March 31, 1925. 1,531,269

F. E. BIDDLE

LOCK

Filed April 9, 1924 2 Sheets-Sheet 1

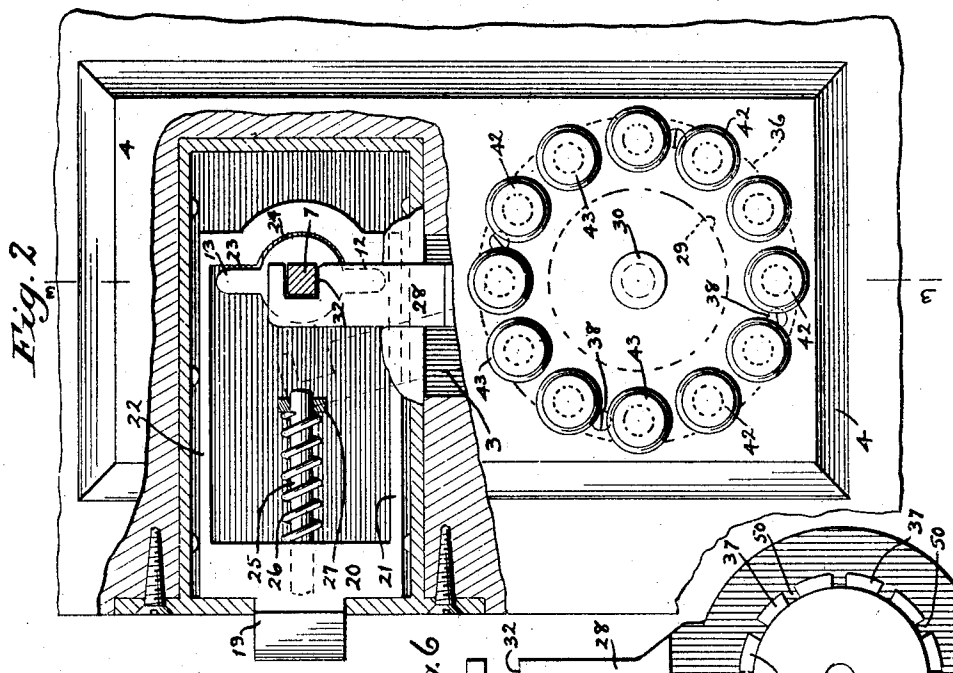


Fig. 2

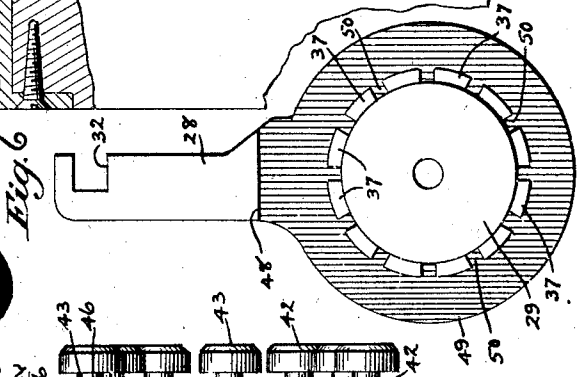


Fig. 6

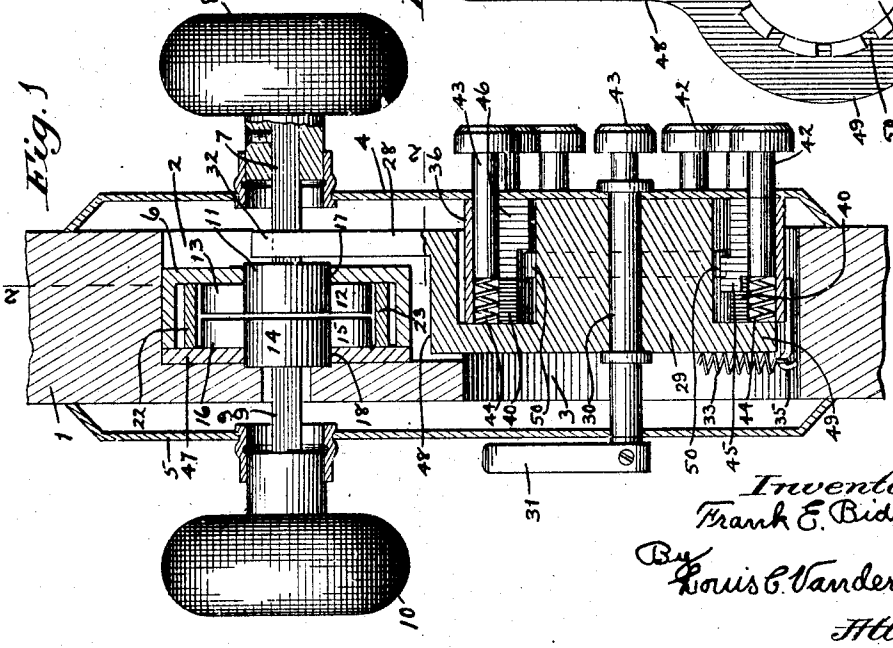


Fig. 1

Inventor:
Frank E. Biddle
By Louis C. Vanderlip.
Att'y.

March 31, 1925. 1,531,269

F. E. BIDDLE

LOCK

Filed April 9, 1924 2 Sheets-Sheet 2

Fig. 4.

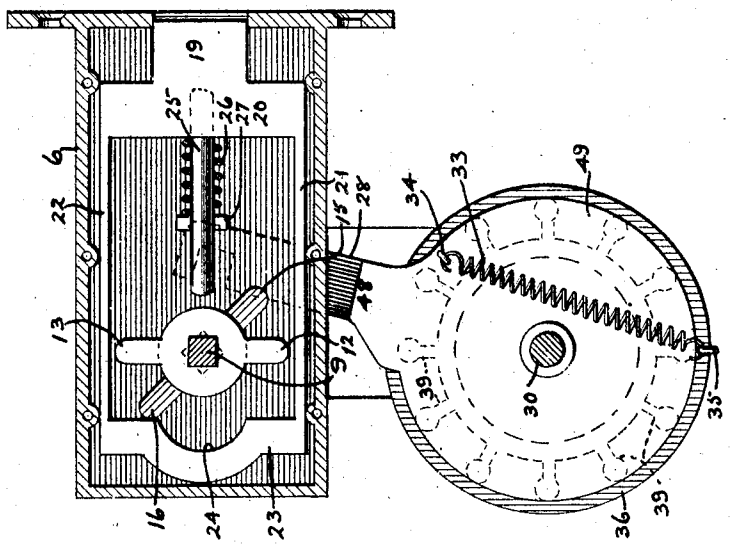


Fig. 5

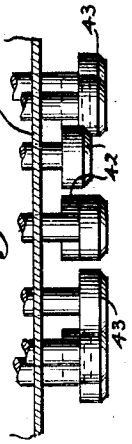


Fig. 3

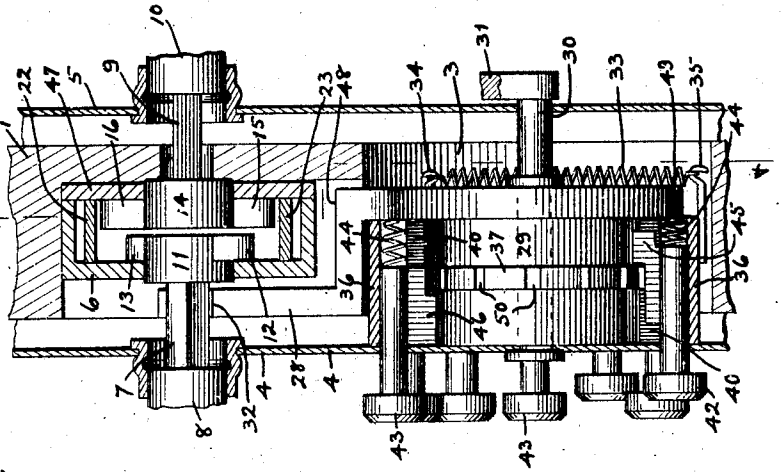


Fig. 7.

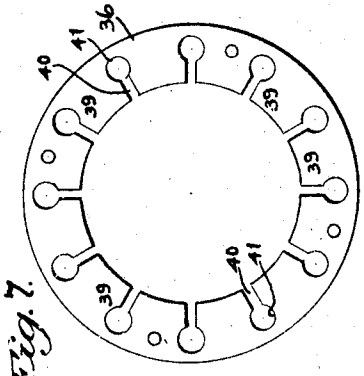


Fig. 8

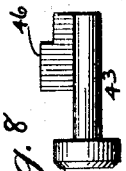
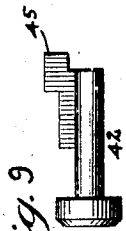


Fig. 9



Inventor:
Frank E. Biddle
By Louis C. Vanderlip
Atty.

Patented Mar. 31, 1925. 1,531,269

# UNITED STATES PATENT OFFICE.

FRANK E. BIDDLE, OF ELKHART, INDIANA.

## LOCK.

Application filed April 9, 1924. Serial No. 705,234.

*To all whom it may concern:*

Be it known that I, FRANK E. BIDDLE, a citizen of the United States, and resident of the city of Elkhart, county of Elkhart, and State of Indiana, have invented certain new and useful Improvements in Locks, of which the following is a specification.

This invention relates to combination locks, and especially to push-key door locks.

The principal object of the invention is to provide a combination lock which can be quickly operated by one having the combination, the lock including a series of interchangeable push-keys of which a plurality are master or locking keys and the others dummy keys.

Another object of the invention is to provide a combination lock for doors which can be quickly operated by one having the combination and in which the locking element is spring retracted and is provided with means interiorly of the door to restore the arm to the locking position and simultaneously restoring the push-keys to the normal locking position. Other objects of the invention are mentioned and described herein.

The preferred embodiment of the invention is illustrated in the accompanying drawings in which Figure 1 is a vertical section through the door fragment and lock showing the outer knob locked; Fig. 2 is a view in side elevation exteriorly of the door and partially in section on line 2—2 of Fig. 1; Fig. 3 is a section taken on line 3—3 of Fig. 2 showing the master push-keys positioned to enable operation of the locks; Fig. 4 is a section taken on line 4—4 of Fig. 3 illustrating the locking arm and latch bolt retracted; Fig. 5 is a side view of the push-keys alone showing the master keys depressed; Fig. 6 is a view in elevation of the locking arm and tumbler hub; Fig. 7 is a view of the tumbler ring; Fig. 8 is a view of the dummy push-keys; and Fig. 9 is a view of one of the master push-keys.

Similar numerals of reference indicate like parts throughout the various figures on the drawings.

Referring to the details of the drawings, the numeral 1 indicates a fragment, in section, of a wood door which may be provided with the intercommunicating recesses 2 and 3 to receive the lock parts hereinafter described. The numeral 4 indicates the outer metal lock plate and the numeral 5 the inner metal lock plate of the device, both of which plates may be secured to the door body in any suitable manner. Numeral 6 indicates a box-like metal casing disposed within the recess 2 and provided with a side cover, or wall element, 47 which may be secured to the casing body in any suitable manner, as by screws—not shown.

The plates 4 and 5 are suitably apertured to admit the passage of the shaft 7 of the outer knob 8 and shaft 9 of the inner knob 10 in which apertures said knobs may be suitably journaled. Preferably, the shaft 7 of outer knob 8 is square, or polygonal in cross-section. The inner end of knob shaft 7 carries a cylindrical hub 11 which may be journaled in casing aperture 17 and which is provided with the opposed radial cam lugs 12 and 13, and shaft 9 carries the cylindrical hub 14 which may be journaled in casing cover aperture 18 and which is provided with the opposed radial cam lugs 15 and 16, all of said cam lugs being disposed within the casing 6, and said shafts being disposed co-axially. The outer end of casing 6 is suitably apertured to admit the passage of the latch bolt 19 to the exterior thereof, the shank 20 of said bolt projecting laterally therefrom within the casing 6 and serving as a stop element therefor. The bolt bars 21 and 22 extend from bolt shank 20 rearwardly in parallel spaced relation and rigidly connect with the transverse bolt end wall, or abutment, section 23, the latter being provided with a semi cylindrical recess 24 in which the cam hubs 11 and 14 normally engage, the cam lugs 12, 13, 15 and 16 being disposed adjacent the inner periphery of bolt end wall 23 on opposite sides of the recess 24. Normally, the bolt assembly described is yieldingly pressed against the outer interior end of the casing 6 by a coil spring 26 carried upon a post 25 fixed in shank section 20 of said bolt, said spring being seated upon a forked lug 27 rigid with one side wall of said casing. The cams 11, 12, 15 and 16 are adapted to retractively actuate the bolt 19 when rotation of shafts 7 and 9 is effected, the latter being constantly rotatable from the door interior, and the former being adapted to be releasably locked against rotation by means hereinafter described.

The numeral 28 indicates an oscillatory locking arm forked at 32 to engage about the

square knob shaft 7 to lock the latter against rotation, said arm being off-set at 48 and provided with a cylindrical hub 49, and provided also with the cylindrical tumbler hub 29 projecting laterally from and centrally of said arm hub and of lesser diameter than said hub 49. The hubs 29 and 49 may be centrally apertured to carry the shaft 30 rigidly secured therein, the end of said shaft being journaled in suitable apertures in the lock plates 4 and 5, the inner end of said shaft being provided with a handle 31 to manually effect partial rotation of the hub 29 and oscillation of arm 28 from the interior side of the door to restore said arm to locking engagement with shaft 7, as hereinafter described. A coil tension spring 33 is connected at 34 with the hub 49 laterally of the arm 28 and anchored to a hook 35 fixed in the tumbler ring 36, whereby the fork 32 of arm 28 will be disengaged from the shaft 7 when the arm 28 is rendered free to oscillate, as hereinafter described.

The tumbler hub 29 is provided with a series of lugs 37 arranged circumferentially thereof intermediate its longitudinal extremities to form the circular series of notches 50, said notches being adapted to register with the open inner ends of the circular series of key sockets 39 formed in the tumbler ring 36 which fixedly encompasses the tumbler hub 29, when the fork 32 of arm 28 engages shaft 7 to lock the latter. The tumbler ring 36 may be rigidly secured to the inner face of the plate 4 by screws 38 and the hub 29 fits loosely within the bore of said ring, the arm hub 49 being lightly engaged by the inner face of said tumbler ring. The sockets 39 are radially formed in the ring 36 and are arranged in a circular series therein parallel with the axis of shaft 30, all sockets being alike in size and formation and formed with the cylindrical section 41 and the radial straight section 40, the latter being open to the ring bore.

The front plate 4 is provided with a plurality of circular series of apertures, in registration with sockets 39, to admit the passage and disposition of a plurality of headed push-keys 42 and 43 which are slidably arranged in said sockets and which extend to the exterior of said plate to enable manual depression thereof from the exterior of the door, each of said keys being outwardly urged by a coil tension spring 44 disposed in the inner end of each section 41 of said sockets, said springs being seated upon the face of the arm hub or flange 49. The push-key 42, of which four are herein illustrated, and of which any number may be used, is the locking or master key, and key 43, of which any number may be used—eight being illustrated herein—is the inactive or dummy key.

Each key 42 is provided with a forwardly projecting lug 45 slidably arranged in section 40 of the socket 39 and adapted to project normally into a notch 50 of the hub 29 to lock said hub non-rotatably, and each key 43 is provided with a rearwardly projecting lug 46 slidable in section 40 of the socket 39 and normally disposed between the plate 4 and lugs 37 of hub 29 and disengaged from notches 50 and adapted to be thrust into engagement with a notch 50 by one unfamiliar with the lock combination to maintain the locked condition of the device.

Assuming that the fork 32 of locking arm 28 is positioned as indicated in Figures 1 and 2, the knob shaft 7 may be quickly unlocked by depressing inwardly the four keys 42 to disengage the lugs 45 from the tumbler hub notches 50. Thereupon, the spring 33 oscillates the arm 28 to the position indicated by the dotted lines thereof in Figures 2 and 4, whereby the knob shaft 7 may be actuated to retract the latch bolt 19. Fig. 1 illustrates one key lug 45 of key 42 engaging a tumbler notch 50 and the same figure shows a lug 46 of a key 43 disposed between the tumbler lugs 37 and the plate 4. And Fig. 3 shows two of the keys 42 depressed, one of which clearly illustrates the position of lug 45 when disengaged from a notch 50.

When the arm 28 is thus oscillated by the spring 33, as described, the tumbler hub 29 makes a partial rotation therewith, thereby carrying the four hub notches 50 out of registration with the tumbler ring sockets 39 and especially the slots 40 thereof, whereby the lugs 45 of the four keys 42 are disengageably locked between the tumbler lugs 37 and the hub element 49, as illustrated in Fig. 3. To restore the keys 42 to the original position the handle 31 is oscillated slightly to effect partial return rotation of the hub 29, thereby also oscillating arm 28, and when slots 40 and notches 50 are again in registration the springs 44 project the keys 42 outwardly, the reduced portion of the lug 45 engaging the plate 4 as a stop element.

In the event the operator should depress one or more of the keys 43 simultaneously with the actuation of the four keys 42 the lug 46 of key 43 would engage in a hub notch 50, thereby maintaining the locked condition of the device. The key lug 46 of key 43 serves to engage the plate 4 as a stop element in addition to its function heretofore described. In the lock illustrated four of the master keys 42 and eight of the dummy keys 43 are shown and described. But since the keys are interchangeable it will be readily appreciated that the proportion of each set of keys may be changed to suit the operator, whereby innumerable changes of the combination may be effected, and whereby it will be

practically impossible for one unfamiliar with the combination to successfully operate the lock.

I claim:

1. In a combination lock, an outer knob; an inner knob; a movable latch bolt; a separate shaft rotatable with each knob; means on each knob shaft for actuating said latch bolt, said inner knob shaft being constantly rotatable; and means for releasably locking said outer knob shaft against rotation, said means including an oscillatory arm, a tumbler hub movable with said arm, a tumbler element rigidly mounted in encompassment of said tumbler hub, and a plurality of master and dummy push keys movably mounted in said fixed tumbler element, said master keys being adapted to releasably lock said tumbler hub to the fixed tumbler element.

2. In a combination lock, an outer knob; an inner knob; a movable latch bolt; a separate shaft rotatable with each knob; means on each knob shaft for actuating said latch bolt, said inner knob shaft being constantly rotatable; and means for releasably locking said outer knob shaft against rotation, said means including an oscillatory arm, a cylindrical tumbler hub adapted to be partially rotated upon oscillation of said arm, a hollow tumbler element rigidly mounted in encompassment of said tumbler hub and provided with a plurality of key sockets, and a plurality of master and dummy push-keys movably mounted in said key sockets of said tumbler element, said master keys being adapted to releasably lock said tumbler hub and fixed tumbler element together.

3. In a combination lock, an outer knob; an inner knob; a movable latch bolt; a separate shaft rotatable with each knob; means on each knob shaft for actuating said latch bolt, said inner knob shaft being constantly rotatable; and means for releasably locking said outer knob shaft against rotation, said means including a movable arm, a rotatable tumbler hub operatively connected with said arm, a ring-like tumbler fixedly mounted in encompassment of said rotatable tumbler hub, a circular series of key sockets in said ring-like tumbler, and a plurality of master and dummy push keys movably mounted in said ring-like tumbler sockets, said master keys engaging said rotatable tumbler hub to releasably lock the latter to said ring-like tumbler.

4. In a combination lock, an outer knob; an inner knob; a movable latch bolt; a separate shaft rotatable with each knob; means on each knob shaft for actuating said latch bolt, said inner knob shaft being constantly rotatable; and means for releasably locking said outer knob shaft against rotation, said means including a movable spring actuated arm, a rotatable tumbler hub operatively connected with said arm, a ring-like tumbler fixedly mounted in encompassment of said rotatable tumbler hub, a circular series of key sockets in said ring-like tumbler, a circular series of notches in said rotatable tumbler hub, and a plurality of master and dummy push keys movably mounted in said ring-like tumbler sockets, said master keys engaging said rotatable tumbler notches to releasably lock said rotatable tumbler to said ring-like tumbler.

5. In a combination lock, an outer knob; an inner knob; a movable latch bolt; a separate shaft rotatable with each knob; means on each knob shaft for actuating said latch bolt, said inner knob shaft being constantly rotatable; and means for releasably locking said outer knob shaft against rotation, said means including a furcated movable locking element, a rotatable tumbler hub operatively connected with said locking element, a ring-like tumbler fixedly mounted in encompassment of said rotatable tumler hub, a circular series of key sockets in said ring-like tumbler, said sockets being open at their inner ends, and a plurality of master and dummy push-keys movably mounted in said ring-like tumbler key sockets, said master keys engaging said rotatable tumbler hub to releasably lock the the latter to said ring-like tumbler.

In witness whereof I have hereunto affixed my signature this 7th day of April, 1924.

FRANK E. BIDDLE.