

March 24, 1936.

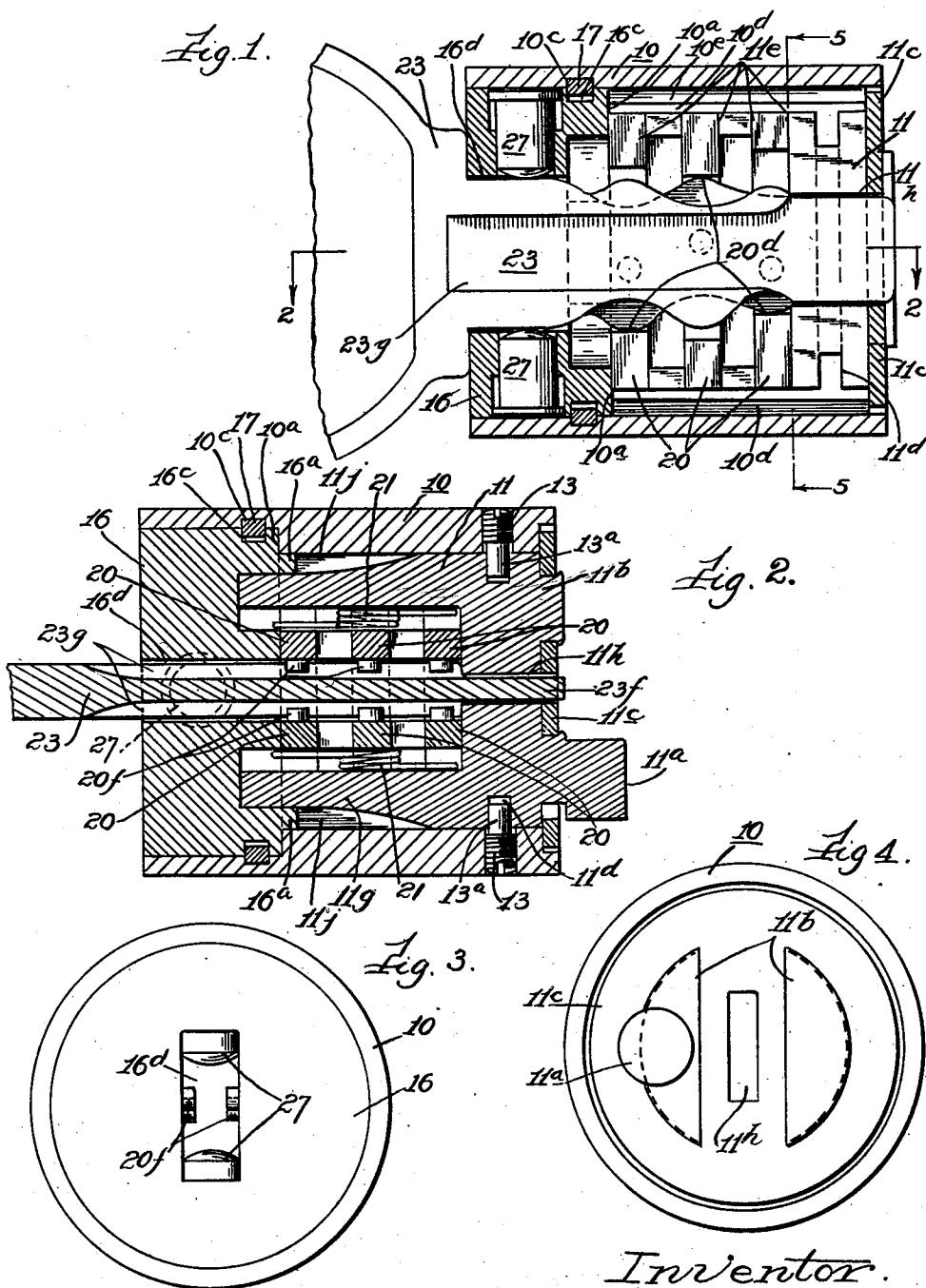
A. W. MOLINARE

2,035,181

LOCK

Filed April 14, 1934

3 Sheets-Sheet 1



Witness
J. B. McHugh.

Inventor.
Anthony W. Molinare.
by *Burt W. Burt*
his Attorneys.

March 24, 1936.

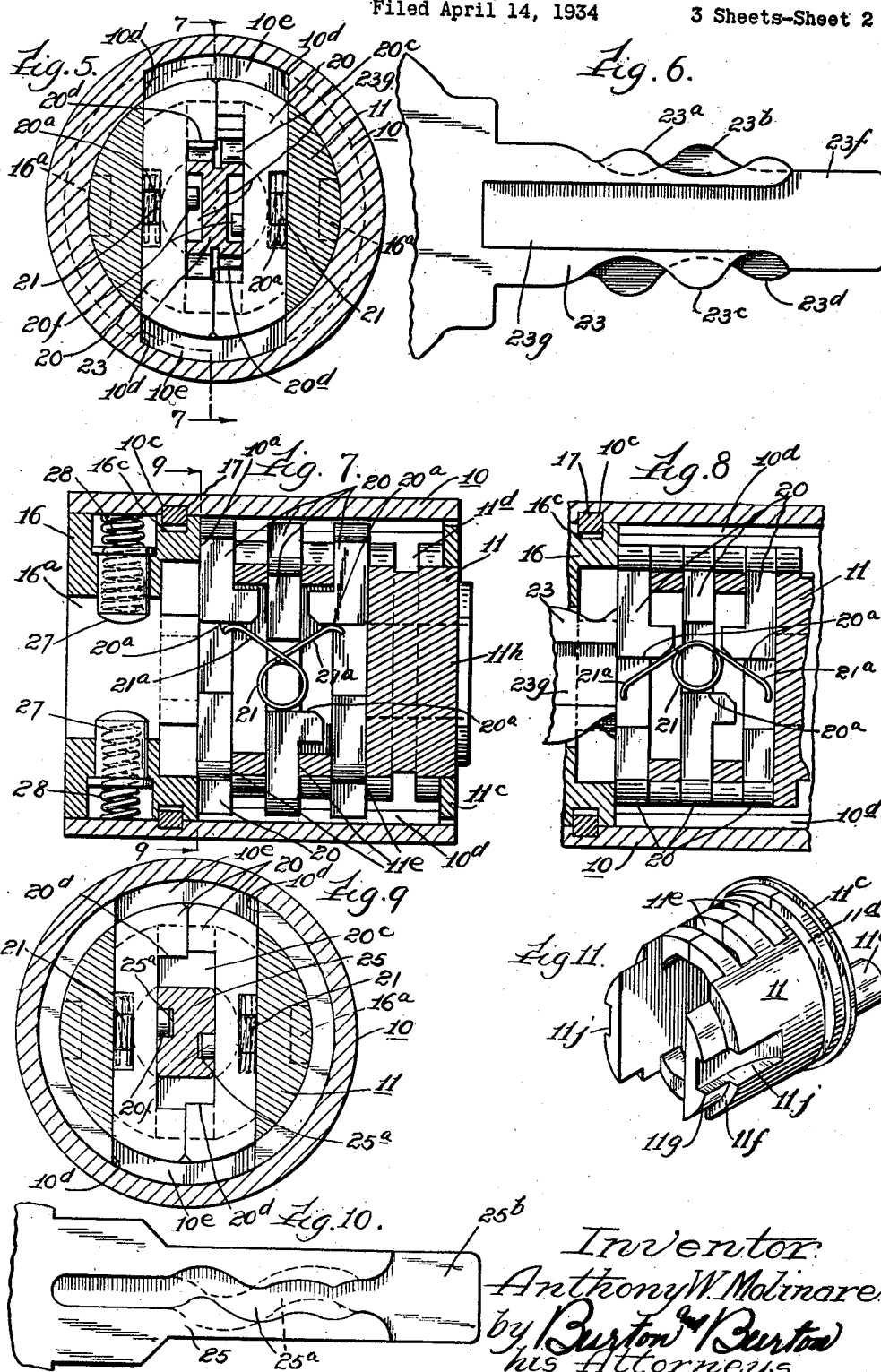
A. W. MOLINARE

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LOCK

Filed April 14, 1934

3 Sheets-Sheet 2



Inventor:
 Anthony W. Molinare
 by *Burton & Burton*
 his Attorneys.

March 24, 1936.

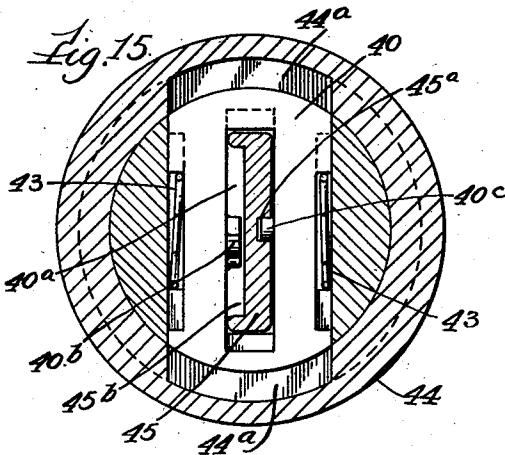
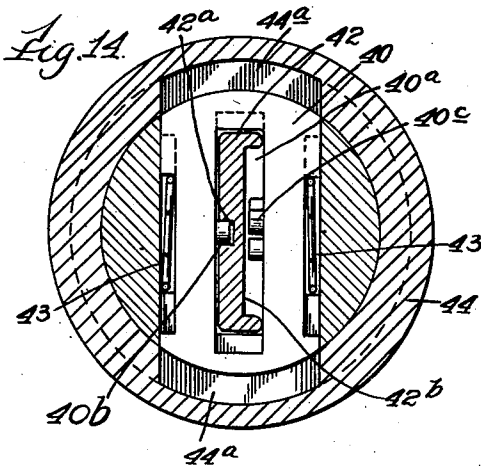
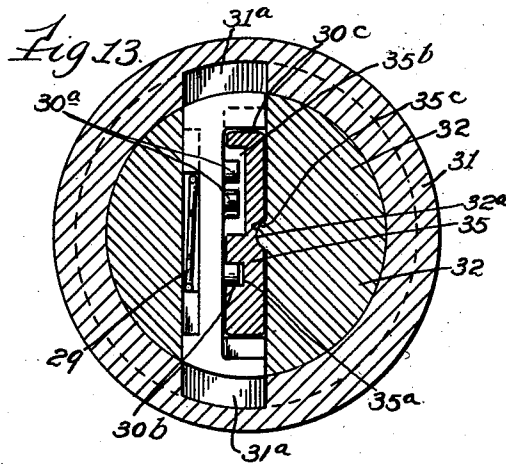
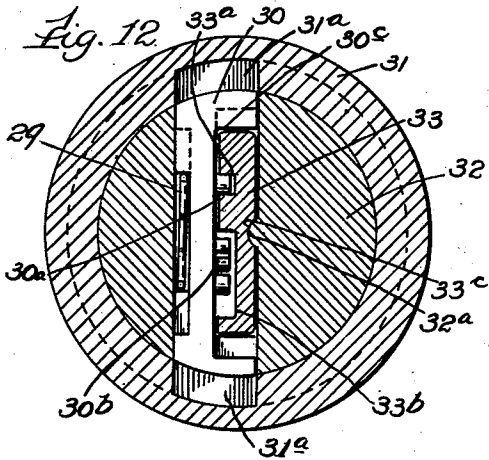
A. W. MOLINARE

2,035,181

LOCK

Filed April 14, 1934

3 Sheets-Sheet 3



Witness
H. P. McPherson

Inventor:
Anthony W. Molinare.
by *Burton W. Burton*
his Attorneys.

UNITED STATES PATENT OFFICE

2,035,181

LOCK

Anthony W. Molinare, Forest Park, Ill., assignor
to Dudley Lock Corporation, Chicago, Ill., a
corporation of Illinois

Application April 14, 1934, Serial No. 720,533

20 Claims. (Cl. 70—92)

The present invention pertains to key locks of the type including a rotary cylinder or plug having a series of transversely movable tumbler elements adapted for engaging an abutment surface of the casing for normally preventing rotation of the cylinder.

One object of my invention is to produce an improved lock of this character, embodying a novel construction and tumbler arrangement which renders the lock substantially incapable of "picking".

Another object resides in the novel construction and arrangement of the tumbler elements wherein the tumblers of the lock are each provided with two or more series of independent key operating features, by virtue of which the tumblers may be engaged by any one of several keys for causing withdrawal of said tumblers from locking engagement with the casing to permit rotation of the cylinder.

A further object is to produce an improved lock construction that is compact in arrangement and which affords a relatively large number of tumbler combinations.

A still further object of my invention consists in the novel construction and arrangement of spring means for urging adjacent tumblers in opposite directions into locking engagement with the casing.

The invention consists in certain features and elements of construction, in combination, herein shown and described and as indicated in the claims.

Certain preferred embodiments of the present invention are represented in the accompanying drawings, in which—

Figure 1 is a longitudinal section through a lock embodying the present invention with a key in position retracting the tumbler elements in unlocking position.

Figure 2 is a longitudinal section through the lock taken at the line 2—2 on Figure 1.

Figure 3 is a front end view of the lock with the key removed.

Figure 4 is a rear end view of the lock.

Figure 5 is a transverse section through the lock taken substantially as indicated at lines 5—5 on Figure 1.

Figure 6 is a side view of one form of a key specially constructed for use in connection with the lock embodying this invention.

Figure 7 is a staggered longitudinal section through the lock, a portion of the section being taken at the outer edge of one series of tumbler elements showing the tumblers in locking position, taken substantially as indicated at lines 7—7 on Figure 5.

Figure 8 is a fragmentary sectional view similar to Figure 7 showing the tumbler elements in retracted or unlocking position.

Figure 9 is a transverse section similar to Figure 5, with another form of key shown in section, and the tumbler elements in unlocking position, taken as indicated at lines 9—9 on Figure 7.

Figure 10 is a side view of the form of key 10 shown in section in Figure 9.

Figure 11 is a perspective view of the cylinder with the tumbler elements removed.

Figure 12 is a transverse section through a lock of modified construction showing one form of key in section for moving the tumblers to unlocking position.

Figure 13 is a section similar to Figure 12 showing a second form of key for operating the same set of tumblers.

Figure 14 is a transverse section of another modified lock construction with a special form of key for moving the tumblers to unlocking position, and

Figure 15 is a section similar to Figure 14 of the same modified form of lock with another form of key for operating the tumblers.

The present invention may be embodied in cylinder locks of various types, and Figures 1 to 11 of the drawings illustrate the invention in connection with one form of lock, which includes an annular casing, 10, and a cylinder or plug 11, which is rotatable therein under the control of tumbler elements when operated by a proper key. The cylinder terminates a substantial distance inwardly from the front edge of the casing, and its rearward end terminates substantially flush with the end of the casing and is provided with an outwardly projecting lug, 11^a, adapted to be engaged with suitable cooperating elements to be operated incident to the rotation of the cylinder. Desirably the cylinder is made up in two sections, each of which is provided with a lug, 11^b, at the rear end, adapted to be extended through apertures in a disk member, 11^c, and riveted thereover for securing the two cylinder parts together. The cylinder is provided with an annular groove, 11^d, adjacent the rear end, in which engage the terminal portions, 13^a, of a pair of threaded studs, 13, which project through from the exterior of the casing, 10, for locking the cylinder and casing together against axial separation, as seen in Figure 2 of the drawings. The respective sections of the cylinder are each provided with a plurality of axially spaced transverse slots, 11^e, registering in

pairs, for accommodating transversely movable tumbler elements, as hereinafter described.

Snugly fitted in the forward end of the casing, 10, is a cap or plug member, 16, which abuts against a shoulder, 10^a, of the casing, and the shoulder, 11ⁱ, of the cylinder or plug formed by a reduced portion, 11^k, of the cylinder, which reduced portion telescopes into the plug or cap member, as seen in Figures 1 and 2. This plug preferably is of a hard material such as steel, to protect the interior of the lock against unauthorized tampering, such as by drilling through into the cylinder, in an attempt to "pick" the lock.

Extending rearwardly from the annular flange of said plug are a pair of diametrically opposite lugs, 16^a, engageable in a pair of longitudinally extending grooves, 11^j, formed in the outer wall of the cylinder, 11, for locking the plug and cylinder together for rotation as a unit. The plug and the interior of the casing are provided with registered annular grooves indicated at 10^c and 16^c, in which is disposed an annular spring ring member, 17, which is fitted snugly in the groove, 16^c, upon insertion of the plug into the casing until it registers with the groove, 10^c, at which time the spring ring expands into the annular groove, 10^c, for locking the plug and casing against axial separation.

Transversely movable in said slots, 11^e, of the cylinder are two series of axially spaced tumbler elements, 20, arranged side by side in pairs, on opposite sides of the key slot, as seen in Figure 5. These tumbler elements normally are yieldingly urged transversely into locking engagement with abutting shoulders, 10^d, formed by the diametrically opposite longitudinally extending slots, 10^e, formed in the inner wall of the casing. The outer edges of the tumblers of each series, which for the purpose of illustration are indicated as three tumblers in each series, are provided with notches forming spring abutment shoulders, 20^a, against which reacts a coil spring, 21, for urging the tumblers into locking engagement with the casing, 10. As may be seen in Figures 7 and 8 of the drawings, the portion of metal which would be normally cut out of the tumbler elements to form the spring abutment shoulders, is bent over to provide a wider surface for engagement by the springs, 21; these tumbler elements are arranged so that the spring abutment shoulders of alternate tumblers are disposed in opposite relation, and the coil spring has its intermediate portion abutting against the abutment shoulder of the intermediate tumbler, while its laterally extending leg portions, 21^a, are in engagement with the abutment shoulders of the two adjacent tumbler elements. By virtue of this arrangement alternate tumblers of each series are projected in opposite directions into locking engagement with the casing, as seen in Figure 7. It will be understood that the two series of tumblers are arranged in reverse relation, so that the tumbler elements constituting each respective pair are yieldingly urged in opposite directions into locking engagement with the casing. If desired, the cylinder of the lock can be formed so that the adjacent tumbler elements of each series abut each other by dispensing with the intermediate spacing portions between the slots, 11^e, of the cylinder.

As shown in the drawings, the tumbler elements of each pair have engaging surfaces which provide guidance for each other throughout their range of transverse movement. The adjacent edges of each pair of tumblers are formed with

rectangular notches indicated generally at 20^c, forming a key slot for accommodating a key, 23. For convenience, one of the transverse shoulders, 20^a, defining part of the notch in each of the tumbler elements serves as the abutment surface which cooperates with a cam surface of the key for moving the tumbler to unlocking position, as seen in Figure 5. In the present arrangement, the shoulders, 20^a, are located so as to be engaged by the key for movement in a direction in opposition to the springs, 21; hence the abutment shoulders, 20^a, of the respective tumbler elements of each pair are arranged in opposite relation, as well as the alternate tumblers of each series. The key, 23, which, for convenience might be termed the "service" key, is provided with four independent cam surfaces indicated at 23^a, 23^b, 23^c and 23^d, two at each edge, and each cam surface of the key is adapted to engage the abutment shoulders, 20^a, of alternate tumbler elements of one series. As is well understood in the art, the abutment shoulders, 20^a, of the respective tumbler elements may be located at any of several predetermined distances with respect to either the end of the tumbler or the center, for making up various tumbler combinations.

The plug or cap member, 16, and the rearward portion of the barrel, 11, are formed with slots 16^d and 11^h, respectively, in registration with the key slot formed by the notches in the tumbler elements. It will be noted that the slot formed in the rear end of the cylinder is of a size just sufficient to accommodate the reduced or terminal portion, 23ⁱ, of the key, 23, which also assists in rotating the cylinder together with the plug, 16.

In order that a group or series of locks, such as of the type above described, may be operated by a single key, commonly termed a "master" key, the tumbler elements of each lock are provided with a second series of abutment surfaces, which, in the present case, are shown in the form of laterally projecting nibs, 20^f, extending into the key slot, and the nibs of each pair of tumbler elements, 20, extend toward each other, as seen in Figure 5 of the drawings. So that the key, 23, may be freely entered into the key slot to engage the abutment surfaces, 20^d, of the tumblers, said key, 23, is provided with longitudinally extending slots, 23^e, in each side surface so as to provide clearance for the nibs, 20^f. When the "master" key indicated at 25, is employed for operating a series of locks, the nibs, 20^f, on each respective series of tumbler elements in all the locks, are arranged in identical relation. The key, 25, is of rectangular cross section, and is dimensioned so as to clear the abutment surfaces, 20^d, of the tumblers, when said key is inserted in the lock. The two opposite side walls of this key are provided with sinuous grooves, 25^a, for engaging the nibs, 20^f, for withdrawing the tumblers from locking engagement with the casing, 10, as seen in Figure 9. It will be apparent that a series of locks could be constructed so that the key, 23, would serve as the "master" key, in which case the abutment surfaces, 20^d, of the respective series of tumblers in all the locks would be identical in arrangement, while the nibs, 20^f, would be variously positioned in the different locks so as to be operated only by an individual key, 25, having properly formed sinuous grooves. The end portion of said key, 25, is also reduced at 25^b, for engaging in the aperture, 11^h, of the cylinder. As may be seen in the drawings, the lock, in addition to being simple and compact, may be made

up in a relatively large number of different tumbler combinations, for the regular "service" key type of lock, and a substantially equally large range of "master" keying arrangements.

It is to be understood that the expression "cam surface of the key" as referred to in the claims, except where specifically mentioned, defines either the cam surfaces forming the walls of the sinuous grooves in the side walls of the key or the serrated cam surfaces formed on the edges of the key.

Manifestly, it is not necessary that the two series of tumbler elements be arranged in alignment, but if desired, one series of tumbler elements could be offset so that each tumbler element of the lock would register with a spacing rib of the opposite cylinder section, and yet the principle of operation of such locks would remain the same as described.

To assist in guiding the key, 25, into engagement with the nibs of the tumblers and into the slot, 11^b, at the rear end of the cylinder, I provide a pair of yielding detent members in the plug, 16, for engaging top and bottom edges of the key as it is inserted into the lock. These yielding detents include a pair of diametrically opposite plungers, 27, which are of hollow form and extend into the key-way, 16^d, formed in the plug, 16, and which are urged to such position by coil springs, 28, reacting against the interior of the plug and inside of the casing, 10, as seen in Figure 7.

Referring now to the modified construction shown in Figures 12 and 13, it will be noted that there is employed only a single series of axially spaced tumbler elements, indicated at 30, and the alternate tumblers are yieldingly urged outwardly in opposite transverse directions, into locking engagement in diametrically opposite longitudinally extending slots, 31^a, formed in the inner wall of the casing, 31, by a spring, 29, which may be of a form similar to the spring, 21. It will be understood that for convenience the cylinder, 32, may also be made in two parts and secured together in the same manner as in the construction disclosed in Figures 1 to 11. In this modified construction each tumbler element is provided with two transversely spaced nibs, 30^a, and 30^b, with the notched portion, 30^c, serving as the key slot. These nibs are preferably located respectively above and below the axis of the cylinder, and only the series of nibs, 30^a, of the respective tumblers are engaged at one time in the sinuous groove, 33^a, of a key indicated at 33, for withdrawing the tumblers from locking engagement with the casing. As will be noted in Figure 12, the lower portion of the key is provided with a longitudinally extending groove, 33^b, so as to provide clearance for the other series of nibs, 30^b, at the lower portion of the tumblers. To assist in guiding the key as it is inserted into the lock, the cylinder and key are formed with a ward, in the form of cooperating tongue and groove features indicated at 32^a and 33^c.

In Figure 13, the key, 35, is the reverse of the construction shown in Figure 12, and has a sinuous groove, 35^a, for engaging the lower series of nibs, 30^b, of the tumblers for moving them into unlocking position, and the upper portion of the same side wall of the key is provided with a longitudinally extending groove, 35^b, for providing clearance for the upper series of nibs, 30^a, on said tumblers. It will be apparent that either of the keys, 33 or 35, may serve as the

individual "service" key, and the other as the "master" key, provided that the series of locks have one of their series of nibs, to be engaged by the "master" key, located in the same identical arrangement in all of the locks to be operated by the "master" key.

Figure 14 and 15 show another modified form of the invention wherein the tumbler elements indicated at 40 are of the plate type having a central aperture, 40^a, serving as the key slot for accommodating the key, 42. The alternate plate tumblers are yieldingly urged by spring members, 43, operating against abutment shoulders at the outer edges of the tumblers in opposite directions into locking engagement in the grooves, 44^a, of the casing, 44. In this construction there is provided two series of nibs, 40^b and 40^c, on opposite sides of the slot, 40^a, and these nibs extend laterally inwardly toward each other. The form of the key illustrated in Figure 14 is provided with a sinuous groove, 42^a, in one of its walls for engaging the series of nibs, 40^b, for withdrawing the tumblers into unlocking position. The opposite side wall of the key is provided with a wide longitudinally extending groove or depression, 42^b, providing clearance for the other series of nibs, 40^c.

In the construction shown in Figure 15 the key indicated at 45 is of reverse form from that shown in Figure 14, in that one side wall is provided with a sinuous groove, 45^a, to cooperate with the series of nibs, 40^c, of the tumblers for withdrawing them from locking position. The opposite wall of said key is formed with a depression or longitudinally extending groove, 45^b, for providing clearance for the other set of tumbler nibs, 40^b. As described in connection with the construction shown in Figures 12 and 13, either of the keys, 42 or 45 may serve as the individual "service" key, and the other key as the "master" key for operating a series of locks, provided that one series of nibs, of the tumblers, in all the locks, are arranged in identical relation.

Although I have shown and described certain preferred embodiments of my invention, it is manifest that certain modifications and rearrangement of parts may be made without departing from the spirit and scope of the invention. I do not, therefore, wish to be understood as limiting myself to the particular constructions herein shown and described, except as indicated in the appended claims.

I claim:

1. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, and a plurality of tumbler elements slidably mounted in the cylinder and normally extending into locking engagement with the casing to prevent rotation of the cylinder, each of said tumbler elements being formed with two independent abutment surfaces extending into the key slot and spaced apart in aligned relation, one directly above the other, in the direction of movement of the tumbler, and each of said two abutment surfaces being engageable by a separate key having a cooperating cam surface for withdrawing the tumbler element from locking engagement with the casing.

2. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, and two series of tumbler elements slidably mounted in the cylinder on opposite sides of the key slot, and normally extending into locking engagement with the casing.

to prevent rotation of the cylinder, both series of tumbler elements being formed with abutment surfaces extending into the key slot and engageable by a key having cooperatively formed features for withdrawing said tumbler elements from locking engagement with the casing, one of said series of tumbler elements being provided with a second set of key-engaging abutment surfaces extending into the key slot and located in substantially the same planes (extending in the direction of movement of said tumbler elements) as the other abutment surfaces on said series of tumblers, said last mentioned series of abutment surfaces being engageable by a second key having cooperatively formed features, and said second key also having cooperatively formed features for engaging the abutment surfaces of the other set of tumbler elements for withdrawing both of said series of tumbler elements from locking engagement with the casing.

3. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot and a plurality of tumbler elements slidably mounted in the cylinder and normally extending into locking engagement with the casing to prevent rotation of the cylinder, said tumbler elements each being formed with two series of independent abutment surfaces, extending into the key slot, one of said abutment surfaces of each tumbler element being located between the planes which extend longitudinally of the cylinder and define the transverse limits of the other abutment surfaces of said tumbler elements, and each series of abutment surfaces of the respective tumbler elements being engageable by a separate key having a cooperating cam surface for withdrawing the tumbler elements from locking engagement with the casing.

4. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, and two series of tumbler elements slidably mounted in the cylinder on opposite sides of the key slot, and normally extending into locking engagement with the casing to prevent rotation of the cylinder, the tumbler elements of each series being formed with two sets of independent abutment surfaces, extending into the key slot, the two sets of abutment surfaces of each series of tumbler elements being located in substantially the same planes extending in the direction of movement of said tumblers, and one set of abutment surfaces of both series of tumbler elements being engageable by a key having cooperating cam surfaces for withdrawing said tumbler elements from locking engagement with the casing, and the other sets of abutment surfaces of both series of tumblers being engageable by another key having cooperating cam surfaces for also withdrawing the tumbler elements from locking engagement with the casing.

5. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, a plurality of tumbler elements slidably mounted in the cylinder and normally extending into locking engagement with the casing to prevent rotation of said cylinder, said tumbler elements being formed with two series of independent abutment surfaces extending into the key slot, one series of abutment surfaces comprising laterally projecting nibs engageable by a cooperatively formed sinuous groove in a side wall of a key adapted for insertion in the key slot for withdrawing said tumblers

from locking engagement with the casing, the other series of abutment surfaces of the tumbler elements being engageable by a cooperatively formed cam surface of a second key for also withdrawing said tumblers from locking engagement with the casing.

6. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, a plurality of tumbler elements slidably mounted in the cylinder and normally extending into locking engagement with the casing to prevent rotation of said cylinder, said tumbler elements being formed with two series of independent abutment surfaces extending into the key slot, one series of abutment surfaces comprising laterally projecting nibs, engageable by a cooperatively formed sinuous groove in a side wall of a key adapted for insertion in the key slot for withdrawing said tumblers from locking engagement with the casing, the other series of abutment surfaces of the tumbler elements being engageable by a cooperatively formed cam surface of a second key for also withdrawing said tumblers from locking engagement with the casing, said last mentioned key being formed with a longitudinally extending groove in its side wall to provide clearance for said nibs on the tumblers.

7. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, and two series of tumbler elements slidably mounted in the cylinder on opposite sides of the key slot, and normally extending into locking engagement with the casing to prevent rotation of the cylinder, both series of tumbler elements being formed with abutment surfaces extending into the key slot and engageable by a key having cooperatively formed features for withdrawing said tumbler elements from locking engagement with the casing, the tumbler elements of one series also being provided with nibs extending into the key slot and located in substantially the same planes (extending in the direction of movement of said tumbler elements) as the other abutment surfaces on said series of tumblers, said nibs being engageable by a second key having a sinuous groove, and said second key also having cooperatively formed features for engaging the abutment surfaces of the other set of tumbler elements for withdrawing both of said series of tumbler elements from locking engagement with the casing.

8. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, and two series of tumbler elements slidably mounted in the cylinder on opposite sides of the key slot, and normally extending into locking engagement with the casing to prevent rotation of the cylinder, both series of tumbler elements being formed with laterally projecting nibs extending into the key slot and engageable in cooperatively formed sinuous grooves in the sides of a key for withdrawing said tumbler elements from locking engagement with the casing, the tumbler elements of one series also being provided with a set of key-engaging abutment surfaces extending into the key slot and located in substantially the same planes (extending in the direction of movement of said tumbler elements) as the nibs, said abutment surfaces being engageable by a second key having cooperatively formed features, and said second key also having a cooperatively formed sinuous groove in a side wall for engaging the nibs

of the other set of tumbler elements for withdrawing both of said series of tumbler elements from locking engagement with the casing.

9. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, two series of tumbler elements slidably mounted in the cylinder on opposite sides of the key slot, and normally extending into locking engagement with the casing, said tumblers each having two independent abutment surfaces, one of the abutment surfaces of each tumbler element of both of the respective series being in the form of a laterally projecting nib, extending into the key slot, said nibs being engageable by cooperatively formed sinuous grooves in the side walls of a key insertable in said key slot for withdrawing said tumbler elements from locking position, the other set of abutment surfaces of the tumbler elements of both series being engageable by cooperatively formed cam surfaces of a second key for also withdrawing all of the tumbler elements from locking position.

10. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, two series of tumbler elements slidably mounted in the cylinder and arranged side by side in pairs on opposite sides of the key slot, spring means for urging the tumblers of each pair in opposite directions into locking engagement with the casing to prevent rotation of the cylinder, said spring means and tumblers also being arranged for urging the alternate tumblers in each series in opposite directions, said tumblers each having two independent abutment surfaces, one abutment surface of each tumbler of both series being in the form of a laterally projecting nib extending into the key slot, the other abutment surfaces of each pair of tumbler elements being located in opposed relation, the last mentioned abutment surfaces of alternate tumbler elements of each series also being arranged in opposed relation, said nibs being engageable by cooperatively formed sinuous grooves in the side walls of a key insertable in said key slot for withdrawing both series of tumbler elements from locking position, the said other set of abutment surfaces of the tumbler elements being engageable by cooperatively formed cam surfaces of a second key having four independent cam surfaces, two at each edge of the key, each cam surface of the key being adapted for cooperative engagement with the last mentioned abutment surfaces of alternate tumblers of one series for withdrawing them from locking position.

11. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, two series of tumbler elements slidably mounted in the cylinder and arranged side by side in pairs on opposite sides of the key slot, spring means for urging the tumblers of each pair in opposite directions into locking engagement with the casing to prevent rotation of the cylinder, said spring means and tumblers also being arranged for urging the alternate tumblers in each series in opposite directions, said tumblers each having two independent abutment surfaces, one abutment surface of each tumbler of both series being in the form of a laterally projecting nib extending into the key slot, the other abutment surfaces of each pair of tumbler elements being located in opposed relation, the last mentioned abutment surfaces of alternate tumbler elements of each series also being arranged in opposed relation, said nibs being engageable by

cooperatively formed sinuous grooves in the opposite side walls of a key insertable in said key slot for withdrawing said tumbler elements from locking position, the said other set of abutment surfaces of the tumbler elements being engageable by cooperatively formed cam surfaces of a second key having four independent cam surfaces, two at each edge of the key, each cam surface of the key being adapted for cooperative engagement with the last mentioned abutment surfaces of alternate tumblers of one series for withdrawing them from locking position, and said last mentioned key being formed with a longitudinally extending groove in each side wall to provide clearance for the nibs of the two series of tumbler elements.

12. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, two series of tumbler elements slidably mounted in said cylinder with the tumbler elements arranged side by side in pairs on opposite sides of the key slot, spring means for urging the tumblers of each pair in opposite directions into locking engagement with the casing to prevent rotation of the cylinder, said spring means also being arranged for urging the alternate tumblers of each series in opposite directions, said tumblers of each pair having engaging surfaces for assisting in guiding each other throughout their normal range of movement, said tumblers each having two abutment surfaces, one abutment surface of each tumbler of the respective series being in the form of a laterally projecting nib extending into the key slot, the other abutment surfaces of each pair of tumbler elements being located in opposed relation, and the last mentioned abutment surfaces of alternate tumbler elements of each series being arranged in opposed relation, said nibs being engageable by cooperatively formed sinuous grooves in the side walls of a key insertable in said key slot for withdrawing both series of tumbler elements from locking position, the said other set of abutment surfaces of the tumbler elements being engageable by cooperatively formed cam surfaces of a second key having four independent cam surfaces, two at each edge of the key, each cam surface of the key being adapted for cooperative engagement with the last mentioned abutment surfaces of alternate tumblers of one series for withdrawing them from locking position.

13. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, a plurality of tumbler elements slidably mounted in said cylinder adjacent the key slot, and normally extending into locking engagement with the casing to prevent rotation of the cylinder, the edges of the tumblers opposite the key slot being recessed to form spring abutment shoulders, and spring means including a coiled intermediate portion engaging a shoulder of one of the tumbler elements, and a pair of oppositely extending leg portions engaging opposed shoulders of the tumbler elements on opposite sides, whereby alternate tumbler elements are urged in opposite directions into locking position.

14. A construction as defined in claim 13, said opposed shoulders of the tumbler elements including a substantial supporting area so that the leg portions of said spring will maintain sliding contact therewith when the tumbler elements are moved.

15. In a lock system, a plurality of key-operated locks, each having a casing, a cylinder rotatably mounted in the casing and having a longitudinally

extending key slot, and two series of tumbler elements slidably mounted in the cylinder on opposite sides of the key slot, and normally extending into locking engagement with the casing to prevent rotation of the cylinder, both series of said tumbler elements being formed with two independent series of key-engaging abutment surfaces located in substantially the same planes in the general direction of movement of the tumblers, one series of abutment surfaces of each series of tumblers being arranged in identical relation in all of the locks of the system for engagement and operation by one key having a cooperatively formed surface, the other series of abutment surfaces of said tumblers in each lock being arranged differently from other locks of the system, and being engageable and operated by an individual key having a cooperatively formed surface.

16. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, a plurality of tumbler elements slidably mounted in said cylinder and normally extending into locking engagement with the casing, said tumbler elements being formed with two independent series of spaced apart laterally extending nibs projecting into the key slot, one series of nibs being engageable by a cooperatively formed sinuous groove in a side wall of a key insertable in said key slot for withdrawing the tumbler elements from locking position, the other series of nibs being engageable by a cooperatively formed sinuous groove in a side wall of a second key for also withdrawing said tumbler elements from locking position, both of said keys being formed with a relatively wide longitudinally extending groove in one of the side walls to provide clearance for the other series of nibs on said tumbler elements.

17. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, a plurality of tumbler elements slidably mounted in said cylinder adjacent the key slot, and normally extending into locking engagement with the casing, to prevent rotation of the cylinder, said tumbler elements being formed with two independent series of spaced nibs, one series of nibs of said tumbler elements being engageable by a cooperatively formed sinuous groove in the side wall of a key insertable in said key slot for withdrawing said tumblers from locking position, the other series of nibs being engageable by a cooperatively

formed sinuous groove in the corresponding side wall of a second key for also withdrawing said tumbler elements from locking position, both of said keys being formed with a longitudinally extending groove in the same side wall as the sinuous groove, to provide clearance for the opposite series of the nibs on said tumbler elements.

18. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, a plurality of tumbler elements having key slots therein and normally extending into locking engagement with the casing, said tumbler elements having two series of laterally extending nibs projecting into the key slot from opposite sides, one series of nibs being engageable by a cooperatively formed sinuous groove in a side wall of a key insertable in said key slot for withdrawing the tumbler elements from locking position, the other series of nibs of said tumbler elements being engageable by a cooperatively formed sinuous groove in a side wall of a second key, said groove being located on the side opposite to the groove of the first mentioned key for also withdrawing the tumbler elements from locking position, both of said keys being formed with a relatively wide longitudinally extending groove in the side wall opposite to the sinuous groove to provide clearance for the opposite series of nibs on said tumbler elements.

19. A construction as defined in claim 13, said tumbler elements engaged by said coiled intermediate portion of the spring including a projection extending through said coiled intermediate portion to prevent lateral displacement of the spring.

20. In a lock, a casing, a cylinder rotatable in the casing and provided with a longitudinally extending key slot, and a plurality of tumbler elements slidably mounted in the cylinder and normally extending into locking engagement with the casing to prevent rotation of the cylinder, said tumbler elements having two series of independently functioning abutment surfaces extending into the key slot, one series being disposed in direct alignment with the other series in the direction of movement of said tumbler elements, and each series of abutment surfaces being engageable by a separate key having a cooperating cam surface for withdrawing the tumbler elements from locking engagement with the casing.

ANTHONY W. MOLINARE.