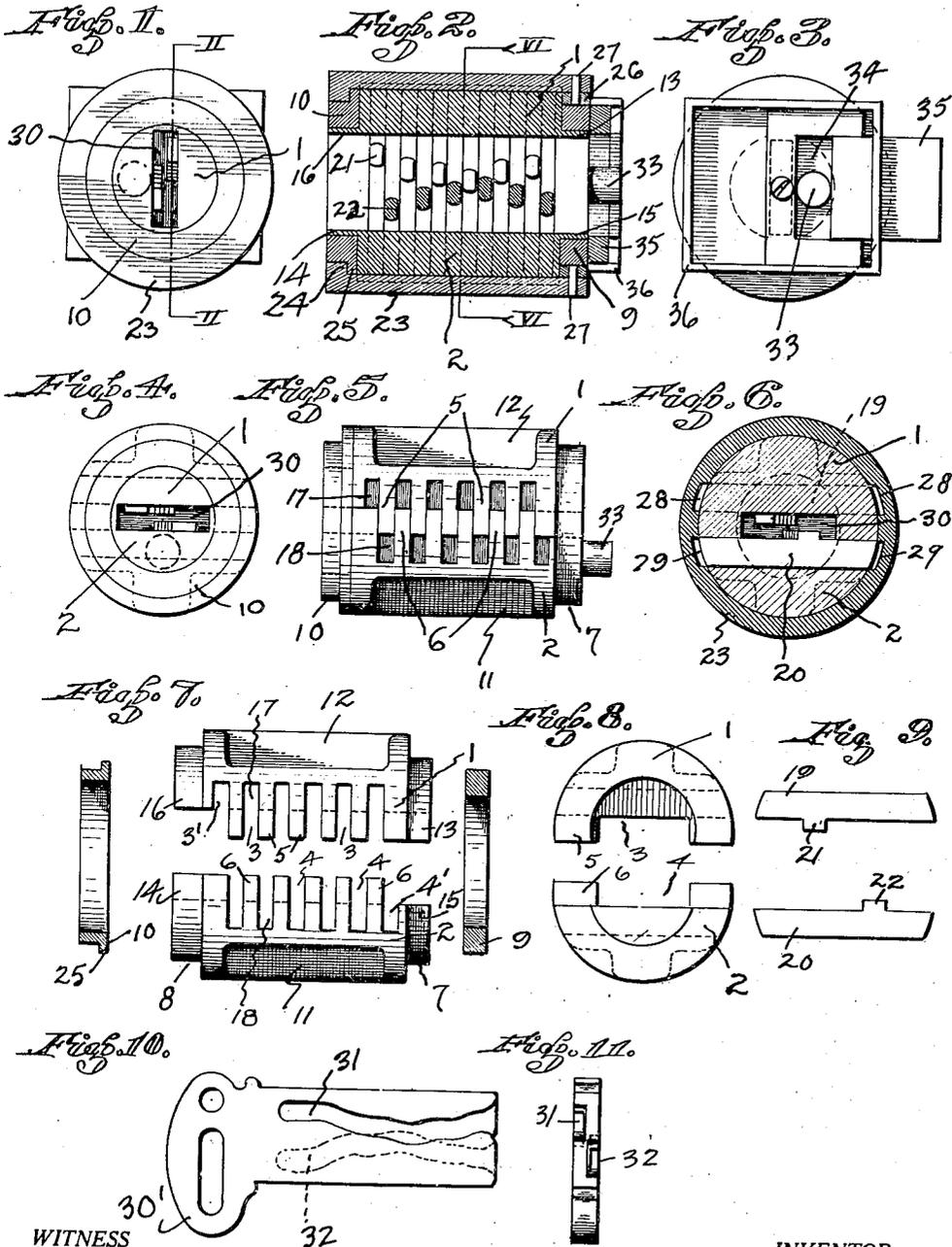


E. O. BENNETT.
 KEY LOCK.
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1,328,074.

Patented Jan. 13, 1920.



WITNESS
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KEY-LOCK.

1,328,074.

Specification of Letters Patent.

Patented Jan. 13, 1920.

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To all whom it may concern:

Be it known that I, EDWARD O. BENNETT, a citizen of the United States, and a resident of the city of Oakland, county of Alameda, State of California, have made a new and useful invention, to wit: Key-Locks; and I do hereby declare the following to be a full, clear, concise, and exact description of the same.

The invention relates particularly to key locks having movable tumblers therein engaging deviations in the key, and it relates also to a new form of key.

Among the objects of the invention are to produce a lock capable of an infinite number of tumbler combinations, simple in construction and operation, strong in construction and proof against picking or fraudulent operation. Other objects and advantages will appear as this description progresses.

In the accompanying specification and the annexed drawings, the invention is illustrated in the form considered to be the best, but it is to be understood that the invention is not limited to such form, because it may be embodied in other forms, and it is also to be understood that in and by the claims following the description it is desired to cover the invention in whatever form it may be embodied.

The present embodiment of this invention illustrates its application to the construction of cylinder or barrel type locks, the outstanding advantage of which is the total elimination of springs and gravity operated parts, all of the parts operated by the key positively engage the same, compelling the tumblers to positively arrange themselves in accordance with the deviations in the key member; yet of such construction and arrangement that the key may be inserted and withdrawn with a minimum amount of resistance and wear and tear upon the parts.

In the accompanying one sheet of drawings:

Figure 1 is a front elevation of a lock constructed in accordance with this invention looking into the keyhole of the lock.

Fig. 2 is a longitudinal section taken on the line II—II Fig. 1 of the same.

Fig. 3 is a rear end elevation of a lock as illustrated in Fig. 1.

Fig. 4 is an end elevation looking into the keyhole of the tumbler cylinder.

Fig. 5 is a side elevation of the same.

Fig. 6 is a cross section of the same taken on the line VI—VI Fig. 2.

Fig. 7 is a disassociated view of the cylinder assembly.

Fig. 8 is an end view of the same.

Fig. 9 is a detailed view in side elevation of a pair of opposed tumblers.

Fig. 10 is a plan view of a key adapted to the operation of a lock constructed in accordance with this invention.

Fig. 11 is an end view of the same, looking toward the entrance end of the key.

In detail the construction illustrated in the drawings includes, a cylinder for containing and guiding a plurality of tumblers and made up of a pair of semi-cylindrical segments 1 and 2 having the transverse cuts 3—3 and 4—4 therein, respectively forming the lugs 5—5 and 6—6 arranged in offset relation, whereby the lugs 5 and 6 fit within the cuts 3 and 4 respectively when the ends of the segments are flush. The flush ends of the assembled segments 1 and 2 are diametrically reduced as at 7 and 8 to receive the snugly fitting rings 9 and 10 respectively, to hold the segments 1 and 2 in assembly, see Fig. 5. The cuts 3—4 are conveniently formed by arranging the segments 1 and 2 in transverse alinement, then passing the segments beneath a gang milling cutter which forms cuts leaving the lugs 5—6 between. For convenience in cutting I provide the web portions 11—12 to provide grips for the chuck jaws during the milling operation. To hold the assembled segments 1 and 2 in proper relation so that the periphery describes a true circle or cylinder, the shoulders 13 and 14 extend beyond the axial line of the cylinder and abut the depressed shoulders 15 and 16 respectively where by the extensions of the lugs 5 and 6 into the cuts 3 and 4 respectively leave the transverse rectangular spaces 17 and 18 above and below the axial line of the cylinder, which act as guides for the parallel bodies 19 and 20 of the opposed tumblers, which slide freely in the guide spaces 17 and 18. These tumblers are each provided with the integral lugs 21 and 22 respectively and arranged in opposed relation within the cylinder. The tumblers are alike in construction except that the end extensions on opposite sides of the lug are of various lengths for reasons which will hereafter appear.

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The cylinder is assembled by laying the tumblers 20 within the groove 4 in the lower segment, see Fig. 2, then the tumblers 19 are inserted in the grooves 3—3 and the segments laid together as in Fig. 5, and the rings 9 and 10 slipped over the ends of the segments to hold them in cylindrical alignment. Thus assembled the cylinder is inserted within the casing or barrel. The casing 23 may be of any desirable exterior contour, cylindrical, as shown, or square, as the purpose for which the lock is constructed may require. The outer end of the casing is provided with the internal shoulder 24 to engage the flange 25 on the ring 10. At the opposite end of the casing the follower ring 26 is inserted over the ring 9 and fixed to the casing by the pins 27 extending there-through to prevent longitudinal movement of the cylinder within the casing, but leaving it free to rotate therein. The sides of the casing are provided with the longitudinal grooves 28—28 and 29—29, placed within the casing to align with the ends of the tumblers 19 and 20 when the same are in the "locked" relation.

In the present instance the determination of the key combination reverses the usual order of procedure, in that the key is made first. The key consists of a flat blank having parallel sides and of a thickness slightly greater than the height of the tumbler lugs 21 and 22, and of proper length to engage all of the tumbler lugs when inserted within the keyhole 30. The key combination is accomplished by routing out the groove 31 in the plane of the key blank with an end mill cutter or otherwise in which operation no particular design need be followed, except that it is desirable to form frequent deviations to form a groove of irregular contour. This groove is repeated on the opposite side of the key as at 32, in the formation of which it is likewise unnecessary to follow a set design as the two grooves are not interdependent. The keys thus formed are inserted in the keyhole 30, the grooves 31 engaging the lugs 21 and the groove 32 engaging the lugs 22 on their respective tumblers, disaligning the lugs in accordance with the lateral deviations in their respective grooves, which causes the ends of the tumblers 19 and 20 to protrude beyond the perimeter of the cylinder. With the key in place, these protruding ends are then filed or turned off flush with the perimeter of the cylinder before it is inserted within the casing 23, as previously described, and within which the cylinder may rotate freely without engaging the casing. When the lock is installed, the casing becomes a fixed part of the door or door jamb or other part to be locked and is the immovable part of the lock, while the cylinder therein is the movable part. When the key is removed from the lock, the lugs 21

and 22 on all the tumblers travel in the deviating contour of their respective grooves 31 and 32 and are thrown into different positions of disalignment, which causes the ends of the various tumblers 19 and 20 to protrude beyond the perimeter of the cylinder and engage the longitudinal grooves 28—28 and 29—29 respectively, which locks the cylinder against rotation within the casing 23. The key is provided with an identifying extension 30' to aid in inserting it properly. In the present instance there are 12 tumblers, one end of each engaging a groove in the casing, resulting in twelve locking points that must be alined before the cylinder can be rotated, a possibility so remote, without the use of the key, that the lock is practically unpickable, for the reason that the last tumbler is so remote from the entrance of the keyhole that it could not be reached without disturbing those ahead of it and the chance of moving all of them into correct position *seriatim* is likewise a remote possibility, considering that the lateral movement of one end of the tumbler out of one of the grooves 28 or 29 enters it into the similar groove on the opposite side of the casing unless the exact proper point is known.

It is obvious that the number of tumblers within the same space may be multiplied by reducing their thickness, making it possible to construct a lock of maximum safety in very compact form. With the number of digits shown the variation in combinations runs practically into infinity; unless it is desired to keep the permutations within stated mathematical limits, in which event certain plotted curves of the grooves 31 and 32 may be followed for the purpose of keeping the combinations within the limits of a master key; which is one of the possibilities of this invention but not one of its essentials.

The rotation of the cylinder within the casing is utilized in any desirable manner, a simple form being shown in Fig. 3, in which a pin 33 is fixed in the end of the cylinder eccentric to the axis thereof and engages a slot 34 in the bolt 35 which is guided within a rectangular frame 36, known in mechanics as a scotch yoke connection for transforming rotary into reciprocating motion, whereby the rotation of the cylinder moving the pin 33 to opposite sides of the axis of the cylinder moves the bolt 35 forward and back to engage and disengage from a suitable keeper or latch plate, to lock the door or other movable part to the frame with which it cooperates. It is obvious that the rotation of the cylinder within the casing may be otherwise utilized without departing from the spirit of this invention. Likewise, other modifications within the range of mechanical knowledge will suggest themselves

to those skilled in this art in applying this invention to special uses.

Having thus described this invention, what I claim and desire to secure by Letters Patent is:

1. A lock including a casing, a cylinder revoluble in said casing and having a longitudinal key-way therein, said cylinder comprising opposed segments having a series of recesses along their longitudinal edges to form alternating lugs and recesses, the lugs of one segment partially engaging in the opposed recesses of the opposite segment to provide transverse tumbler guides in the cylinder on opposite sides of the key-way, tumblers slidable in the guides and having lugs extending into said key-way, and a flat key insertible in the key-way and having deviating grooves on opposite sides thereof adapted to engage the lugs of the tumblers on opposite sides of the key-way.

2. A lock including a casing; a cylinder revoluble in said casing and having a longitudinal keyhole; independently movable tumblers transversely slidable on opposite sides of said keyhole and having lugs extending into said keyhole; and a key to fill and fit the key-hole in said cylinder and having deviating grooves in the sides to engage said lugs.

3. A lock including a casing; a cylinder

revoluble in said casing comprising a pair of opposed segments having registering lugs and recesses forming transverse tumbler guides; tumblers slidable in said guides; and key means for moving said tumblers into and out of engagement with said casing.

4. A lock including a casing, a cylinder revoluble in said casing and having a longitudinal key hole and comprising a pair of opposed segments having registering lugs and recesses forming transverse tumbler guides; tumblers slidable in said guides and having lugs extending into said keyhole; and a key having deviating grooves therein adapted to engage said lugs.

5. A lock including a casing having internal grooves therein; a cylinder revoluble in said casing and having a longitudinal keyhole located axially therein; tumblers transversely slidable in said cylinder adapted to engage said grooves and having lugs extending into said keyhole; and a key having deviating grooves therein adapted to engage said lugs.

In testimony whereof I have hereunto set my hand at San Francisco, California, this 13th day of April, 1918.

EDWARD O. BENNETT.

In presence of—

HARRY A. MUNROE,
LINCOLN V. JOHNSON.