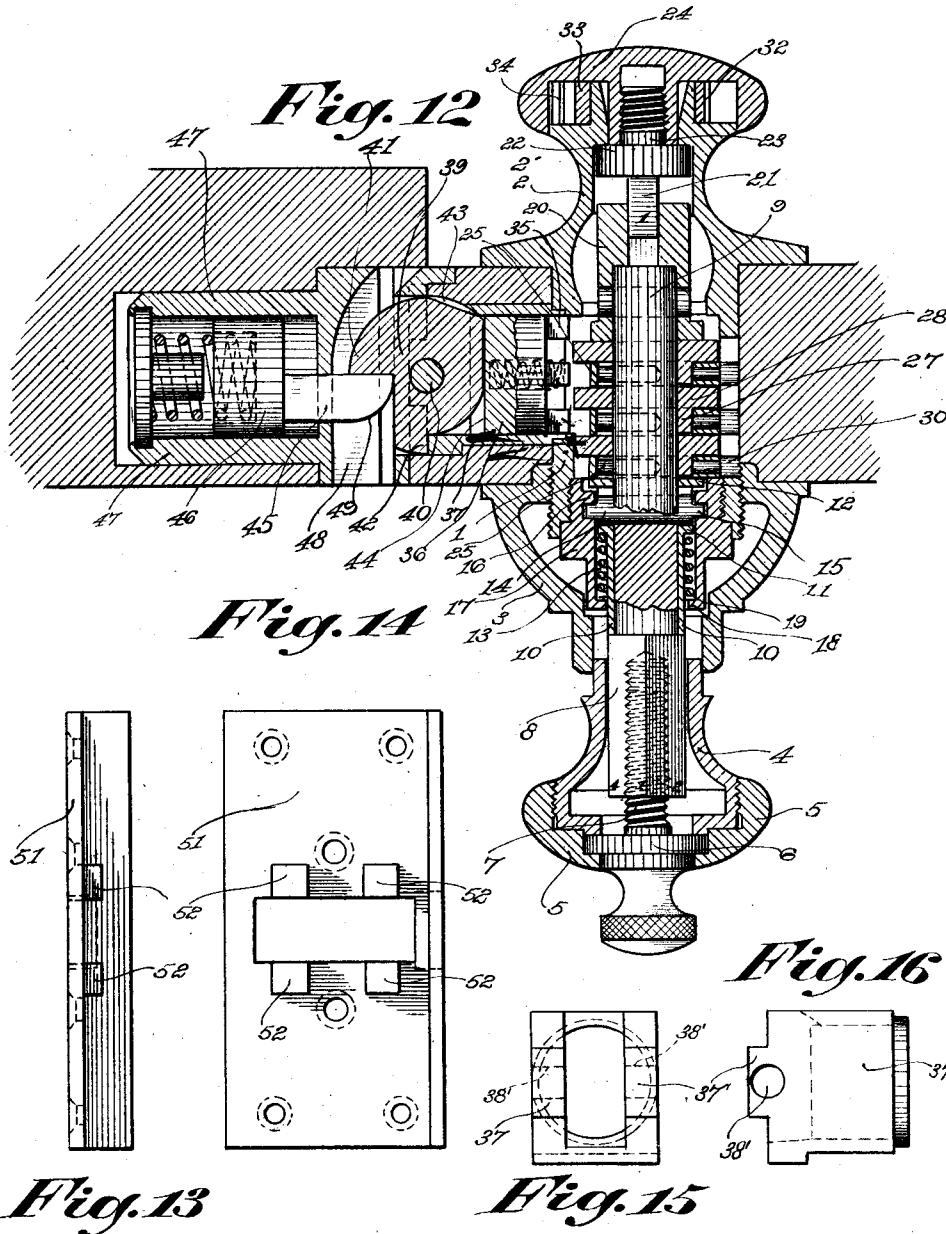
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4 SHEETS—SHEET 3.



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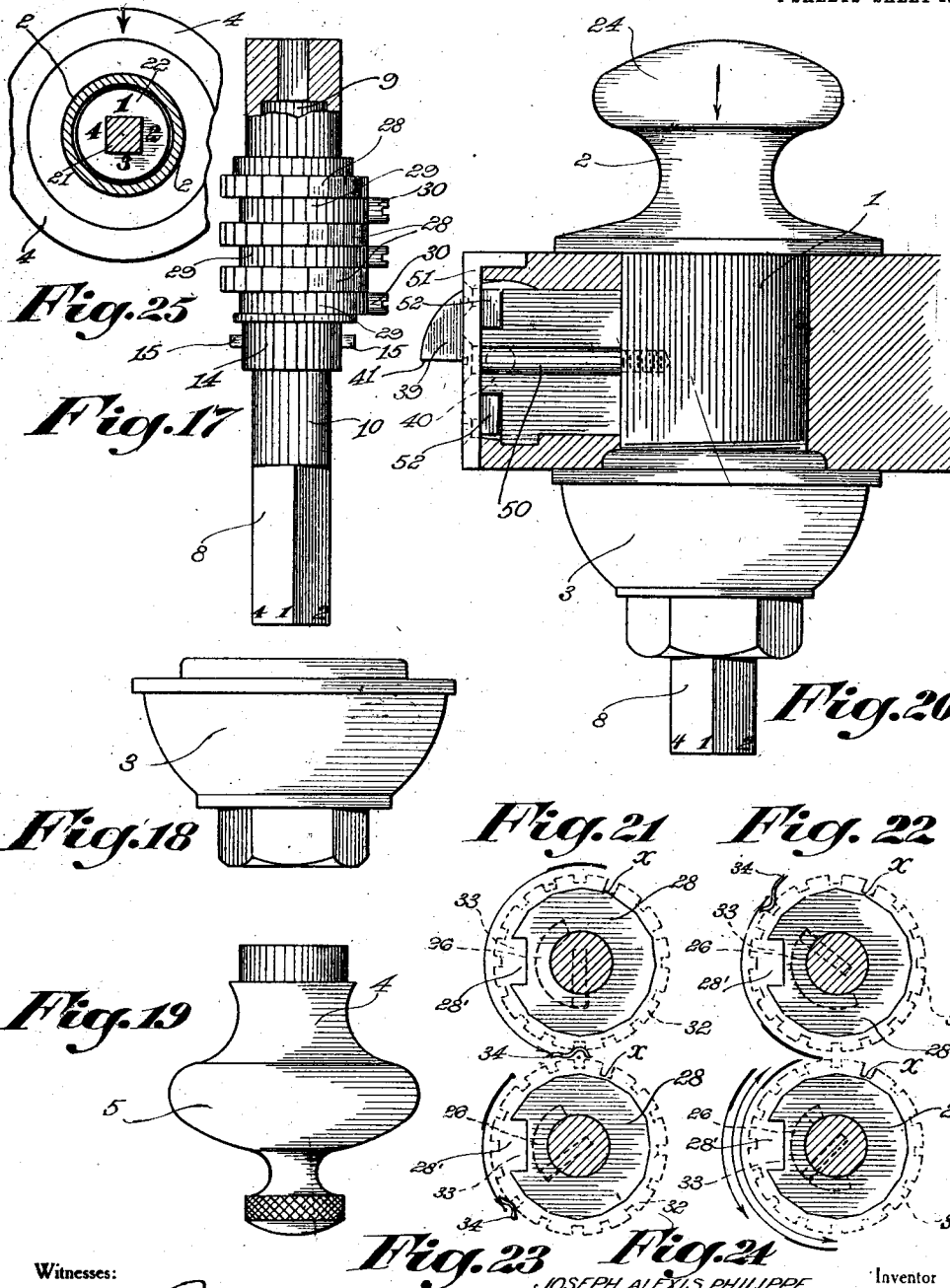
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4 SHEETS—SHEET 4.



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COMBINATION-LOCK.

1,060,234

Specification of Letters Patent.

Patented Apr. 29, 1913.

Application filed August 5, 1912. Serial No. 713,235.

To all whom it may concern:

Be it known that I, JOSEPH ALEXIS PHILIPPE DE GUISE, a subject of the King of Great Britain, residing at Maisonneuve, Province of Québec, Canada, have invented certain new and useful Improvements in Combination Locks; and I do hereby declare that the following is 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.

The invention to be hereinafter described relates to permutation locks.

In order to more clearly disclose the construction, operation, and use of the invention reference should be had to the accompanying drawings forming part of the present application.

Throughout the several figures of the drawings like reference characters designate the same parts.

In the drawings: Figure 1 is a central, longitudinal, horizontal, cross section through the lock, with parts in position for unlocking from the outside; Fig. 2 is a top plan view, partly broken away; Fig. 3 is a vertical cross section on line 3—3 of Fig. 1, looking in the direction of the arrows; Fig. 4 is a vertical cross section on line 4—4 of Fig. 1, looking in the direction of the arrows; Fig. 5 is a like view on line 5—5 of the same figure; Fig. 6 is an end view of the holding sleeve; Fig. 7 is a side view of the same; Fig. 8 is a perspective view of one of the disk supporting washers; Fig. 9 is a side elevation of the plunger block; Fig. 10 is a bottom plan view of the same; Fig. 11 is a top plan view of one of the combination disks; Fig. 12 is a view similar to Fig. 1, but with the parts moved to position for unlocking from the inside; Fig. 13 is a side elevation of the socket plate for the bolt; Fig. 14 is a front view of the same; Fig. 15 is a top plan view of the plunger socket for the catch block; Fig. 16 is a side elevation of the same; Fig. 17 is a plan view of the operating shaft and disks assembled; Fig. 18 is a side elevation of one cover plate; Fig. 19 is a similar view of the inner handle; Fig. 20 is a plan view of the lock, in position; Fig. 21 is a plan view of one combination disk, showing the first step of unlocking; Fig. 22 is a similar view of the second step; Fig. 23 is a similar view of the third step; Fig. 24 is a similar view of all disks set; and Fig. 25 is a cross section on line 25—25 of Fig. 1.

The main objects of the invention are to provide a simple, efficient, economical, compact, and durable permutation lock which will require the operation of a combination to open it from the outside, while at the same time it may be readily open from the inside without the use of a combination.

Referring to the drawings in detail, 1 indicates a tubular casing adapted to be fitted into a lock opening in a door and to receive and contain combination devices for operating the lock. One end of the casing is formed as a knob shank 2 while the opposite end is screw threaded, both internally and externally, for purposes to be later disclosed. Upon the exterior screw threads of casing 1 is threaded a cover plate 3 in the outer end of which is slidably mounted the inner end of the shank 4 of the inside knob 5. This knob is formed in two parts; a body provided with external threads and having a large central opening, and a cover or head provided with a similar opening adapted to be alined therewith and having internal screw threads. Between the body and head, when assembled, is seated a head 6 formed on a screw threaded rod 7 adapted to be screwed into the threaded bore of the square end 8 of an operating shaft 9, the squared end being adapted to fit, slidably, into the correspondingly squared interior of the shank 4, for a purpose to be later disclosed. On the shaft 9, near the inside end, is mounted a sleeve 10 having two parallel spaced flanges 11 and 12 and provided with two elongated openings 13 arranged diametrically opposite each other. A stop pin 14 provided with squared projecting ends 15 is passed through the shaft and the opening 13, allowing limited longitudinal movement of the sleeve relatively to the shaft. The squared ends 15 are adapted to be drawn through notches in a flange 16 of a holding sleeve 17 and into an annular groove in the inner face or wall thereof. The sleeve 17 is connected to the casing by screw threads cooperating with the interior threads of the casing, as shown in Fig. 1. This sleeve is provided with an annular flange 18 which spaces it from the sleeve 10. Between the flanges 18 and 11 a coil spring 19 is arranged. The tendency of this spring is to force the sleeve 10 and connected parts inwardly of the casing 1.

The inner end of the shaft 9 has a block keyed thereto and provided with a

square hole adapted to receive a square cooperating lug 21 extending from the inner face of a disk 22 from which extends, in the opposite direction, a threaded rod 23 adapted to be screwed into a threaded bore of an outer knob cover 24 which is revoluble on the shank 2. Such coupling between the knob cover and shaft causes the shaft to rotate with the knob cover. By this arrangement, the shaft 9 may be uncoupled from the knob cover, then rotated one, two, or three quarters of a turn, or a whole turn, and again coupled, for purposes to be later disclosed.

From the shaft, and in the same longitudinal line thereon, project a plurality of pins 25 each playing in a notch or recess 26 in the hub 27 of a combination disk 28 loosely supported about the shaft 9 in the bore of a stationary spacing and supporting washer 29 fixed to the interior of the casing by means of a set screw 30 and having about one-half of its circumference cut away or considerably reduced as at 31, for a purpose to be later disclosed. On referring to Figs. 21 to 24 it will be noticed that the notches 26 in the several disk hubs are of different lengths. Likewise, the length of each notch corresponds to the distance between a certain number of teeth 32 on a counting ring 33 which is fixed to the shank 2 at a point within the knob cover 24, a click spring 34 being secured to the inner wall of the knob cover 24 in position to cooperate with the teeth of the counting ring, as clearly shown in Fig. 5.

It will be clear that rotation of shaft 9 until and after the pins 25 engage the walls of notches 26 will cause the combination disks to rotate therewith. Likewise, it will be evident that rotation of the knob cover 24 to cause rotation of shaft 9 will also cause the click spring 34 to travel over the teeth 32 of the counting ring 33, thereby giving a distinct and audible sound for each separate tooth, so that one may easily count the number of teeth that the shaft 9 has been rotated in one or the other direction. In this way a combination may be composed for unlocking the door, as will more clearly appear from what follows.

The edge of each disk 28 is provided with a notch 28' adapted to receive a lug 35 projecting from the bottom or inner end of a plunger block 36 slidably mounted in a socket 37 seated in the door frame and so arranged that its lower open end falls directly above a longitudinal opening in the casing 1, thus permitting the lugs to project through the opening and into position to be received by the notches 28', when these notches have been properly aligned. Normally, the plunger block 36 is held outwardly or in inoperative position by means of supporting springs 38 seated in longitudinal bores and resting upon the bottom wall of the socket 37, as clearly shown in Fig. 4.

We will suppose, now, that it is desired to unlock the door by means of the combination. The knob cover 24 and coupled shaft 9 will be rotated, as indicated in Fig. 21, until the pin cooperating with one of the disks engages the wall of the notch 26 and carries the disk to such position that its notch 28' falls into line to receive one of the lugs 35, then the knob cover will be reversely rotated until another of the pins engages the wall of a notch 26 in another disk and carries that disk to such position that its notch 28' is in position to receive another of the lugs 35 (see Fig. 22); then the knob cover 24 will be again rotated in the first direction until the last pin engages the wall of the notch of its disk and carries it to such position that its notch 28' is in position to receive the remaining lug 35 (see Fig. 23). At this point, all three notches 28' will be aligned and each will be in a position to receive one of the lugs 35. This alinement is shown in Fig. 24.

It is necessary, of course, to have some starting point for the combination. This comprises an extra deep notch α which causes the click spring to make a much louder click than when falling into the notches between the other teeth. Also; when knob cover 24 is provided with an index arrow, the corners of the squared end of shaft 9 are provided with index numbers, and the opposite ends of lug 21 together with the portions of disk 22 at the sides thereof are provided with corresponding numbers. To set one of the many possible combinations: first turn the knob cover 24 until the click spring drops into the notch α (giving a louder click), then turn all of the combination disks as far as possible to the right in Fig. 24, and then insert the shaft 9, taking care that the index number one on the squared end will fall directly in line with the same number on the disk 22, and with the arrow. After this assembly is complete screw home the holding sleeve 17, cover plate 3, and threaded rod 7. Now, to operate this combination, turn the cover knob 24 nine clicks counter clockwise (as in Fig. 21), then six clicks clockwise (as in Fig. 22), and then four clicks counter clockwise again (as in Fig. 23). On the first movement, the pins will engage the walls of their notches 26 successively and cause the successive disks to travel proportionately greater or less distances in the same direction, according to the lengths of their slots. Thus, by rotating the shaft first nine clicks in a counter clockwise direction, the disk shown in Fig. 21 will be properly positioned, whereas the other two disks will be carried on beyond. Then by rotating six

10
70
75
80
85
90
95
100
105
110
115
120
125
130

clicks in a clockwise direction the disk shown in Fig. 22 will be caught and returned until it is in proper position, the other or third disk being carried on slightly beyond, whereas, due to the length of its slot, the first disk remains undisturbed. Then, by turning again in a counter clockwise direction four clicks, the third disk will be caught up and returned until it is in proper position, as shown in Fig. 23. To change the combinations it is only necessary to change the relative positions between the lug 21 and shaft 9. This may be readily done by drawing out the shaft, turning it one or more quarters of a revolution, and then coupling again. At each quarter revolution, a different number of the squared end will fall opposite the number one of the lug 21, and for each such rearrangement there will be a known combination, along the same general lines as that above given. It will be understood, of course, that the combinations are worked from the outside by the knob cover 24. The locking members themselves comprise a catch block 39 journaled on a pin 40 extending through the socket 37 and provided with two shoulders 41 and 42, and two flattened faces 43 and 44. The faces 43 and 44 are adapted to engage the plunger block 36, and lie in the groove 36'. Thus, as long as the block 36 is held in the position of Fig. 1 and the notches 28' are not in position to receive the lugs 35, the catch block will be solidly locked against turning. In such position the shoulder 41 will be engaged by the straight or abrupt face of a bolt 45 carried by a spring pressed bolt block 46 slidably mounted in a socket 47 adapted to be seated in the door frame and having a grooved bolt plate 48 to guide the catch block as the door is swung shut or opened. The shoulder 42 of the catch block acts simply as a stop. Now, supposing that the combination has been set to permit unlocking: the operator simply pushes on the door and the bolt causes the catch block to turn, forcing the plunger block 36 inwardly until its lugs are seated in the notches 28'. It will be held in this position by engagement of the other flattened surface 43 with the face of plunger block 36. As the door is closed, the opposite face of the notch or shoulder 41 will be engaged by the beveled end 49 of the bolt 45, causing the catch block to swing back to its original position. Should the combination become disarranged after the door has been opened and before it is closed again, it is evident that the catch block will not be able to turn when it has met the bolt end. But, the bolt end being beveled, will permit the door to be closed by simply forcing the bolt back within its socket, as will be well understood.

The door may be opened and closed as an

ordinary door and without using the combination from the inside, by simply drawing the handle or knob 4 and its attached parts outwardly until the spaces between the disks 28 fall directly beneath the lugs 35. This will permit the plunger block 36 to be forced inwardly for operating the catch block 39, regardless of the combination, so that the door may be pulled open from the inside. The parts may be retained in this position in the manner previously disclosed.

The slightly enlarged bore of each disk 28, together with the stationary supporting washer therefor, completely avoids all possible frictional contact between the disk and shaft. Also, each washer is just a shade thicker than the hub of its disk, to prevent any possible frictional contact between one disk and another, whereby a moving disk would move another in contact with it.

Preferably, the casing 1 and socket 37 are clamped tightly together by means of clamping bolts 50 passed through a cover plate 51 and threaded into the outer wall of the casing. This plate is provided with pairs of depending lugs 52 adapted to engage the outer wall of the socket 37 at either side of the lugs 37' having the bearings 38' for the pin 40 of the catch block 39.

It is thought that the operation and use of the invention will be clear from the preceding detailed description.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In combination, a bolt in a door frame, a catch block in a door adapted to engage the same, means for holding said catch block in operative position, permutation mechanism for controlling said means, and means for simultaneously rendering said permutation mechanism inoperative and permitting operation of the means for holding said catch block in operative position.

2. A lock of the character described comprising, a bolt in a door frame, a catch block in a door adapted to engage the same, a slidably mounted block adapted to engage said catch block and prevent its operation, permutation mechanism for controlling said slidable block, means for normally maintaining said permutation mechanism in operative position, and means for sliding said permutation mechanism into inoperative position to free said slidable block and permit free operation of the aforesaid catch block.

3. A lock of the character described comprising, a bolt in a door frame, a catch block in a door adapted to engage the same, a slidably mounted block provided with lugs and adapted to engage said catch block and prevent its operation, a slidably mounted revoluble shaft, a plurality of permutation disks mounted on said shaft and each pro-

vided with a notch to receive one of the lugs of said slidable block, means for connecting each disk to said shaft to allow limited rotary movement between said disk and shaft, means for preventing frictional contact between said disks and shaft, and means for rotating said shaft.

4. A lock of the character described comprising, a bolt in a door frame, a catch block in a door adapted to engage the same, a slidably mounted block provided with lugs and adapted to engage said catch block and prevent its operation, a slidably mounted revoluble shaft, a plurality of permutation disks mounted on said shaft and each provided with a notch to receive one of the lugs of said slidable block, means for connecting each disk to said shaft to allow limited rotary movement between said disk and shaft, means for preventing frictional contact between said disks and shaft, means for preventing frictional contact between one disk and another, and means for rotating said shaft.

5. A lock of the character described comprising, a bolt in a door frame, a catch block in a door adapted to engage the same, a slidably mounted block adapted to engage said catch block and prevent its operation, permutation mechanism for controlling said slidable block, means for normally maintaining said permutation mechanism in operative position, means for sliding said permutation mechanism into inoperative position

to free said slidable block and permit free operation of the aforementioned catch block, and means for returning said shaft to operative position.

6. A lock of the character described comprising, a bolt in a door frame, a catch block in a door adapted to engage the same, a slidably mounted block provided with lugs and adapted to engage said catch block to prevent its operation, a tubular casing provided with a knob shank, an outer knob cover revoluble on said shank, counting mechanism between said cover and shank, a revoluble shaft slidably mounted in said casing, sliding detachable connections between said shaft and said knob cover, permutation disks mounted on said shaft and provided with notches to receive the lugs of the aforesaid slidable block, separate means for connecting each of said disks to said shaft to permit limited relative rotary movements of different extents between the several disks and said shaft, an inner knob fixed to said shaft for sliding the same to inoperative position, means for maintaining said shaft in inoperative position, and means for returning said shaft to operative position.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

JOSEPH ALEXIS PHILIPPE DE GUISE.

Witnesses:

E. J. GAUVIN,
S. A. GAUVIN.