Oct. 4, 1927. 1,644,365

E. O. BENNETT

KEY LOCK

Filed Feb. 28, 1923

Fig. 1

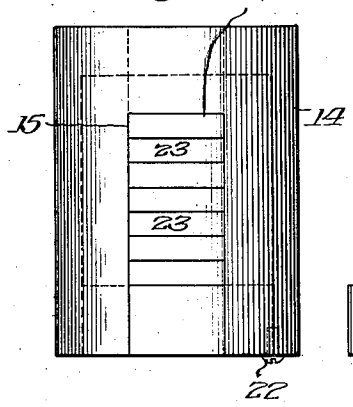



Fig. 2

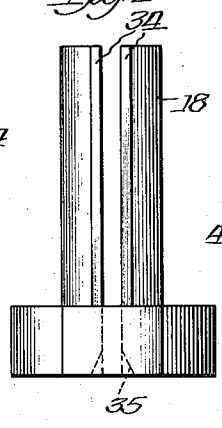



Fig. 3

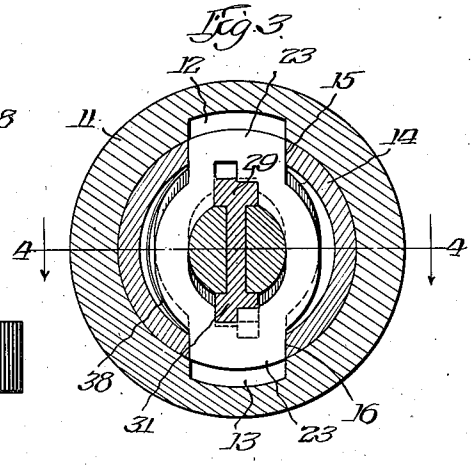



Fig. 4

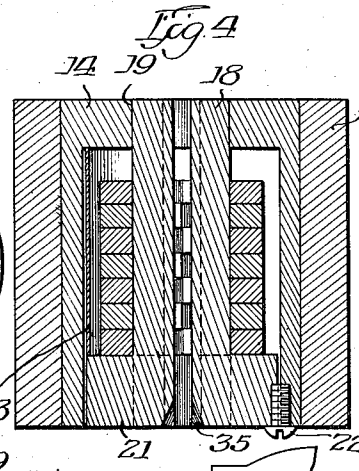



Fig. 5

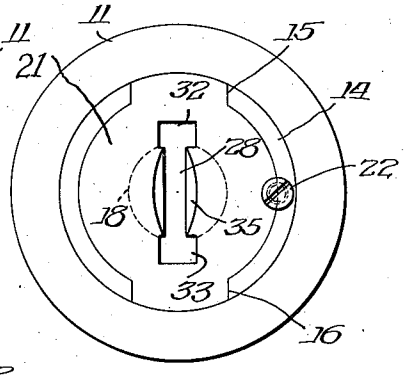



Fig. 6

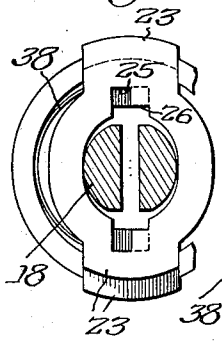



Fig. 9

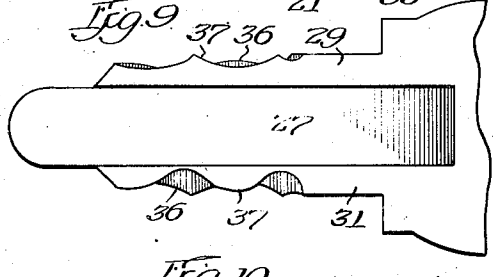



Fig. 10

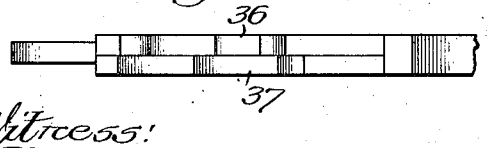



Fig. 7

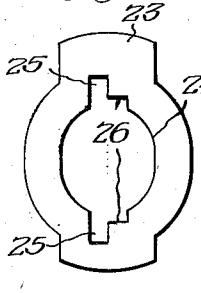
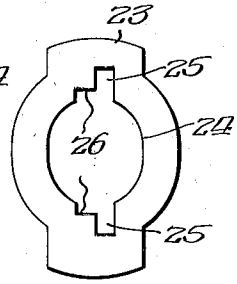



Fig. 8.




Witness:

Inventor:

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By Ira J. Wilson Atty.

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# UNITED STATES PATENT OFFICE.

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## KEY LOCK.

Application filed February 28, 1923. Serial No. 621,714.

This invention pertains to key locks of the type having sliding tumblers adapted to be actuated by a serrated key.

One of the purposes of this invention is to improve the construction, assembly, and reliability of a lock of this character by incorporating in its construction a slotted key guide which is adapted to receive and accurately guide the key during the entire insertion and operations thereof.

Another feature of the invention resides in the construction and arrangement of the locking tumblers, which are so designed that their locking action upon withdrawal of the key is practically infallible, and picking of the lock is rendered substantially impossible.

Another object of the invention is to provide a key of novel construction which is adapted to actuate the tumblers, but is extremely difficult to duplicate.

Other objects are to provide a lock which is simple in construction, one which can be economically manufactured and readily assembled, one which will be reliable and durable in use and one in which a single resilient element may be used to insure the positive locking movement of a plurality of tumblers.

For the purpose of facilitating an understanding of my invention I have illustrated on the accompanying drawings a preferred embodiment thereof, from an inspection of which, when considered in connection with the following description, my invention in one of its preferred forms, and many of the inherent advantages thereof, should be readily understood and appreciated.

Referring to the drawings:

Fig. 1 is a plan view of a lock embodying my invention;

Fig. 2 is a detailed view of the key guide;

Fig. 3 is a transverse sectional view through the lock, showing the key therein;

Fig. 4 is a longitudinal sectional view on the line 4—4 of Fig. 3;

Fig. 5 is an end elevation of the lock;

Fig. 6 is a transverse view, showing the tumblers in locked position;

Figs. 7 and 8 are detailed views of adjacent tumblers; and,

Figs. 9 and 10 are side and edge views, respectively, of my improved key.

Referring to the drawings more in detail, reference character 11 indicates a barrel, preferably cylindrical in shape and adapted to be associated in any suitable manner with the lock case proper and a locking bolt of any preferred construction. This barrel is provided interiorly, preferably at the top and bottom, with longitudinally extending grooves 12 and 13, respectively, adapted to receive the ends of the tumblers, as will be later more apparent.

Within the barrel there is rotatably disposed a cylinder 14 provided at its top and bottom with longitudinally extending slots 15 and 16, these slots being extended from the forward end of the cylinder rearwardly to a point remote from the rear end of the cylinder, as indicated by reference character 17, these slots being also adapted to receive the ends of the tumblers and to align with the barrel grooves 12 and 13.

A cylindrical key guide 18 is disposed within the cylinder 14 with its rear end projecting through an opening 19, formed in the rear wall of the cylinder 14, as will be apparent from Fig. 4, the forward end of this key guide being provided with an enlarged head 21, shaped to fit within the cylinder and having extensions at top and bottom, fitting within the grooves 15 and 16, whereby the cylinder and key guide are connected to rotate as a unit. A screw 22 threaded into a tapped opening intersecting the cylinder and key guide, locks these elements together against relative displacement.

The tumblers 23 are flat, the outer contour of each being such that it may be disposed within the cylinder 14 with the ends thereof extending into the slots 15 and 16 of the cylinder, and each tumbler is provided with a central aperture 24 adapted to loosely receive the key guide 18 so that each tumbler is held by the key guide against lateral displacement, but is adapted to move up and down relatively to the guide. Each tumbler is also provided with aligned slots 25 and aligned operating shoulders or faces 26, adapted to be engaged by companion serrations on opposite edges of the key, to be later described. The slots 25 extend radially outwardly beyond the operating faces 26, and permit the other set of key serrations to pass through without affecting or moving the tumbler which is controlled solely by the key serrations which engage the faces 26. The tumblers are disposed on the key guide in alternation; that is, the slots 25 being disposed at the left in alternate tumblers, as

shown in Fig. 7, and these slots being disposed at the right in the intervening tumblers, as shown in Fig. 8. Looking longitudinally of the key guide, therefore, the slots 25 and the operating faces 26 will be disposed in alternation on opposite sides of the median plane of the key.

The key, illustrated in Figs. 9 and 10, is provided on opposite sides with longitudinally extending grooves 27, the central portion of the tongue of the key between these grooves being adapted to enter the narrow central portion 28 of the key hole and key slot in the guide 18. The thicker top and bottom portions 29 and 31, respectively, of the key are adapted to enter the enlarged upper and lower ends 32 and 33, respectively, of the key hole, and to travel along the flat surfaces 34 at the top and bottom of the slot in the key guide so that the key is accurately guided during its complete insertion into and removal from the lock. It will be noted that the enlarged upper and lower ends of the slot in the guide are cut laterally deeper on one side (the same side) than on the other, that is, on one side of the center. This is done for the purpose of insuring the entrance of the key in but one position, the proper one. To facilitate the entrance of the key into the lock the key hole is preferably tapered as indicated by 35.

The upper and lower edges of the key are each provided with two sets of serrations 36 and 37, extending longitudinally of the key at opposite sides of the median plane thereof. The set of serrations 36 is adapted to actuate the alternate tumblers which have their operating faces disposed at the right of the slot, while the other set of serrations 37 is adapted to actuate the intervening alternate tumblers which have their operating faces 26 disposed at the left. It will be apparent, therefore, that upon insertion of the key into the lock, alternate tumblers are actuated by the serrations 36, while intervening alternate tumblers are actuated by the serrations 37, and that the slots 25 in each tumbler permit the serrations on the aligned side of the key to pass freely through the tumbler without affecting or displacing the same.

When the key is fully inserted in the lock, the outer ends of the tumblers are all moved by the key into alignment and within the perimeter of the cylinder 14, so that the cylinder may be rotated to manipulate the locking bolt. When the key is withdrawn, however, the tumblers will be displaced either upwardly or downwardly, as the case may be, with the result that their ends are projected into the grooves 12 or 13, thereby locking the cylinder against rotation within the barrel. To insure against accidental movement of the tumblers, such as might possibly align them in unlocking position, I prefer to dispose within the cylinder a curved leaf spring 38 (Figs. 3 and 6), which contacts the shoulders at the juncture of the curve and straight portions of the tumblers, thereby tending to project said tumblers into locking position, as illustrated in Fig. 6, and when the tumblers are moved by the key into unlocking position, the spring is spread or placed under tension, as illustrated in Fig. 3.

In assembling the lock, the tumblers are first strung on the key guide in the alternate relation previously described, the spring 38 is positioned within the cylinder 14, whereupon the key guide with the tumblers thereon is inserted into the cylinder where it is retained by the screw 22. The key is then inserted in the lock and since the tumblers are all originally made of standard length, the action of the key serrations on the tumblers will dispose them with their ends projecting varying distances beyond the perimeter of the cylinder. These projecting ends are then ground or turned off flush with the perimeter of the cylinder, whereupon the cylinder is positioned within the barrel 11 and connected with the bolt actuating mechanism by which the cylinder is held against displacement from the barrel.

It will be apparent from the foregoing that I have provided a lock in which the flat tumblers are strung upon and carried by a key guide, by which the tumblers are maintained in predetermined relation and position in the lock, and by which also the key is accurately guided during its insertion and removal, so that it cannot enter at an angle or bind so as to interfere with its movements. The tumblers, furthermore, are arranged on the key guide in two series, one adapted to be actuated by one set of the key serrations, and the other adapted to be actuated by the other set of key serrations, each tumbler being so constructed that it will not be displaced or affected by the key serrations designed to actuate the tumblers of the other series. Since, when the tumblers are in locking position, some of them project in one direction beyond the lock cylinder and others in the opposite direction beyond this cylinder, and since the operating faces of the two series of tumblers are disposed in different vertical planes, it will be manifest that picking of the lock or opening of the same, except by means of the particular key designed to open the same, is practically impossible. The key, furthermore, being of special design, both with respect to its edges and to its sides, cannot be readily duplicated, which gives further insurance against unauthorized unlocking of the lock.

The lock is simple in construction, economical to manufacture, and can be readily assembled. The details of the construction of the lock, however, may be modified within

considerable limits without departing from the essence of the invention, as set forth in the appended claims.

I claim:

1. In a lock the combination of an internally grooved and relatively stationary barrel having a substantially unbroken surface, a rotatable cylinder within said barrel, a slotted key guide rotatably mounted within said cylinder, a plurality of tumblers surrounding and carried by said key guide and adapted to move transversely of said guide into engagement with the grooves of said barrel, and a key insertable in said guide for actuating said tumblers and rotating said cylinder.

2. A lock comprising a slotted key guide, a plurality of apertured tumblers threaded upon said key guide, each tumbler having opposed operating faces at one side of the center thereof and elongated slots at the opposite side of the center thereof, said tumblers being alternately faced upon said key guide so as to be arranged in a plurality of series, and a key having independent provisions for actuating each series of tumblers.

3. A lock comprising a key guide, a cylinder surrounding the same and connected therewith, a plurality of tumblers mounted on said key guide and engaged in slots in said cylinder, each tumbler having opposed operating faces at one side of the center thereof and elongated slots at the opposite side of the center thereof, a key adapted to align the ends of said tumblers with the perimeter of said cylinder, and yielding means within the cylinder for projecting the ends of the tumblers outside the perimeter of the cylinder upon withdrawal of said key.

4. A lock comprising a slotted key guide, duplicate flat tumblers threaded on said guide in alternate relation so as to be disposed in two series, and a key having lateral grooves to receive said guide and a pair of serrations at each edge adapted to respectively actuate a series of said tumblers.

5. A lock comprising, a key guide, a plurality of duplicate tumblers having unequal outwardly and oppositely projecting portions about said guide, certain of said tumblers being arranged about said guide oppositely to certain other tumblers to provide opposite sets and each tumbler having interiorly facing operating faces and interiorly opening slots adjacent said faces, and a key having independent provisions for engaging said operating faces for aligning the outer ends of the tumbler projections of one set.

6. In a lock, the combination of a relatively stationary barrel having diametrically disposed longitudinally extending grooves and an unbroken external surface, a rotatable cylinder within said barrel, a bifurcated key guide rotatably mounted within said cylinder, a plurality of tumblers surrounding and loosely retained by said bifurcated key guide and adapted to be moved transversely of said guide in opposite directions into engagement with said grooves in said barrel, and a key having oppositely disposed portions insertable in said guide for actuating said tumblers and rotating said cylinder.

7. In a lock of the character described, a relatively stationary barrel, a cylinder rotatably mounted within said barrel, said cylinder having a slot and said barrel an internal groove registerable with one another in a predetermined position, a plurality of tumblers adapted to pass through said slot into said groove when the slot and groove are in register, and a single resilient member normally engaging all of said tumblers for urging the tumblers into said slot and groove when the slot and groove are in register.

8. In a lock of the character described, a barrel having an internal longitudinal slot, a hollow generally cylindrical and longitudinally slotted member mounted within said barrel for relative rotation therein, said slot and groove being adapted to register in a predetermined relative position of said member and barrel, a plurality of tumblers within said member and each provided with a portion adapted to be projected through said slot into said groove and to lock said member and barrel against relative rotation when so projected, and a single spring between said member and said tumblers adapted to normally tend to move said portion of each of a plurality of said tumblers through said slot into said groove.

EDWARD OLIN BENNETT.