

July 10, 1934.

J. W. FITZ GERALD

1,965,889

LOCK

Filed Nov. 3, 1933

2 Sheets-Sheet 1

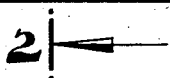
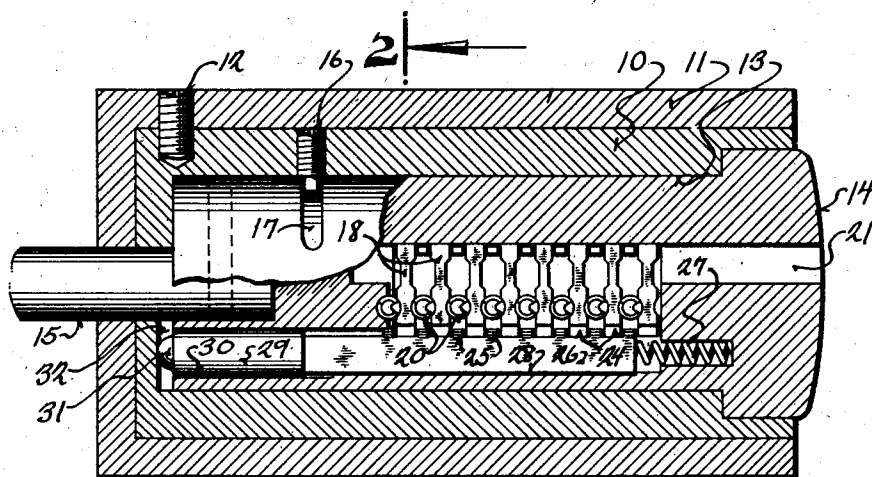


Fig. 1.

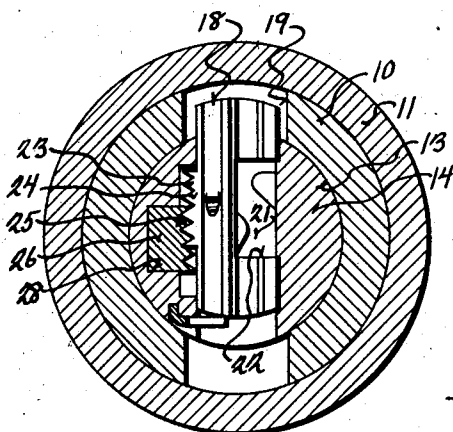


Fig. 2.

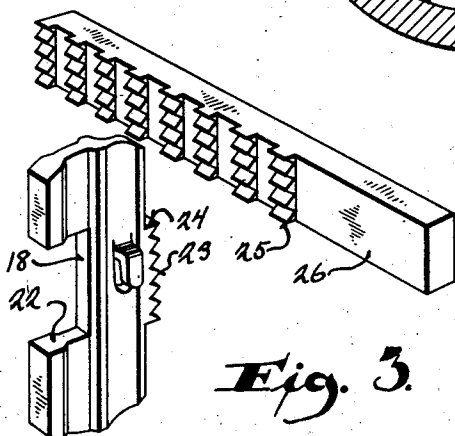


Fig. 3.

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2 Sheets-Sheet 2

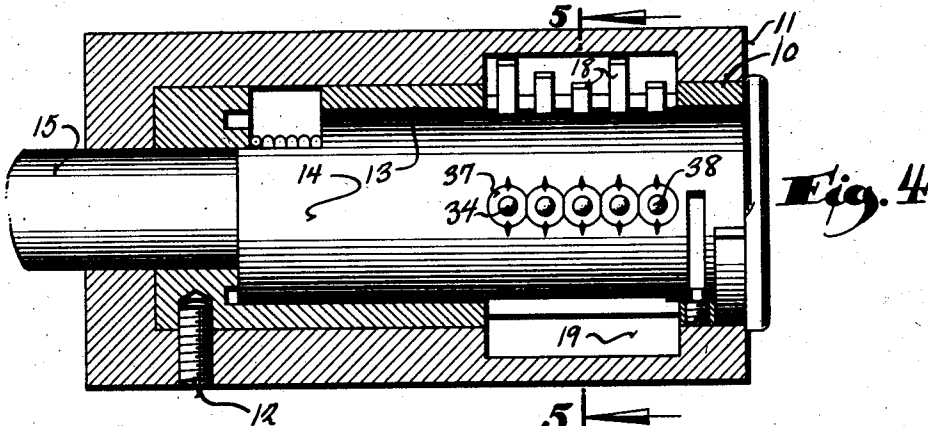


Fig. 4.

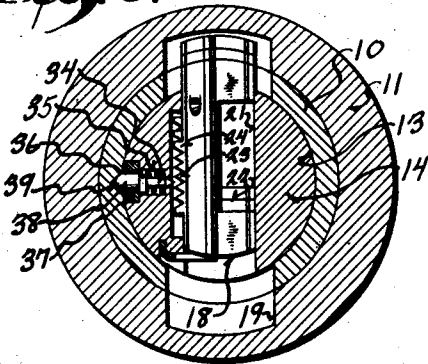


Fig. 5.

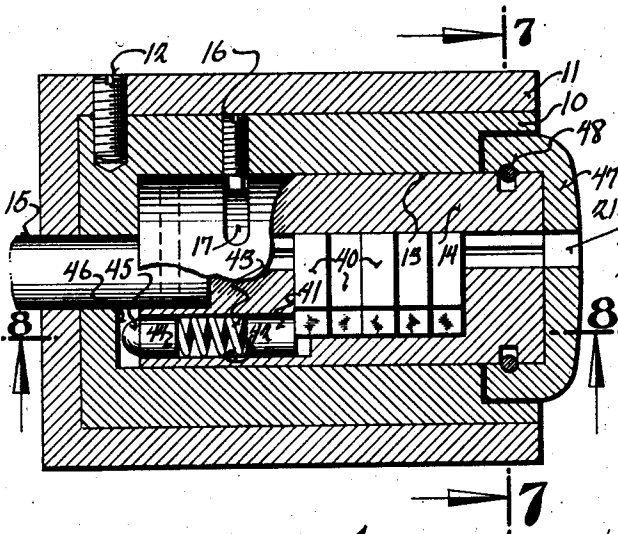
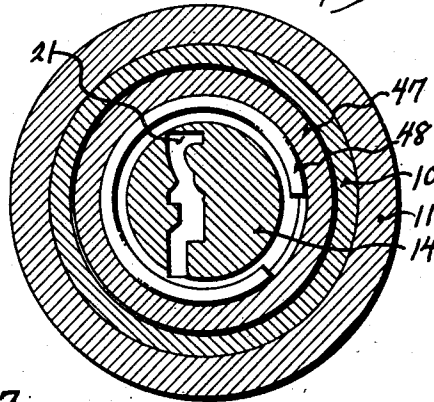


Fig. 6.

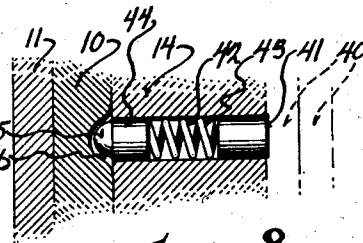


Fig. 8.

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UNITED STATES PATENT OFFICE

1,965,889

LOCK

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19 Claims. (Cl. 70—46)

This invention relates to improvements in locks and refers more particularly to key operable tumbler locks.

It is an object of this invention to provide additional security against unauthorized actuation of a lock by the provision of means for automatically restraining the tumblers against actuation in the event of unauthorized rotation of the cylinder.

More specifically it is an object of this invention to provide means engageable with the tumblers to secure the same against actuation, which means is rendered operative upon a slight rotation of the cylinder out of its normally locked position.

With the above and other objects in view which will appear as the description proceeds, my invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

In the accompanying drawings, I have illustrated several complete examples of the physical embodiment of my invention constructed according to the best modes I have so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a longitudinal sectional view through a lock structure embodying this invention;

Figure 2 is a transverse sectional view taken through Figure 1 on the plane of the line 2—2;

Figure 3 is a perspective view of one of the tumblers and the locking bar of the structures shown in Figures 1 and 2;

Figure 4 is a view partly in longitudinal section and partly in elevation of a lock structure equipped with a modified embodiment of this invention;

Figure 5 is a cross section view taken through Figure 4 on the plane of the line 5—5;

Figure 6 is a view similar to Figure 1 illustrating another modification of this invention;

Figure 7 is a cross sectional view taken through Figure 6 on the plane of the line 7—7; and

Figure 8 is a detail sectional view taken through Figure 6 on the plane of the line 8—8.

Referring to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 10 designates a mounting member which in the present instance is in the form of an inner cylindrical shell mounted in an outer supporting member 11.

The supporting member 11 in the embodiment

shown is in the form of a cylinder but may take any shape, and merely indicates a general support for the lock. The shell 10 which forms the mounting member of the lock is secured in the supporting member by a set screw 12.

Rotatably mounted in the bore 13 of the mounting member is a lock cylinder 14 the inner end of which has a stem 15 secured thereto to project from the mounting member into operative engagement with a latch mechanism or other means to be controlled, not shown.

Any means may be employed to retain the lock cylinder assembled with the mounting member and in the present instance a set screw 16 is provided having its inner end engaged in an arcuate slot 17 formed in the cylinder.

A plurality of locking tumblers 18 is mounted in the cylinder for transverse movement into engagement with a recess or slot 19 in the mounting member, the tumblers being yieldably urged to project into the slot by springs 20 disposed between adjacent tumblers. The tumblers are retractable by a proper key (not shown) insertable into a key opening 21 in the cylinder, and engageable in keyways 22 formed in the tumblers in line with the key opening 21.

Each tumbler also has a plurality of serrations 23 on its side edge opposite its keyway 22, the serrations preferably being formed on the outer edge of a sidewise extension 24 on the tumbler. Engageable with these serrations of the tumblers are toothed projections 25 carried by a locking bar 26 slidably mounted in the cylinder alongside the tumblers.

The toothed projections 25 are spaced apart a distance equal to the spacing of the tumblers so that when the locking bar is in its inoperative position illustrated in Figure 1, the toothed projections will be disengaged from the serrations of the tumblers, but upon endwise shifting of the locking bar its toothed projections will be arranged with the tumbler serrations to secure the tumblers against movement.

A compression spring 27 engaging the inner end of the locking bar yieldably tends to project the locking bar out of its slideway 28 and holds the bar in its inoperative position. The outer end of the bar engages a pin 29 slidably mounted in a bore 30 communicating with the outer end of the slideway 28. The extreme outer end of the pin 29 has a rounded projection 31 which engages in a radial groove or slot 32 in the bottom of the mounting member bore 31 when the locking cylinder is in its normal locked position.

Upon turning of the cylinder out of its normal

locked position in either direction, the sides of the radial groove or slot 32 cam the rounded end of the pin 29 outwardly thereof and force the pin and locking bar inwardly against the actuation of the spring 27 to engage the toothed projections 25 with the tumbler serrations and thus secure the tumblers against actuation.

It is noted that the recess or slot 19 into which the spring projected ends of the tumblers engage is sufficiently wide to permit a degree of rotation on the part of the cylinder without first retracting the tumblers and this permitted degree of rotation is sufficient to move the rounded end 31 of the pin 29 out of the radial groove or slot 33 and to actuate the locking bar to its operative locking position.

In the embodiment illustrated in Figures 4 and 5, the locking bar 26 is replaced by individual locking pins 34. These pins, as best shown in Figure 5, are mounted in multiple diametered bores 35 in the side of the lock cylinder for movement into and out of engagement with the tumbler serrations 23. The inner ends of the pins 34 are pointed and project through the smallest diameter of the bores. Medially of their ends the pins are provided with annular flanges 36 between which and the bottoms of the intermediate diameter bores, expansive springs are confined to yieldably maintain the pins in their normally inoperative positions. The outer ends of the bores 35 are closed by fixed retaining washers 37. The outer rounded ends 38 of the pins project through the retaining washers.

When the cylinder is in its normal locked position illustrated in Figure 5, the rounded edges 38 of the pins project beyond the cylindrical surface of the cylinder into an elongated groove 39 in the wall of the mounting member bore, and as in the embodiment illustrated in Figures 1, 2 and 3, initial rotation of the cylinder away from its normal locked position cams the pins into engagement with the tumblers and thus positively locks the tumblers against actuation.

In the embodiment illustrated in Figures 6, 7 and 8, the tumblers are secured against actuation not by the engagement of locking elements with serrations in the side edges thereof but by being forced into and held in frictional contact with each other.

In this embodiment of the invention, the tumblers 40 are of the block type and are engageable with each other at their adjacent faces or at least have portions of their meeting faces in engagement. The entire plurality or stack of tumblers completely fills the transverse recess in the cylinder in which they are mounted so that no guides between the tumblers are necessary. It is thus possible to impart pressure on either end of the stack of tumblers to increase the frictional engagement therebetween.

This is done by a pin 41 slidable in a bore 42 opening to the inner end of the cylinder. The inner end of the pin 41 bears against the adjacent tumbler. The outer end of the pin is engaged by a compression spring 43, the opposite end of which bears against a plug 44 mounted in the outer end of the bore 42. The plug 44 has a rounded exposed end 45 which engages in a radial slot or groove 46 in the bottom of the mounting member bore similar to the groove 33 in the embodiment shown in Figure 1. The rounded end 45 of the plug 44 engages in the slot or groove 46 only when the cylinder is in its normal locked position and upon rotation of the cylinder in either direction from its normal

locked position the plug will be moved inwardly to compress the spring 43 and thus impart considerable pressure on the stack of tumblers 40.

The increased frictional engagement between the tumblers effected in this manner affords adequate protection against possible actuation of the tumblers by means of a picking tool and thus materially increases the protection of the lock against possible picking.

Additional protection against possible picking may be afforded by providing a loose head on the outer end of the cylinder as in the embodiment shown in Figures 6, 7 and 8. The head or cap 47 is held assembled with the cylinder by a spring ring 48 and is freely rotatable with respect to the cylinder so that if a tool is inserted only in the outer end of the key opening, it will be impossible to impart forced rotation to the cylinder itself.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art to which this invention appertains, that this invention materially increases the protection of a tumbler lock against possible picking in that it provides means for securing the tumblers against actuation immediately upon rotation of the cylinder from its normally locked position, and thus requires complete retraction of all of the tumblers before rotation can be safely imparted to the cylinder.

What I claim as my invention is:

1. In a lock, a mounting member, a lock cylinder movable in the mounting member, a plurality of locking tumblers carried by the cylinder and engageable with the mounting member to secure the cylinder against movement, said tumblers being retractable by a proper key to free the cylinder for movement, and means operable upon relative movement between the lock cylinder and mounting member to hold the tumblers against actuation with respect to the cylinder so as to preclude retraction of the tumblers after the cylinder is moved out of its normal locking position.

2. In a lock, a mounting member, a lock cylinder movable in the mounting member, locking tumblers carried by the cylinder and engageable with the mounting member to normally secure the cylinder against movement, said tumblers being retractable by a proper key to free the cylinder for movement, and cooperating means carried by the mounting member and the cylinder and operable upon movement of the cylinder to hold the tumblers against movement whereby retraction of the tumblers after the cylinder has been moved from its normal locked position is precluded.

3. In a lock, a mounting member, a lock cylinder movable in the mounting member, key operable locking tumblers carried by the cylinder and engageable with the mounting member to secure the cylinder against movement in a normal locked position, a member carried by the lock cylinder and operable upon predetermined movement thereof to secure the tumblers against movement with respect to the cylinder, and means on the mounting member operable upon relative movement between the lock cylinder and mounting member to move said tumbler securing member to its operative position.

4. In a lock comprising a bored mounting member and a lock cylinder rotatably mounted therein, a plurality of locking tumblers carried by the cylinder and engageable with a mounting member to secure the cylinder against rotation, said

tumblers being retractable by a proper key to free the cylinder for rotation, and a member operable upon rotation of said cylinder to engage all of the locking tumblers and hold them against

5 actuation whereby complete retraction of all of the tumblers before the application of any turning force to the cylinder is necessary to free the cylinder for rotation.

10 5. In a lock, a mounting member, a lock cylinder movable in the mounting member, a locking tumbler carried by the cylinder and engageable with the mounting member to secure the cylinder in locked position, said tumbler being retractable by a proper key to free the cylinder for movement from said locked position, a member

15 carried by the cylinder and engageable with the tumbler to hold the same against retraction, and a cammed surface on the mounting member with which said tumbler engaging member

20 cooperates to effect movement of said tumbler engaging member into operative engagement with the tumbler upon movement of the cylinder.

25 6. In a lock, a bored mounting member, a lock cylinder rotatable in the mounting member bore, a plurality of locking tumblers movable transversely of the cylinder and engageable with the mounting member, said tumblers being retractable upon the insertion of a proper key to free the cylinder for rotation and said cylinder having

30 a limited degree of permitted rotation while the tumblers are in their operative positions, a member carried by the lock cylinder and movable perpendicularly to the direction of movement of the tumblers into operative engagement

35 with the tumblers to hold the same against movement, and means on the mounting member to move said tumbler engaging member into operative engagement with the tumblers upon rotation of the cylinder whereby the tumblers are

40 secured against retraction in the event the cylinder is rotated without first retracting the tumblers.

45 7. In a lock, a bored mounting member, a lock cylinder rotatable therein, locking tumblers carried by the cylinder and transversely movable to project into engagement with the mounting member to secure the lock cylinder in locked position, said tumblers being retractable by a proper

50 key to free the cylinder for rotation out of locked position and means engageable with the side edges of the tumbler upon rotation of the cylinder away from its locked position to hold the tumblers against movement, whereby retraction of the tumblers is possible only with the cylinder

55 in locked position.

60 8. In a lock, a bored mounting member, a lock cylinder rotatable therein, locking tumblers carried by the cylinder and engageable in a recess in the mounting member, said recess being of a size to permit a limited degree of rotation on the part of the cylinder without requiring retraction of the tumblers, serrations on the edges of the tumblers, and means carried by the cylinder and operable during said permitted degree of rotation of the cylinder to engage the serrations of the tumblers and secure the same against retraction.

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70 9. In a lock device, a bored mounting member, a lock cylinder rotatable therein, locking tumblers carried by the cylinder and movable into engagement with the mounting member to secure the cylinder in locked position, and means carried by the cylinder and cammed into engagement with the tumblers upon rotation of the

75 cylinder away from its locked position whereby

said tumblers are held in the positions they occupy at the time of rotation of the cylinder.

10. In a lock device, a bored mounting member having a recess communicating with its bore, a lock cylinder rotatable in the bore, locking tumblers carried by the cylinder and projectable into the recess to secure the cylinder in locked position, and said recess being wider than the tumblers so that the cylinder has a degree of limited rotation with its tumblers projected, and means carried by the cylinder and cammed into engagement with the tumblers during rotation of the cylinder through said limited degree of permitted rotation to secure the tumblers in the positions they occupy at the time of such rotation whereby retraction of the tumblers after the cylinder has been slightly turned is precluded.

11. In a lock device, a bored mounting member a lock cylinder rotatable therein, locking tumblers carried by the cylinder and engageable with the mounting member to secure the cylinder in locked position, means carried by the cylinder and engageable with an edge of the tumblers to hold the tumblers against movement with respect to the cylinder, said means normally being in an inoperative position, and means on the mounting member to cam said tumbler engaging means into operative engagement with the tumbler edges during an initial movement of the cylinder from its locked position so that the tumblers are secured against retraction upon such rotation of the cylinder.

12. In a lock device, a bored mounting member a lock cylinder rotatable therein, a plurality of locking tumblers carried by the cylinder and engageable with the mounting member to secure the cylinder in locked position, a member slidable in the lock cylinder and movable to engage the tumblers to restrain the same against retraction, spring means yieldably maintaining said member in an inoperative position, and means on the mounting member operable upon slight rotation of the cylinder to cam said member to its operative position.

13. In a lock device, a bored mounting member, a lock cylinder rotatable therein, locking tumblers carried by the cylinder and movable transversely thereof into engagement with the mounting member to secure the cylinder in locked position, serrations on a side edge of each tumbler, a member slidably mounted in the cylinder and having parts engageable with the serrations of the tumblers to secure the tumblers against movement with respect to the cylinder, spring means to yieldably maintain said member in its inoperative position, and means to move said member to its operative tumbler engaging position upon a slight rotation of the cylinder in the mounting member.

14. In a lock device, a bored mounting member a lock cylinder rotatable in the mounting member bore, locking tumblers carried by the cylinder and engageable with the mounting member to hold the cylinder in locked position but permitting a limited degree of rotation, a member slidably mounted in the lock cylinder and movable to a position engaging the tumblers to restrain the same against retraction, spring means yieldably maintaining said tumbler engaging member in an inoperative position, and means carried by the cylinder and engageable in a groove in the mounting member when the lock cylinder is in its locked position and cammed out of said groove upon movement of the cylinder

der from locked position to force said tumbler engaging member to its operative position.

15. In a lock device, a bored mounting member, a lock cylinder rotatable therein, locking tumblers 5 movable transversely of the cylinder and engageable with the mounting member to hold the cylinder in locked position, serrations on one edge of each tumbler, tumbler retaining members carried by the cylinder, and spring means to project 10 part of said tumbler retaining means beyond the cylinder into a groove in the mounting member while the cylinder is in its normal locked position, movement of said retaining member parts out of the groove upon rotation of the cylinder moving 15 the retaining members into engagement with the tumblers to restrain the same against actuation.

16. In a lock device, a bored mounting member, a lock cylinder rotatable therein, locking tumblers movable transversely of the cylinder, a locking 20 bar slidable axially with respect to the cylinder, cooperating means on the locking bar and the tumblers operable upon engagement to secure the tumblers against actuation, and means to move the locking bar to engage said cooperating means 25 upon rotation of the cylinder.

17. In a lock device, a bored mounting member, a lock cylinder rotatable therein, locking tumblers carried by the cylinder and engageable with the mounting member to secure the cylinder in locked 30 position, a locking bar carried by the cylinder and slidable transversely with respect to the tumblers, serrations on the tumblers, toothed projections on the locking bar engageable with the tumbler serrations upon endwise shifting of the 35 locking bar to secure the tumblers against movement, yieldable means maintaining the locking bar in an inoperative position with its toothed projections out of line with the tumblers, and

means operable upon rotation of the cylinder in the mounting member to shift the locking bar axially against the action of its spring means to engage its toothed projections with the tumbler serrations. 80

18. In a lock device, a bored mounting member, a lock cylinder rotatable therein, locking tumblers movable transversely of the cylinder into engagement with the mounting member to hold the cylinder in locked position, serrations on a side 85 edge of each tumbler, pins carried by the cylinder in line with the tumblers, said pins being projectable toward the tumblers to engage their inner ends with the serrations of the tumblers and secure the tumblers against actuation, spring 90 means yieldably maintaining the pins out of engagement with tumbler serrations and projecting the outer end portions of the pins beyond the cylindrical surface of the cylinder and into a groove in the wall of the mounting member bore, 95 whereby upon rotation of the cylinder said pins in moving out of the groove are depressed against the action of their springs to engage the tumblers.

19. In a lock device, a bored mounting member, a lock cylinder rotatable in the mounting member bore, a plurality of locking tumblers carried by the cylinder and engageable with the mounting member, said tumblers being in engagement at their adjacent faces, a pin slidable in the lock cylinder and having its inner end bearing against 105 one of the endmost tumblers, and means operable upon turning of the cylinder to force said pin inwardly against said tumbler and to frictionally hold all of the tumblers in engagement with each other to restrain actuation of the tumblers. 110

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