Nov. 17, 1936. H. J. FEDERHOLZNER 2,061,354

LOCK

Filed April 25, 1935

Fig. 1.

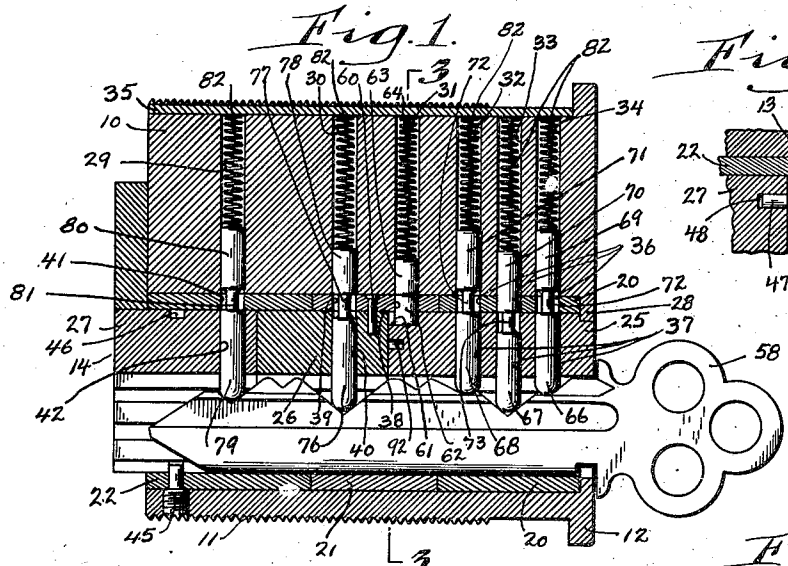


Fig. 7.

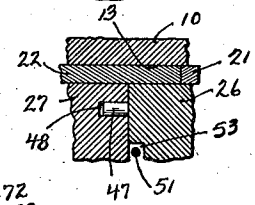


Fig. 2.

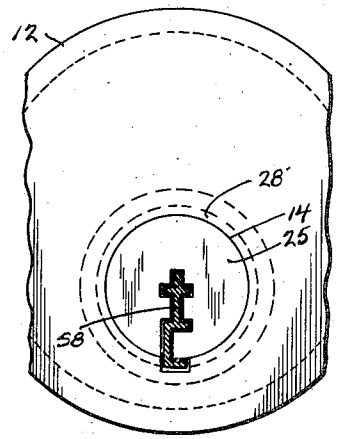


Fig. 4.

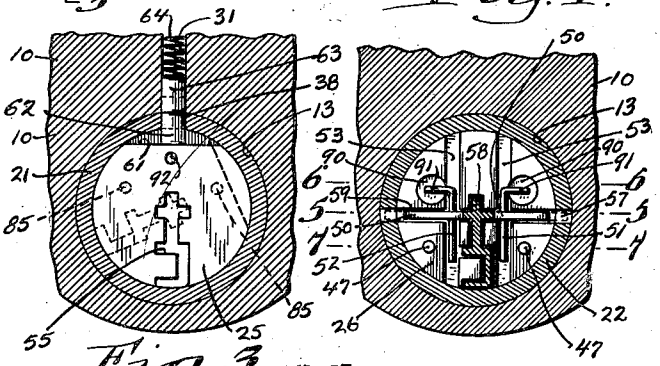


Fig. 3.

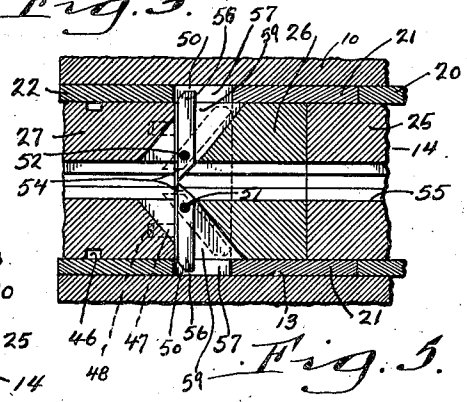


Fig. 6.

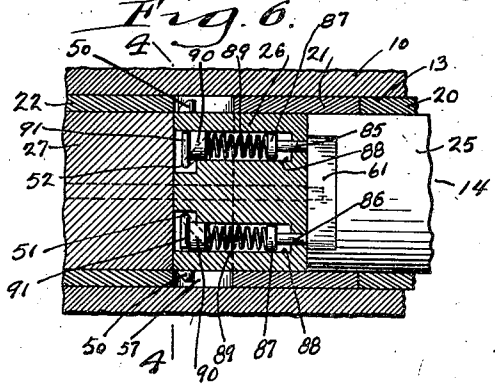


Fig. 5.

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2,061,354

LOCK

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Application April 25, 1935, Serial No. 18,183

16 Claims. (Cl. 70—47)

My invention relates in general to locks and in particular to locks of the cylinder or pin tumbler type.

As is well known to those skilled in the art, the ordinary lock of this type may be quite easily picked by those skilled in the practice with the use of suitable instruments.

The principal object of my invention has been to provide a lock which shall be substantially pick-proof.

Another object has been to provide a lock having a cylinder formed of a number of sections so arranged that should the first section be rotated, the other section or sections thereof will be positively locked against rotation.

Moreover, my lock may be further safe-guarded by providing some of the pin tumblers with reduced ends.

A further object has been to provide the rear cylinder section with detent arms which normally lock such section against rotation and which can only be released by the insertion of a key.

Furthermore, my lock may be so designed that should any unauthorized person rotate the first portion of the cylinder, such portion would be locked against further rotation in either direction by detent means, thus giving to the owner of the lock definite information that the lock has been tampered with.

The above objects and advantages have been accomplished by the device shown in the accompanying drawing, of which:

Fig. 1 is an enlarged, longitudinal, sectional elevation of my complete device.

Fig. 2 is a fragmentary, face view of the lock.

Fig. 3 is a fragmentary, transverse, sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is a similar view taken on line 4—4 of Fig. 6.

Fig. 5 is a longitudinal, fragmentary, sectional view taken on line 5—5 of Fig. 4.

Fig. 6 is a fragmentary, longitudinal, sectional view taken on line 6—6 of Fig. 4, with portions thereof broken away for clearness of illustration.

Fig. 7 is a fragmentary, sectional view taken on line 7—7 of Fig. 4.

The form of my invention which is shown in the drawing comprises a casing 10 having the customary screwthreaded periphery 11 and flange 12 at its forward end. The casing 10 is provided with a bore 13 considerably larger than the diameter of the cylinder 14 of my device and in the bore is mounted a multiple-part sleeve comprising a front section 20, an intermediate section 21, and a rear section 22. Mounted within the sleeve is the lock cylinder 14 comprising a front section 25, an intermediate section 26, and a rear section 27. The flange 12 is formed with a centrally arranged opening which is smaller in diameter than the diameter of the lock cylinder so that a shoulder 28 is formed for the front section 20 of the sleeve and for the front section 25 of the cylinder, as clearly shown in Figs. 1 and 2.

The casing 10 is provided with the usual holes 29, 30, 31, 32, 33, and 34 extending therethrough, the upper ends of which are closed by means of the lock plate 35. The front section 20 of the sleeve is provided with three apertures 36 which register with the apertures 32, 33, and 34 of the casing. Likewise, the front section of the lock cylinder is provided with apertures 37 which register with the apertures 36 of the front sleeve section. The intermediate sleeve section 21 is provided with an aperture 38 which registers with the aperture 31 of the casing and this sleeve section is also provided with an aperture 39 which registers with the aperture 30 of the casing. The intermediate cylinder section is provided with an aperture 40 which registers with the apertures 39 and 30 of the intermediate sleeve section and casing, respectively.

The rear sleeve section 22 is provided with an aperture 41 which registers with the apertures 29 of the casing, and the rear cylinder section 27 is provided with an aperture 42 which registers with the aperture 41.

The rear section 22 of the sleeve is held in unmovably fixed position by means of a detent screw 45. This screw passes through the casing 10 and is in engagement with an annular groove 46 formed in the rear cylinder section 27, whereby this cylinder section is held in rotative manner but prevented from moving axially. The rear sleeve section 22 is considerably longer than the rear cylinder section 27 so that this sleeve section overlaps, for a considerable distance, the joint between the rear and intermediate cylinder sections, as clearly shown in Figs. 1, 5, and 6. The intermediate cylinder section 26 is provided with two stop pins 47, arranged preferably one on each side of the center of the lock, as shown in Fig. 4, and these pins engage suitable apertures 48 (see Fig. 7) formed in the rear cylinder section 27, whereby these two sections are thus connected together so that they will move in unison when rotated.

In the face of the intermediate cylinder section 26 there are provided two diametrically opposite slots 59 in each of which is disposed a detent lever 50. One of these levers is provided near

its inner end with a pivot pin 51 and the other lever is provided near its inner end with a pivot pin 52, to be hereinafter further described. These pins are set into recesses 53 formed in the end face of the intermediate cylinder section 26, which recesses hold these pins in position and permit rotation of the arms. Each of the arms is provided with a key engaging portion 54 which extends into the key slot 55 formed through the sections 25, 26, and 27 of the lock cylinder. Each of the levers is also further provided with a detent arm 56 which extends outwardly and into detent slots 57 formed at diametrically opposite points in the stationarily arranged, rear, sleeve section 22. When these detent levers 50 are in the position shown in Figs. 5 and 6, the intermediate and rear cylinder sections 26 and 27 will be locked aganst rotation. When, however, the key 58 is inserted in the slot, the key engaging arms 54 of the detent levers will be engaged and the levers will be pushed to the dotted line position shown in Fig. 5 where their outer detent arms 56 will be out of engagement with the detent slots 57.

The intermediate sleeve section 21 is so proportioned that it extends across the joint between the intermediate cylinder section 26 and the front cylinder section 25. This intermediate sleeve section is fixed to the intermediate cylinder section by means of a pin 60, clearly shown in Fig. 1, so that these two sections are rotatable together. The front cylinder section 25 is formed in its periphery near the rear end thereof with a flat surface 61, clearly shown in Figs. 1 and 3. A detent pin tumbler 62 is carried by the intermediate sleeve section 21 and has its lower end in engagement with the flat surface 61. Since the joint in the lock between the intermediate sections of the cylinder and sleeve is between the intermediate sleeve section and the bore 13 of the casing, the detent pin tumbler 62 is of such length that its upper surface will register with the outer periphery of the sleeve or the bore 13 when the lock cylinder sections are in their normal positions. A supplemental detent pin 63 is carried by the hole 31 of the casing. By means of this construction, should the front section 25 of the cylinder be rotated in relation to the intermediate section 26 thereof, the flat surface 61 will act as a cam and force the detent pin tumbler 62 up into the hole 31 against the tension of the spring 64 and thus position it across the joint in the lock at this place, thereby positively preventing rotation of the intermediate cylinder or sleeve sections.

Pin tumblers 66, 67, and 68 are mounted in the holes 37 of the front cylinder section 25 which are in registration, respectively, with the holes 34, 33, and 32 of the casing. Supplemental pin tumblers 69, 70, and 71, respectively are carried by the holes 34, 33, and 32 of the casing. In addition to the picking of a lock, an unauthorized person can make a key for a lock, by what is known as the impression method. In such method a blank key is inserted in the lock cylinder slot and is turned slightly so as to cause the tumblers to bind in their respective holes, the key being now moved back and forward very slightly but sufficiently to produce a mark on the top thereof where the tumblers engage. The blank is then withdrawn and the places where the marks are indicated are filed. The key is then inserted again and the same procedure is carried on. When one of the notches is filed to the proper depth for the particular pair of tumblers which it engages, this particular tumbler will be moved only to such position where it will be unlocked and, therefore, it will not bind, with the result that no mark will be left on the key for this particular tumbler. The thief, therefore, knows that the key is fitted for this particular tumbler and gives his attention to such tumblers which still produce marks on the key. In order to thwart this practice, I provide one of each pair of pin tumblers in my device with an end having a reduced diameter. In order to accomplish the desired result, however, it is necessary that the reduced ends be oppositely formed on adjacent pairs of pin tumblers. Thus, the alternately arranged supplemental pin tumblers 69 and 71 are each provided with a reduced lower end 72, while the supplemental pin tumbler 70 is not reduced, but the intermediate pin tumbler 67 engaging therewith is formed with a reduced end 73. The supplemental pin tumbler 70 is made with full diameter throughout its length so that it engages the hole 33 of the casing and the registering hole 36 of the front sleeve portion 20, whereby this sleeve portion will be held against rotation within the casing, thus bringing the joint in the lock at this point between the front sleeve section 20 and the front cylinder section 25. In addition to the previously mentioned pin tumblers a pin tumbler 76 is provided which is carried by the aperture 40 of the intermediate cylinder section 26 and it is provided at its upper end with a reduced portion 77. The supplemental pin tumbler 78 is mounted in the aperture 30 and bears against the upper end of the reduced portion 77 of the pin tumbler 76. A pin tumbler 79 is also provided which is carried by the aperture 42 of the rear cylinder section 27 and this tumbler is of uniform diameter throughout its length. The supplemental pin tumbler 80 is carried by the hole 29 of the casing and it is provided with a reduced end 81 which engages the pin tumbler 79 at the joint between the rear cylinder section 27 and the rear sleeve section 22. The pairs of tumblers 76 and 78, and 79 and 80 thus have their reduced ends alternately arranged. Springs 82 are arranged in each of the holes 29, 30, 32, 33, and 34 for engagement with the pin tumblers carried therein. Assuming that it is atempted to fit a key to my lock by the impression method, it will be seen that all of the tumblers at the beginning of operation will undoubtedly show marks on the key. When, however, the key has been fitted so that the tops of each of the tumblers 66, 68, and 79 come at the joint of the moving parts, the cylinder portion will be unlocked, thereby permitting the rotation thereof until the reduced ends 72 of tumblers 67 and 76 strike the edges of the respective holes in the casing, whereupon the further rotation of the cylinder portion will be stopped by these reduced ends. It will now be seen that in this position, if it is attempted to work the key back and forth to get the unlocked tumblers to cause marks, such movement will cause the tumblers 66, 68, and 79 to strike against the casing or adjacent sleeve, thereby preventing axial movement. When such axial movement is thus prevented it will be seen that the key will again be marked by these tumblers and the thief, thinking that these tumblers are not fitted, will continue to file the respective notches, thus undoing the work previously accomplished and thus making it impossible for him to get an accurate impression of all of the tumblers.

Where it is desired that unmistakable evidence be given that an attempt has been made to pick

the lock, I provide means for securing the first section of the lock cylinder in an abnormal position when it is actuated in either direction by a thief. Such means may comprise two detent plungers **85** and **86**, one arranged on each side of the vertical center line of the lock. Each of these plungers is provided with a head **87** which is mounted in a longitudinal bore **88** formed in the intermediate section **26** of the lock cylinder. A locking spring **89** is arranged to bear against each of the plunger heads, and a plug **90** is provided in the end of each bore **88**. The pivot pins **51** and **52** of the detent levers **50** are each provided with an outwardly extending arm **91** which bears onto the plug **90**. The springs **89**, therefore, serve to force the plungers **85** forwardly against the inner face of the front cylinder section **25** and also serve to keep the detent levers **50** in the positions shown in Figs. 4, 5, and 6 through the medium of plugs **90** and arms **91**. Formed in the inner face of the front cylinder section **25** is a detent aperture **92** which is arranged on the vertical center line of the lock. This aperture is arranged a distance from the center of the cylinder substantially the same as the distance from the center to the detent plungers **85** and **86**. It will be obvious, as shown in Fig. 3, that when the front cylinder section **25** is rotated in either direction relative to the intermediate section **26**, the detent aperture **92** will be brought in registering position and engagement with either the detent plunger **85** or the detent plunger **86** and thus serve to lock these two parts together in such position that it will not be possible to insert the key beyond the front section of the cylinder. Since the intermediate and rear sections are locked by means of the detent tumbler **62** and the pin tumblers **76** and **79**, the entire device will be positively locked against further use and can only be again put back into service by having the parts drilled out and replaced by a locksmith.

From the foregoing it will be obvious that the joint between the rotatable parts of my lock and the casing is between the rear section **22** of the sleeve and the portions of the intermediate and rear sections **26** and **27**, respectively, of the cylinder which are covered thereby; between intermediate sleeve section **21** and the bore **13** of the casing; and between front section **20** of the sleeve and surface of the front section **25** of the cylinder with which it engages. Should an attempt be made to pick my lock, it might be possible to unlock and release the front cylinder section **25**. The intermediate and rear cylinder sections **26** and **27**, respectively, are however, held in fixed position by the detent levers **50**, and the stop pins **47**, the detent screw **45**, as well as by the pin tumblers **76** and **79**. Assuming that the front cylinder section has been released, it will be obvious that it would be impossible to get an instrument in far enough to engage the intermediate section thereof to put rotative tension upon it and the rear section in an attempt to release the tumblers carried by them. Even if this could be done, the device would still remain locked because the detent levers **50** lock the intermediate and rear cylinder sections **26** and **27**, respectively, to the stationarily arranged rear sleeve section **22**. As hereinbefore pointed out, in the event that the front cylinder section has been released and is rotated, the detent pin tumbler **62** will be elevated by the relative rotation of this front cylinder section with the fixed intermediate section and thus further lock the intermediate and rear cylinder sections. Should the thief rotate the released front cylinder section **25** so as to bring the aperture **92** formed therein to a position opposite either of the detent plungers **85** or **86**, the entire lock would be made inoperable, as hereinbefore pointed out.

Obviously, if desired, the front sleeve section **20** may be omitted and the bore **13** of the casing be reduced in diameter in relation to the diameter of the front cylinder section **25** over the length occupied by the front sleeve section. Furthermore, while I have shown the detent plungers **85** and **86** for positively locking the front cylinder section in a position to which it may be moved by an unauthorized person, it is obvious that this is optional and could be omitted from the structure if desired.

These and other modifications of the details herein shown and described may be made without departing from the spirit of my invention or the scope of the appended claims, and I do not, therefore, wish to be limited to the exact embodiment herein shown and described, the form shown being merely a preferred embodiment thereof.

Having thus described my invention, what I claim is:

1. A lock comprising a casing provided with a longitudinal bore, a sleeve mounted in the bore, a cylinder comprising two relatively rotatable sections, a plurality of pin tumblers carried by the casing, the sleeve, and the cylinder, one section of the cylinder being permanently fixed to the sleeve, and locking plunger means carried by one cylinder section and engageable with the other for locking said sections together only when relative rotation occurs between the two sections.

2. A lock comprising a casing, provided with a longitudinal bore, a sleeve mounted in the bore, a cylinder comprising two relatively rotatable sections, a plurality of pin tumblers carried by the casing, the sleeve, and the cylinder, one section of the cylinder being permanently fixed to the sleeve, sleeve detent means actuated by the other section of the cylinder for locking the first mentioned section against rotation within the casing when relative rotation occurs between the cylinder parts, and locking plunger means carried by one cylinder section and engageable with the other only when relative rotation occurs between the two sections.

3. A lock comprising a casing provided with a longitudinal bore, a sleeve mounted in the bore, a cylinder comprising a plurality of relatively rotatable sections mounted within the casing, a plurality of pin tumblers carried by the casing, the sleeve, and sections of the cylinder, one section of the cylinder being permanently fixed to the sleeve, key actuated means for normally locking the first mentioned cylinder section against rotation within the casing, and plunger locking means carried by said cylinder section and engageable with another section only when relative rotation occurs between the two sections.

4. A lock comprising a casing provided with a cylindrical bore, a sleeve comprising two sections mounted in the bore, one section thereof being fixed against rotation and the other section being rotatable within the casing, a cylinder comprising a plurality of relatively rotatable sections mounted within the sleeve and the casing, a plurality of pin tumblers carried by the casing, the sleeve sections, and the cylinder sections, one cylinder section being permanently fixed to one sleeve section, detent levers carried by said cylinder sec-

tion for normally locking such cylinder section against rotation in the fixed sleeve, and a normally inactive detent pin tumbler carried by that section of the sleeve which is fixed to a cylinder section and operable to lock such sleeve portion and its fixed cylinder section against rotation in the casing when relative rotation occurs between such cylinder section and the adjacent cylinder section which engages such sleeve section.

5. A lock comprising a casing provided with a cylindrical bore, a sleeve comprising two sections mounted in the bore, one section thereof being fixed against rotation and the other section being rotatable within the casing, a cylinder comprising a plurality of relatively rotatable sections mounted within the sleeve, a plurality of pin tumblers carried by the casing, the sleeve sections, and the cylinder sections, one cylinder section being permanently fixed to the rotatable sleeve section, detent levers carried by said last mentioned cylinder section for normally locking such cylinder section against rotation in the fixed sleeve section, and a normally inactive detent pin tumbler carried by said rotatable sleeve section, the adjacent cylinder section being provided with a flat peripheral surface engageable with the detent pin tumbler for moving said tumbler to sleeve locking position, whereby when relative rotation occurs between the last mentioned cylinder section and the cylinder and sleeve section carrying the detent pin, such section and sleeve will be locked to the casing against rotation.

6. A lock comprising a casing provided with a longitudinal bore, a sleeve mounted in the bore, a cylinder comprising two relatively rotatable sections, a plurality of pin tumblers carried by the casing, the sleeve, and the cylinder, one section of the cylinder being permanently fixed to the sleeve, and plunger locking means comprising plungers slidably carried by one of the cylinder sections and engageable with an aperture formed in the adjacent cylinder section, whereby when the two sections are rotated relatively the locking means will positively engage them and prevent further rotation.

7. A lock comprising a casing, a cylinder rotatably mounted in the casing, the casing and cylinder being provided with suitable registering apertures, a plurality of pairs of pin tumblers carried by the apertures, one tumbler of each of said pairs being provided with a reduced end, each alternate pair having its reduced end tumbler carried by the casing and each intermediate pair having its reduced end tumbler carried by the cylinder.

8. A lock comprising a casing provided with a longitudinal bore, a multiple section sleeve mounted in the bore and having one of its sections permanently fixed, a cylinder comprising two relatively rotatable sections, a plurality of pin tumblers carried by the casing, the sleeve, and the cylinder for locking these elements together, one section of the cylinder being permanently fixed to one of the sleeve sections, and radially arranged sleeve detent means actuated by the other section of the cylinder for locking the first mentioned section and the affixed sleeve section against rotation within the casing when relative rotation occurs between the cylinder sections.

9. A lock comprising a casing provided with a cylindrical bore, a sleeve comprising two sections, mounted in the bore, one section thereof being fixed against rotation and the other section being rotatable within the casing, a cylinder comprising a plurality of relatively rotatable sections mounted within the sleeve and the casing, a plurality of pin tumblers carried by the casing, the sleeve sections, and the cylinder sections, the sleeve sections overlapping the joints between the cylinder sections, one cylinder section being permanently fixed to one sleeve section, detent levers carried by one cylinder section for normally locking such cylinder section against rotation in the fixed sleeve, and a normally inactive detent pin tumbler carried by that section of the sleeve which is fixed to the cylinder section and operable to lock such sleeve section and the affixed cylinder section against rotation in the casing when relative rotation occurs between such cylinder section and the adjacent cylinder section which engages such sleeve section.

10. A lock comprising a casing provided with a cylindrical bore, a sleeve comprising two sections mounted in the bore, one section thereof being fixed against rotation and the other section being rotatable within the casing, a cylinder comprising a plurality of relatively rotatable sections mounted within the sleeve and the casing, a plurality of pin tumblers carried by the casing, the sleeve sections, and the cylinder sections, one cylinder section being permanently fixed to one sleeve section, and detent levers carried by one cylinder section for normally locking such cylinder section against rotation in the fixed sleeve.

11. A lock comprising a casing provided with a cylindrical bore, a sleeve comprising two sections mounted in the bore, one section thereof being fixed against rotation and the other section being rotatable within the casing, a cylinder comprising a plurality of relatively rotatable sections mounted within the sleeve and the casing, a plurality of pin tumblers carried by the casing, the sleeve sections, and the cylinder sections, one cylinder section being permanently fixed to one sleeve section, and a normally inactive detent pin tumbler carried by that section of the sleeve which is fixed to a cylinder section and operable to lock such sleeve section and its affixed cylinder section against rotation in the casing when relative rotation occurs between such cylinder section and the adjacent cylinder section which engages such sleeve section.

12. A lock comprising a casing provided with a cylindrical bore, a sleeve comprising two sections mounted in the bore, one section thereof being fixed against rotation and the other section being rotatable within the casing, a cylinder comprising a plurality of relatively rotatable sections mounted within the sleeve and the casing, a plurality of pin tumblers carried by the casing, the sleeve sections, and the cylinder sections for locking these elements together, one cylinder section being permanently fixed to one sleeve section, and a normally inactive detent pin tumbler carried by that section of the sleeve which is fixed to the cylinder section, the adjacent cylinder section being provided with a flat peripheral surface engageable with the detent pin tumbler, whereby when relative rotation occurs between the last mentioned cylinder section and the cylinder and sleeve section carrying the detent pin, such section and sleeve will be held within the casing against rotation.

13. A lock comprising a casing provided with a longitudinal bore, a sleeve mounted in the bore and comprising a rotatable section and a stationary section, the stationary section being formed with slots, a cylinder in said sleeve comprising two relatively rotatable sec-

tions, a plurality of pin tumblers carried by the casing, the sleeve, and the cylinder, one section of the cylinder being permanently fixed to said rotatable sleeve section, key actuated means carried by one of the cylinder sections and comprising two oppositely arranged, pivotally mounted, detent levers, and resilient means carried by the cylinder section for normally forcing the levers outwardly in cooperative locking engagement with the slots of the stationary sleeve section, whereby the cylinder section will be held against rotation until the proper key is inserted.

14. A lock comprising a casing provided with a longitudinal bore, a sleeve mounted in the bore, a lock cylinder in said sleeve comprising a front section, an intermediate section, and a rear section, said intermediate and front sections being relatively rotatable, the intermediate section being formed with two longitudinal apertures, a locking plunger in one end of each of the apertures, a locking spring behind each of the plungers for forcing its end outwardly beyond the face of the section and in engagement with an aperture formed in the adjacent section when relative rotation of the two sections occur, the opposite face of the intermediate section being formed with slots, a detent arm pivotally mounted in each of said slots and being in cooperative relation with one of the locking springs, whereby the arms are normally forced outwardly in locking engagement with a stationary part of the lock.

15. A lock comprising a casing provided with a longitudinal bore, a sleeve mounted in the bore, a lock cylinder in said sleeve comprising a front section, an intermediate section, and a rear section, said intermediate and front sections being relatively rotatable, the intermediate section being formed with two longitudinal apertures, a locking plunger in one end of each of the apertures, a locking spring behind each of the plungers for forcing its end outwardly beyond the face of the section and in engagement with an aperture formed in the adjacent section when relative rotation of the two sections occur, the opposite face of the intermediate section being formed with slots, a detent arm pivotally mounted in each of said slots and being in cooperative relation with one of the locking springs, a pivot pin for each detent arm, each pin having an outwardly extending arm engageable with the locking spring, whereby the arms are normally forced outwardly in locking engagement with a stationary part of the lock.

16. A lock comprising a casing provided with a longitudinal bore, a sleeve mounted in the bore, a lock cylinder comprising a front section, an intermediate section, and a rear section, said intermediate and front sections being relatively rotatable, the intermediate section being formed with two longitudinal apertures, a locking plunger in one end of each of the apertures, a locking spring behind each of the plungers for forcing its end outwardly beyond the face of the section and in engagement with an aperture formed in the adjacent section when relative rotation of the two sections occur, a plug mounted at the opposite end of each of the apertures and bearing against the spring, the opposite face of the intermediate section being formed with slots, a detent arm pivotally mounted in each of said slots, a pivot pin for each detent arm, each pin having an outwardly extending arm engageable with the plug, whereby the arms are normally forced outwardly in locking engagement with a stationary part of the lock.

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