Aug. 12, 1930. J. M. WEAVER 1,772,791

LOCK

Filed July 24, 1926 4 Sheets-Sheet 1

Fig. 3.

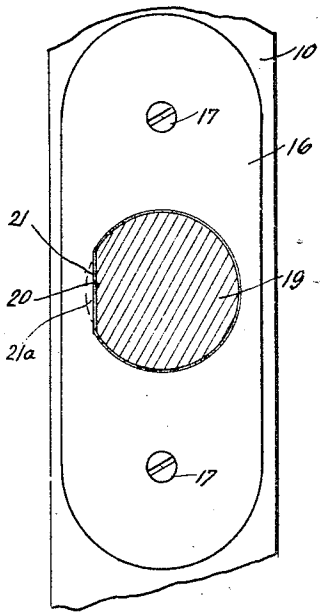


Fig. 1.

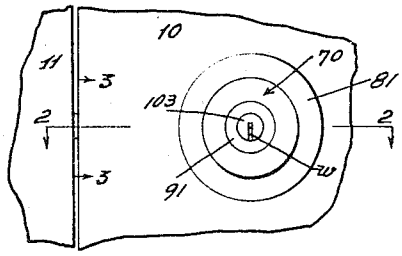


Fig 2.

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Aug. 12, 1930. J. M. WEAVER 1,772,791

LOCK

Filed July 24, 1926 4 Sheets-Sheet 2

Fig. 4.

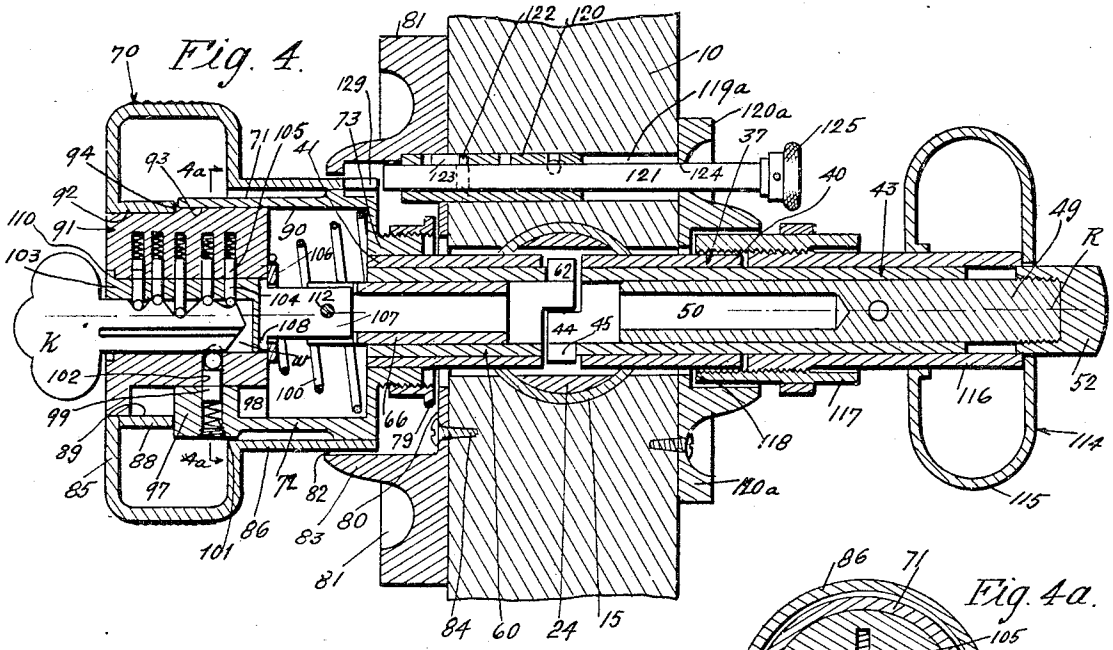


Fig. 4a.

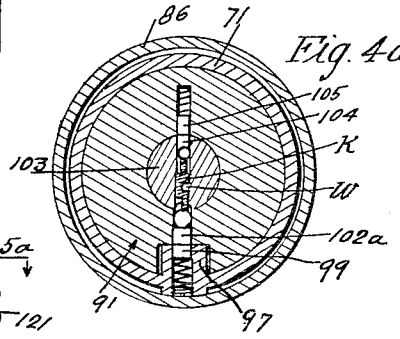


Fig. 5.

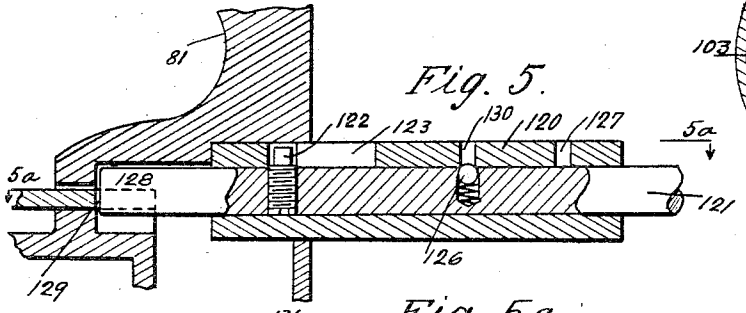


Fig. 5a.

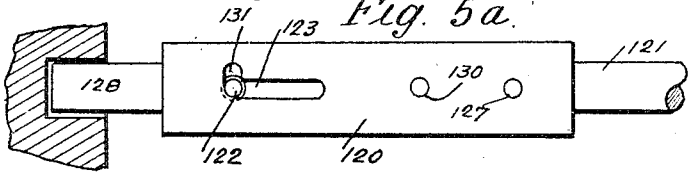


Fig. 7.

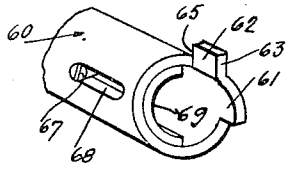


Fig. 6.

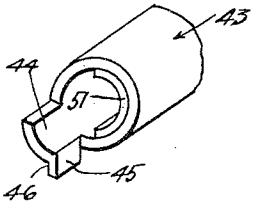
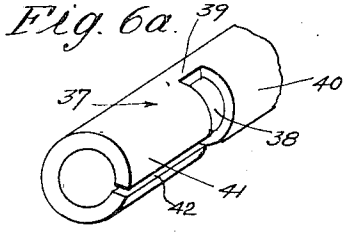


Fig. 6a.



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Aug. 12, 1930. J. M. WEAVER 1,772,791

LOCK

Filed July 24, 1926 4 Sheets-Sheet 3

Fig. 8.

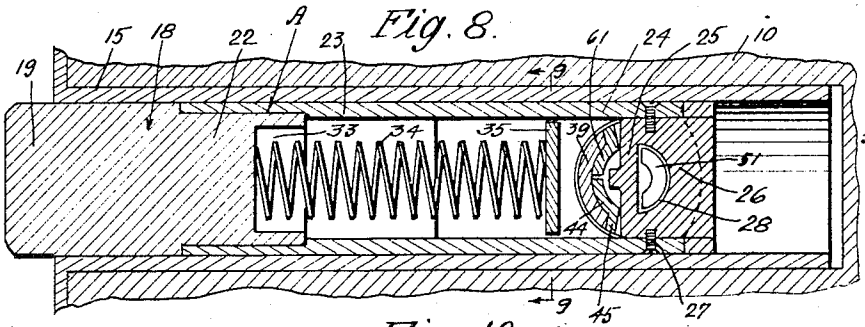


Fig. 9.

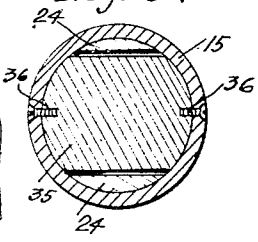


Fig. 10.

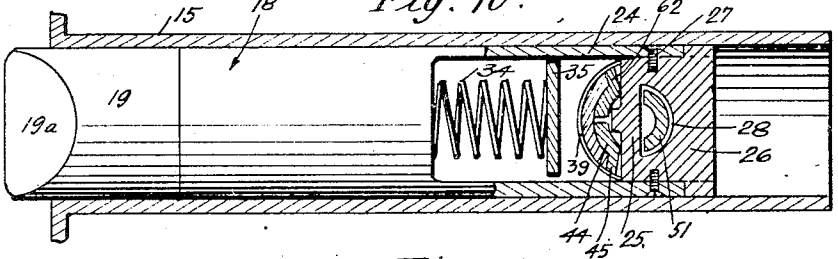


Fig. 11.

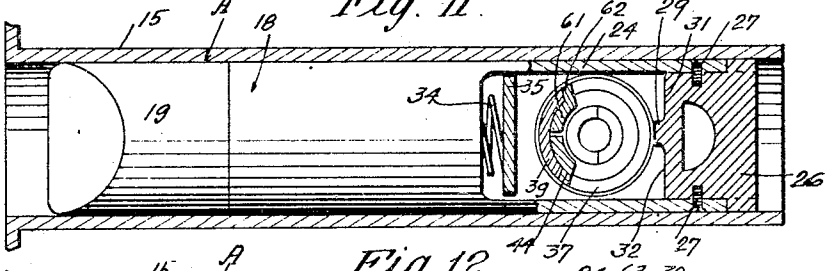


Fig. 12.

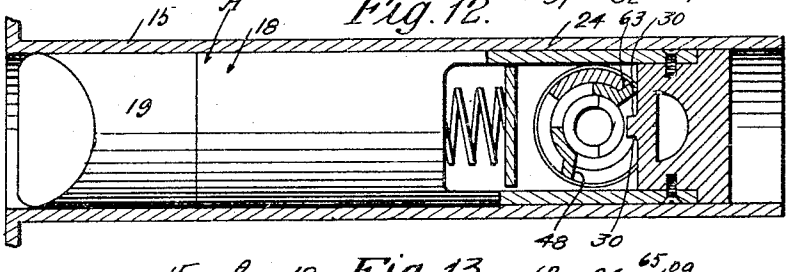
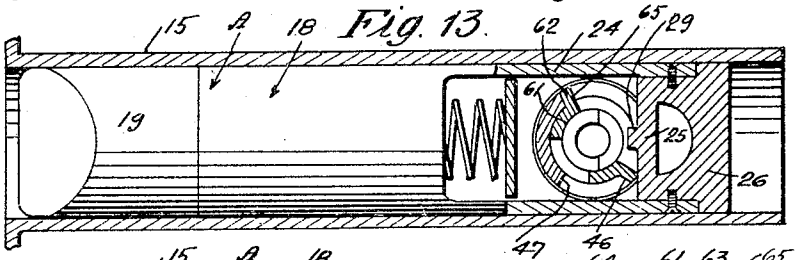


Fig. 13.



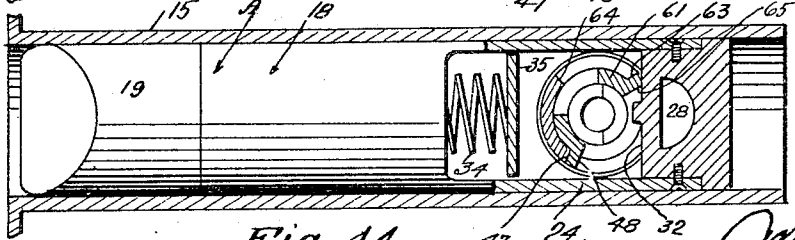


Fig. 14.

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Aug. 12, 1930. J. M. WEAVER 1,772,791

LOCK

Filed July 24, 1926 4 Sheets-Sheet 4

Fig. 15.

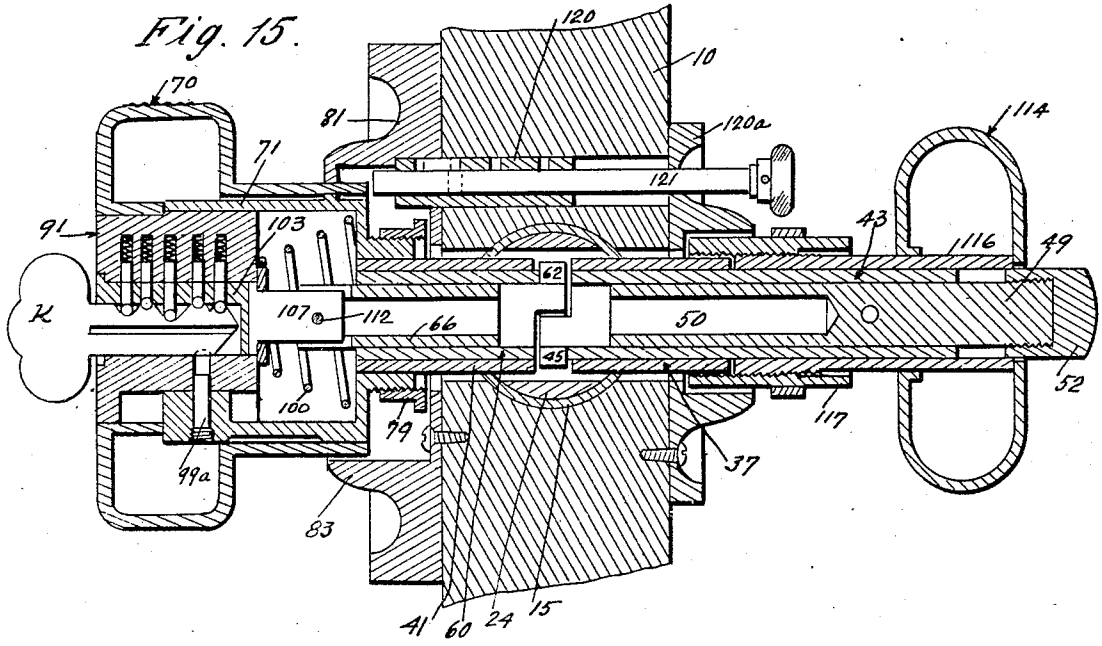
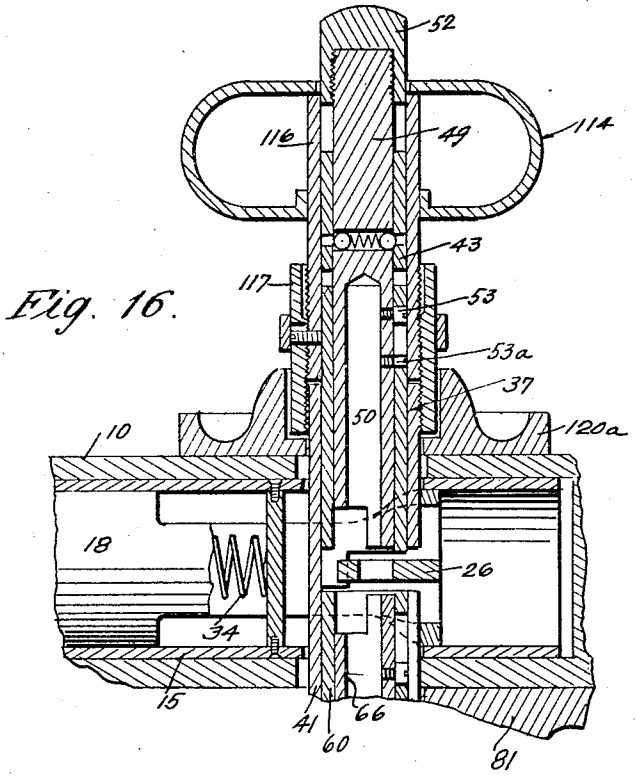


Fig. 16.



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Patented Aug. 12, 1930 1,772,791

UNITED STATES PATENT OFFICE

JAMES M. WEAVER, OF CULVER CITY, CALIFORNIA

LOCK

Application filed July 24, 1926. Serial No. 124,603.

This invention has to do generally with locks, and is particularly well adapted for embodiment in locks wherein the bolt and bolt-throwing spindle are of cylindrical form whereby only two axially perpendicular holes need be bored in a given door to prepare it for installation, in contradistinction to usual locks which, due to their configuration, necessitate considerable chiseling and cutting of the door. However, it will be understood that the invention, considered in its broader aspects, is not limited to embodiment in a lock having these particular characteristics. For instance, the bolt-throwing assembly here shown may be used in connection with a bolt having characteristics other than those here illustrated; or vice versa.

It is among the general objects of the invention to provide a lock of utmost simplicity and sturdiness, one which is smooth and unfailing in action, and one which may be installed with ease and with minimum mutilation of the door.

The spindle, under certain conditions, is the member by which the bolt is drawn to retracted or unlocked position, but under other conditions the spindle is adapted to be locked against rotation, and dependence must be had upon independently actuated means for retracting the bolt. The retracting means provided at the inside of the door is actuated by operation of the inner knob, while the retracting means actuated from the outside of the door is key-controlled. The independent throwing means are disposed within the main spindle, the spindle preferably acting as the journal or bearing whereby the throwing means are rotatably mounted.

Even with the spindle held against rotation by a locking mechanism, the bolt is capable of being retracted by inward pressure directed against its nose, the bolt therefore being adapted to be thrust into retracted position by its engagement with the striker plate on the door casing and being then free to be spring-shot to extended or locking position as soon as it is in register with the aperture of the keeper or striker plate. As long as the spindle is held against rotation, the bolt acts automatically to latch the door wherever the latter is closed, and the bolt can only be retracted from the outside of the door by application of a key to the key-controlled retractor mechanism, though the inner knob is free to be rotated for actuating its associated retractor mechanism.

A further feature, though my invention, considered in its broader aspects is not limited to a structure which embodies this feature, lies in the provision of a dead-locking device whereby not only the spindle is held from rotation, but the bolt is positively and directly held from retraction. This dead-locking device is in the form of a plunger which preferably is mounted for longitudinal reciprocation through the spindle and operable through the medium of a grip at the inner side of the door. For releasing the dead-locking device, from outside the door, there is provided a key-controlled mechanism. It greatly simplifies the device to utilize certain elements of the dead-lock release and as parts of one of the independent retraction mechanisms, and I have shown such a combination, though it will be understood this is not limitative on the invention. I have also shown the release for the dead-locking mechanism and the key-controlled retractor mechanism as controlled by a single key, but it will be understood that this unitary control is not be construed as a limitation on such of my claims as do not specifiy this particularity.

Other novel features and objects of the invention will be made apparent in the following detailed description, reference being had to the accompanying drawings in which:

Fig. 1 is a fragmentary elevation showing a door and casing equipped with an embodiment of my invention;

Fig. 2 is an enlarged section on line 2—2 of Fig. 1;

Fig. 3 is an enlarged section on line 3—3 of Fig. 1;

Fig. 4 is a section on line 4—4 of Fig. 2, the retractor bar of the bolt being omitted in order that underlying parts may be disclosed;

Fig. 4ª is a section on line 4ª—4ª of Fig. 4;

Fig. 5 is an enlarged fragmentary section

of a locking bolt shown in Fig. 4, but showing said bolt in locking position;

Fig. 5ª is a fragmentary section on line 5ª—5ª of Fig. 5;

Fig. 6 is a fragmentary perspective showing the end of one of the retractor members;

Fig. 7 is a fragmentary perspective showing the end of the other retractor members;

Fig. 8 is a section on line 8—8 of Fig. 2;

Fig. 9 is a section on line 9—9 of Fig. 8;

Fig. 10 is a view similar to Fig. 8 but shows the dead-locking member in operative or projected position;

Fig. 11 is a view similar to Fig. 8 but showing the bolt manually thrust to the position it occupies when assembly or disassembly of the bolt and spindle is being accomplished;

Figs. 12, 13 and 14 are views generally similar to Fig. 8 but showing the bolt in retracted position, the retraction being accomplished by different actuating members in the several views;

Fig. 15 is a view similar to Fig. 4 but showing a variation wherein the outside release for the dead lock is rendered inoperative; and

Fig. 16 is a fragmentary view of the variation shown in Fig. 15, but showing, in addition, means for rendering the dead-lock inoperative.

At the outset, I wish to make the reservation that while I will describe the precise make-up of the illustrated lock with particularity, it will be understood the invention, considered in its broader aspects, is not limited to certain of the specified particularities. It will also be understood that while, for convenience, I have illustrated and will describe a particular type of bolt retractor and control means on the throwing spindle at the outer side of the door, and a slightly altered type of retractor member on the spindle at the inner side of the door, these specifications are not to be considered as limitative on any claims except those which definitely call for these arrangements; for in certain situations, I may provide identical retractor and control means on the two ends of the spindle or I may eliminate either or both the retractor and control means from one side of the door.

In the drawings, numeral 10 designates a fragment of a door which is adapted to close against stationary door casing 11, there being a striker or keeper plate 12 of any suitable design mounted on the inner edge of the casing and adapted to take the bolt of my lock in the usual manner.

In preparing a door for installation of my lock, there are bored two axially perpendicular and intersecting holes 14 and 15ª, hole 14 being bored from the edge of the door, and hole 15ª being bored through the door from side face to side face.

I will first describe the bolt assembly A. This assembly is made up of a tubular sleeve or housing 15 adapted to fit within bore 14 and having at its outer end a flange 16 which forms a face plate adapted to oppose plate 12 when the door is closed. The housing 15 is secured to the door against displacement by any suitable means, for instance, by screws 17 which extend through flange 16 into the door. The latch bolt is generally indicated by numeral 18 and preferably is cylindrical throughout the major portion of its longitudinal extent and is adapted to fit nicely in and slide longitudinally through housing 15. The bolt is made up of a nose piece 19, preferably having a flat face 20 adapted to engage the square-cut face 21 formed at the mouth of keeper 15 by inwardly projectiug lip 21ª of the face plate, the interfitting of faces 20 and 21 serving to hold the bolt from rotation within the keeper. Nose 19 has the usual bevel or cam face 19ª whereby it is adapted to be cammed to retracted position as it strikes plate 12 during closing of the door. Fitted tightly over the reduced portion 22 of nose piece 19 (Fig. 8) is a tube 23 which has longitudinally extending and diametrically opposed arms 24. These arms may be considered as portions of the bolt which extend from opposite sides of the nose and substantially in the direction of the nose axis.

Near the rearward end of tube 24 is a cross bar 25 adapted to be engaged on one side by means for retracting the bolt and, under certain conditions, adapted to be engaged on the other side by a member for holding the bolt against retraction. Bar 25 may be considered as a cam member extending from arms 24 towards the nose axis. It is not essential to the invention that a single bar have such dual function, nor is it essential that the bar be fashioned and secured in the manner illustrated, though the illustrated embodiment is preferred for manufacturing and structural reasons and therefore will be described in detail. The relatively thin, rectangular block 26 extends between arms 24, being secured thereto by such means as screws 27, and this block is pierced as at 28, bar 25 thus defining the forward side of the aperture. Aperture 28 is provided for the reception of a dead-locking member, as will appear later, and where the dead-locking feature is not used, the aperture may then be omitted. In fact, broadly speaking, all that is essential to the invention is that there be shoulders projecting inwardly from the arms, which shoulders are adapted to be engaged on one side by bolt-retracting mechanism, and, in case the bolt is to be dead-locked under certain conditions, arm shoulders, to the rear of which a dead-lock member may be thrust. Or the last-named shoulders may be entirely independent of the first-mentioned shoulders.

Preferably, there projects from the forward face of bar 25 a central lug 29 having

substantially square cut shoulders 30 at its sides, the lug dividing said forward face to provide an upper cam face 31 and a lower cam face 32.

The inner end of nose-piece 19 is recessed at 33 to take one end of spring 34, and an abutment plate 35 (Figs. 8 and 9) extends across the bore of housing 15 between arms 24, being secured to the housing by any suitable means such, for instance, as screws 36. Spring 34 acts between abutment 35 and nose-piece 19 in a manner normally to thrust the bolt to extended or locking position, as in Figs. 2, 8 and 9. Plate 35 preferably is of such width that it is taken with easy fit between arms 24 so it will not interfere with the stroking of the bolt, and, as the bolt reciprocates through the housing, the plate and arms preferably, though not necessarily, coact in a manner to prevent other than very limited rotation of the bolt within the housing, particularly when the nose is clear of lip 21ª, thus relieving other parts of the assembly from wear incident to any tendency the bolt may have to rotate with respect to the housing.

When the bolt and its housing are disassembled from the rest of the lock, bar 25 engages the abutment plate to limit the movement of the bolt through the housing in its spring-urged direction, the bolt and housing thus being maintained detachably is assembly.

Numeral 37 designates a main or bolt-controlling spindle, and this spindle is preferably tubular and cylindrical, being cut away intermediate its ends to provide a slot 38 and leave a connecting or bridging portion 39 between its ends 40 and 41. Under certain conditions, later to be made apparent, this bridge portion or retractor-bar acts as the effective bolt retracting member. For convenience, end 40 of the spindle will be considered as the inner end, that is, the end to which the knob at the inside of the door is attached, and spindle end 41 will be considered and termed as the outer end, that is, the end to which the outside door knob is attached. Of course, this reference to the ends of the spindle is not to be considered as in any way limitative on the invention, for occasions may well arise wherein the mechanism disclosed at one particular end may be shifted to the opposite end.

Extending through end 41 in parallel relation to the axis of rotation R of the spindle, is a keyway 42, this keyway extending from the end of the spindle and to slot 38, and it may be utilized in assembling and disassembling the internal mechanism of the spindle as well as to receive a keying element for holding the outer knob structure against rotation with respect to the spindle, though, of course, it is not necessary that the keyway have this dual function.

Now while, under certain conditions, the spindle itself is the effective bolt-retractor, I provide independent retractor mechanisms in each end of the spindle, each mechanism being controlled from its particular end, only. I will first describe the independent retractor provided within spindle end 40. This retractor includes a member 43 which preferably consists of a cylindrical tube 43 having rotational bearing in spindle 37, and has at its inner end a segmental bolt retractor or extension 44 which projects into registration with slot 38. Preferably, though not necessarily, segment 44 has an angular lug extension 45 which projects into slot 38, one face or shoulder 46 (see Fig. 6) of the lug being adapted to engage shoulder 47 of spindle bridge or bar 39 (see Fig. 13) and the opposite face or shoulder 48 being adapted to engage cam face or shoulder 32 of bar 25 when the lock is assembled. The tube 43 is initially assembled with the spindle by thrusting it therethrough from the left of the spindle, as viewed in Fig. 4, lug 45 passing through keyway 42 and into slot 38. The tube is then rotated into the position of Fig. 8, and, when the lock is assembled, means are present which prevent the spindle from being rotated back sufficiently to re-aline the lug with the keyway, so the lug coacts with the walls of the spindle slot 38 to hold tube 43 against movement longitudinally through the spindle, though it is capable of limited rotation with respect thereto.

Under certain conditions, though not always, it is desirable that there be provided a dead lock in connection with spindle end 40, and I will now proceed to describe in detail the preferred form of such a dead locking device. A cylindrical plunger 49, preferably tubular at its inner end 50, is mounted for longitudinal reciprocation through tube 43; in other words, tube 43 and plunger 49 are telescopically arranged. End 50 has a segmental locking extension 51, and the opposite end of the plunger has a head or finger-grip 52 detachably secured against displacement in any suitable manner as, for instance, by screw threaded engagement.

A screw or limit stop 53 is threaded into plunger 49, and the screw head projects into a longitudinally extending slot 54 provided in tube 43. This stop functions to prevent relative rotation between tube 43 and the plunger and allows only limited relative longitudinal movement therebetween. When the plunger is drawn to the limit of its movement to the right in Fig. 4, locking extension 51 is clear of spindle slot 38, while, when it is thrown to locking position by thrusting it to the other limit of its longitudinal movement, extension 51 is projected across said spindle slot.

It will be noted by reference to Fig. 8 that extensions 44 and 51 are spaced sufficiently to

take bar 25 between them when plunger 49 is thrown to locking position, (Fig. 10), and since tube 43 and plunger 49 are held against relative rotation, this spacing between the extensions is maintained constantly. Of course, the plunger can only be thrown to locking position when the bolt 18 is in full extended position since only at such a time is aperture 28 in alinement with extension 51.

In order that the dead-lock plunger or auxiliary locking bolt 49 may be yieldably held in either of its extreme positions so there may be no danger of it being shifted by incidental vibration, I may provide a spring detent. While this detent may be of any suitable nature, I have shown a simple, and therefore preferable, form in Fig. 2. This consists of a pair of spaced balls 55 positioned within a transverse bore 56 in the plunger, the balls being urged outwardly by an intermediate coil spring 56ª. When the plunger is drawn to retracted position, as in Fig. 2, spring 56 presses balls 55 into the undersize holes 57 provided in tube 43, thus serving to hold the plunger yieldably in retracted position. When the plunger is thrust toward locking position, balls 55 are, of course, freed from holes 57 by moving inwardly against the spring action and are then moved outwardly into undersize holes 58 to hold the plunger yieldably in its projected or locking position.

The bolt retractor 60 at the outer end 41 of spindle 37 is preferably key-controlled, and in certain instances a part of this retractor may also be utilized as a part of the key-controlled dead-bolt release mechanism. Therefore, I will describe the retractor as so made up, though it will be understood that my broader claims contemplate the use of an independent bolt retractor which is not key-controlled, and which does not include an element acting as a part of the dead-lock release. The retractor member 60 is preferably in the form of a cylindrical tube having rotational bearing within spindle 37 and having the general characteristics of the previously described tube 43. Thus, it has a segmental retractor extension 61 similar to extension 44 and an angular, substantially radially extending lug 62 similar to lug 45.

Tube 60 is assembled with the spindle by thrusting it therethrough from the left, as viewed in Fig. 4, lug 62 passing through keyway 42 and into slot 38, whereupon the tube is rotated to bring the parts to the position shown in Fig. 8, the segment 61 then being immediately above segment 44, lug shoulder or face 63 (Fig. 14) engaging bridge shoulder 64, and the opposite shoulder or face 65 of the lug being positioned to engage cam shoulder 31 of bar 25 when the entire lock is assembled. Since, when the lock is assembled, bar 25 prevents tube 60 from rotating back to bring lug 62 into re-alinement with keyway 42, said lug engages the side walls of spindle slot 38 to prevent subsequent longitudinal movement of the tube with respect to the spindle.

Telescopically arranged with tube 60 is a dead lock release plunger 66 which makes up a part of the bolt retracting mechanism since it is by virtue of rotation of said plunger 66 that rotation of tube 60 is accomplished. However, it will be understood that in certain situations where this type of dead-lock release is not essential, the tube 60 and plunger 66 may in effect or in actuality be a single piece, and my broader claims contemplate such a construction.

Plunger 66 has a longitudinally sliding fit within the bore of tube 60, the plunger carrying a screw 67 whose head fits within a slot 68 (Fig. 2) in the tube, the pin and slot coacting in a manner to limit the longitudinal stroke of the plunger and preventing relative rotation between tube and plunger. The plunger carries a segmental release extension 69 which is in axial alinement with recess 28 and dead bolt extension 51 when bolt 18 is in full extended position, and when the release plunger is in inoperative position, extension 69 lies clear of or to the left of slot 38, as viewed in Fig. 4. However, assuming that plunger 49 has been thrust to locking position, as in Fig. 10, longitudinal movement of plunger 66 to the right, as viewed in Fig. 4, engages extension 69 with the end of extension 51 and serves to thrust plunger 49 back to retracted position. Plunger 66 is then withdrawn to its retracted position, whereupon bolt 18 is free to move to retracted position.

It will be noted that extensions 61 and 66 are spaced apart by a distance substantially equal to the width of bar 25, in the same manner as extensions 44 and 51 and that these extensions are always thus spaced since the tube and plunger are held against relative rotation, though, of course, extension 69 is movable longitudinally into and out of alinement with extension 61. It will be noted that plunger 66 is movable longitudinally in the direction of the axis of rotation of both spindle 60 and spindle 37.

The preferred means for reciprocating the release plunger and for rotating this plunger to cause coincident rotation of tube 60 and hence actuation of the independent bolt retractor mechanism at the outer end of the spindle, will now be described.

While the particular nature of the knob associated with spindle-end 41 is not essential to the invention, considered in its broader aspects, it is preferred that it have the general characteristics illustrated. Knob 70 includes a tubular body member 71 having a portion 72 of relatively large diameter and a portion 73 of relatively small diameter, the latter portion preferably, though not

necessarily, having external screw threads 74 and a keyway 75 (Fig. 2). Said keyway is adapted to register with keyway 42 and to take a key 76 whereby the body portion and spindle are positively held from relative rotation.

Preferably, though not necessarily, I also provide a set screw 77 which extends through a slot 78 in adjustment collar 79, and through portion 73 into spindle 37, this screw holding the body portion and spindle against relative rotation and longitudinal separative movement and also holding the adjustment collar or sleeve 79 in its position of threaded adjustment on portion 73. This adjustment collar is adapted to engage face 80 of escutcheon plate 81 to limit the end play of knob and spindle to the right, as viewed in Fig. 4, thereby relieving the inner mechanism of the lock from the necessity of checking such end play and taking the wear incident thereto. The face 80 is at the bottom of a central recess 82 provided in the boss or hub 83 of the escutcheon plate, the latter being secured to the door 10 by any suitable means, for instance, by screws 84.

The handle or housing portion 85 of knob 70 preferably has a tubular neck 86 adapted to take portion 72, being detachably secured against displacement with respect thereto by any suitable means as, for instance, screws 87. Boss 83 overhangs these screws and therefore prevents malicious disassembly of or tampering with the elements whereby connection is made between the knob parts and spindle. Housing 85 has an inturned annular flange 88 defining a bore 89 which is in axial alinement with bore 90 of body portion 72, but preferably is of slightly smaller diameter than said body portion bore, though this condition is not essential to the invention, considered in its broader aspects.

A lock barrel or bushing 91 is of two external diameters, diameter 92 being such that it fits nicely within bore 89 and diameter 93 being such that it fits nicely within bore 90, the inner end 94 of flange 88 engaging a shoulder 95 formed at the junction of diameters 92, 93 to limit movement of barrel 91 to the left, as viewed in Fig. 4. Barrel 91 is capable of limited, opposite longitudinal movement in the direction of the axis of rotation of spindle 37, but is held from rotation relative to body portion 71 by virtue of a key or lug 97 (Fig. 4) which projects upwardly from said body portion and into a keyway 98 provided in the barrel.

In certain instances, notably where it is not desired that there be a dead lock release operable from the outer side of the door, it is not necessary that the barrel be movable longitudinally, and I have illustrated and later will describe a variation wherein the barrel is held from such movement.

Extending upwardly through key 97 is a locking tumbler 99. When the barrel is in the retracted position of Fig. 4, and it is normally and yieldably held in this position by a telescopic coil spring 100, tumbler 99 is adapted to be pressed by spring 101 into a registering bore 102 provided in the barrel, the tumbler thus holding the barrel from movement longitudinally.

Rotatably mounted within barrel 91 is lock cylinder 103 having usual clearance tumblers 104 which, when the cylinder is in the normal position of Fig. 4, are in alinement with the spring-pressed locking tumblers 105 in barrel 91. When there is no key in the lock cylinder, tumblers 105 engage cylinder 103 in the usual manner to hold it against rotation with respect to the barrel. Secured to cylinder 103 by detachable washer 106 (Figs. 2 and 4) is a usual connecting bar 107, this bar having a T head 108 fitting into a slot 109 in the cylinder to hold the bar and cylinder against relative rotation, washer 106 serving both to hold the cylinder and bar against relative longitudinal movement and engaging the inner end of barrel 91 to hold the cylinder against movement to the left, as viewed in Fig. 4, with respect to the barrel. Flange 110 on the other end of the cylinder, engages the outer face of the barrel to prevent movement of the cylinder to the right, as viewed in Fig. 4, with respect to said barrel.

The free end of bar 107 extends into a slot 111 provided in plunger 66, and is pinned to said plunger as by screw 112, the cylinder, bar, plunger 66 and tube 60 thus being held against relative rotation; the cylinder bar and plunger 66 being held against relative longitudinal movement; and barrel 91, bar 107, and plunger 66 being held against relative longitudinal movement.

When a proper key K is inserted within the keyway W of the cylinder, clearing plunger 102^a, in bore 102, and 104 are acted upon by the key in the usual manner to thrust locking tumblers 99 and 105, respectively, radially outward so their inner ends are just flush with the member which they lock; it following that thereafter the cylinder 103 may be rotated by the key to cause coincident rotation of tube 60 and segment 61, and that barrel 91 may be thrust inwardly against the action of spring 100 to project plunger 66 to the right and thereby move segment 69 through aperture 28 to thrust extension 51 from said aperture.

Under certain conditions, it is only essential that one of these movements be accomplished in order to unlock a given door, though in other situations both movements must take place though they need not occur simultaneously, but this will be made clear at a later point in the description. It is also to be noted that it is not essential to the invention, considered in its broader aspects,

that a single key be adapted to clear both the tumbler in key 97 and the tumblers in barrel 91, though such a provision is preferable under most conditions.

In assembling the lock, bolt assembly A is first positioned within bore 14, and bolt 18 is manually thrust to the right to its position in Fig. 11, lug 29 then clearing the diametrically opposite apertures 113 in keeper tube 15. Spindle 37 is then thrust longitudinally through bore 15^a and apertures 113 until slot 38 is in line with bar 25. Thereupon, manual pressure is relieved from the bolt 18, spring 34 acting to throw said bolt to the extended position shown in Figs. 8 and 10, this longitudinal movement of the bolt being limited by the engagement of shoulders 31 and 32 with segments 61 and 44, respectively. Therefore, spindle 37 is adapted to have rotational bearing within the keeper, except when the spindle is locked from rotation, the opposite walls of the keeper through which the apertures extend providing two spaced points of bearing for the spindle.

When the parts are in the condition described, such fastening devices as hold knob 70 against movement relative to the spindle and which hold the various knob parts in assembly, are protected against malicious tampering by the overhang of the escutcheon boss.

The inner knob 114, which includes a handle portion 115 rigidly secured to a central, tubular hub 116, is slipped over the end of tube 43 and is secured to said tube to hold it against rotation and longitudinal separative movement with respect thereto by any suitable means as, for instance, set screw 115′ (Fig. 2), this screw also extending through a slot 116^a in an adjustment collar 117. Said collar is threaded on hub 116 and its end 118 is adapted to engage the face 119 of escutcheon plate 120^a to prevent end play of tube 43 towards the center of the door, thereby relieving the interior mechanism of the lock from wear incident to the prevention of said end play.

It will be readily understood that adjustment collars 79 and 117 render it possible to fit spindles and spindle-contained mechanism of standard lengths to doors or different thicknesses.

Preferably, though not necessarily, I provide means additional to plunger 49 for locking the knob and spindle against rotation, the preferred type of lock being illustrated in Figs. 4, 5 and 5^a. Extending inwardly from escutcheon plate 81 and into a bore 119^a through the door, is a housing tube 120. A cylindrical bolt or plunger 121 is capable of longitudinal sliding movement through said tube, a plunger-carried pin 122 coacting with a longitudinally extending slot 123 in tube 120 to limit the extent of plunger reciprocation. The tube, plunger and escutcheon plate 81 are assembled before said plate is applied to the door, the free end of the plunger being thrust through an aperture 124 in escutcheon plate 120^a, a finger grip 125 then being fixed in any suitable manner to the end of the plunger.

Plunger 121 is normally in the retracted position shown in Fig. 4, a spring detent 126 engaging an undersized hole 127 in tube 120 to hold the plunger yieldably in its retracted position. When the plunger is thrust inwardly to extended position, as shown in Fig. 5, the locking end 128 of said plunger enters a notch 129 provided in knob 70 to hold said knob and hence spindle 37 against rotation. When plunger 121 is in this extended or projected position, detent 126 coacts with undersized hole 130 in tube 120 to hold the plunger yieldably in that position. If it be desired positively to lock the plunger against retractive movement so there may be no chance of it being thrust to retracted position by the introduction of instruments from the outside of the door, plunger 121 may be rotated by knob 125 to carry pin 122 into slot offset 131 (Fig. 5). I will consider plunger 121 as the main locking member, and dead-bolt or plunger 49 as the auxiliary lock.

Assuming that the parts are in the normal condition shown in Fig. 8 and that both main and auxiliary locks are in inoperative position, it will be seen that bolt 18 is capable of being pushed to retracted position by inwardly directed pressure on the nose 19. Thus, if the door be open, closing movement thereof moves nose 19 into engagement with the striker plate on the casing and bolt 18 is thrust to the right, as viewed in Fig. 8, against the action of spring 34, bar 25 merely passing through spindle slot 38 and leaving segments 44 and 61. As soon as the nose registers with the striker aperture, spring 34 returns the bolt 18 to normal, extended position, it being noted that neither knob nor spindle have been rotated during this operation.

If the outside knob be rotated to the right, as viewed in Fig. 2, spindle 37 is, of course, also rotated to the right, carrying bridge 39 into the position of Fig. 12. Shoulder 64 of said bridge engages shoulder 63 of lug 62 during this movement to carry segment 61 with the bridge, and said lug engages bar shoulder 31 in a manner to thrust block 26 in a manner to draw said bolt to retracted position against the action of spring 34, segment 44, tube 43 and the inner knob remaining stationary. The uppermost shoulder 30 on lug 29 limits the rotative movement of the segment and therefore prevents the spindle from being turned continuously to the right past lug 29 or far enough to bring lug 62 into alinement with keyway 42.

The contact of said shoulder with the lug

also prevents the movement of the segment to a "dead-center" position where it would tend to resist the subsequent retraction of the bolt. During such movement of course, it is the spindle 37 which, in effect, moves the bolt 18 to retracted position, though the spindle acts through lug 62. When the outer knob is released, spring 34 acts to re-extend bolt 18, bar 25 rotating segment 61 and the spindle back to the normal position of Fig. 8.

If the outer knob be rotated to the left, as viewed in Fig. 2, the spindle 37 is rotated also to the left, bridge 39 engaging the lug on segment 44 and forcing it against bar shoulder 32 to cause retraction of the bolt, in the manner described above, the lower shoulder 30 of lug 29 performing in connection with segment 44 the same purpose as the upper shoulder 30 performed in connection with segment 61. While the spindle acts, in effect, as the bolt retracting element in this instance, its force is transmitted through lug 45, and tube 43 therefore is rotated and carries the inner knob with it.

When the inner knob is turned to the right, as viewed in Fig. 2, the spindle 37 is rotated to the right due to the engagement of lug shoulder 46 with bridge shoulder 47, and said bridge then acts through lug 62 to press against bar 25 and retract bolt 18.

When the inner knob is turned to the left, as viewed in Fig. 2, the spindle and hence tube 60, remains stationary, while tube 43 and hence segment 44 rotate to the left, (or counter-clockwise as viewed in Fig. 13) swinging lug 45 into engagement with bar shoulder 32, to retract the bolt, as shown in said figure. It will be noted that during all these operations the spindle and retractor tube 60 are held against relative rotation due to the coaction of parts previously described.

It will now be assumed that plunger 121 is thrust into locking position (Fig. 5) whereupon the outer knob and hence the spindle and retractor tube 60 are held against rotation. It will be seen that the bolt 18 may still be retracted from the inside of the door, for the inner knob may be rotated to the left, as viewed in Fig. 2, to the position of Fig. 13, such movement being accomplished without the necessity of bridge 39 being moved. Furthermore, if the door be open, it may be slammed shut and will be automatically latched since operation of plunger 121 does not lock bolt 18 against longitudinal movement, but rather merely holds the outer knob against rotation and hence prevents the spindle from being turned by manipulation of said knob.

The only way the bolt 18 may be retracted from the outside of the door is by application of the proper key to the lock cylinder, whereupon rotation of the key and cylinder, which has been cleared from tumblers 105, cause coincident rotation of bar 107, plunger 66, tube 60 and segment 61 to cause lug 65 to engage bar shoulder 31 and thereby retract bolt 18 (see Fig. 14). Of course, the spindle and inner knob remain stationary during such operation, and, when the key is rotated back and withdrawn from the cylinder, segment 61 is returned to normal position and spring 34 re-extends the bolt so it requires a new application of the proper key before bolt 18 may again be retracted from outside the door

Now, assume that it be desired to dead-lock bolt 18, plunger 49 is thrust inwardly through aperture 28, or, in other words, behind bar 25. It follows that locking segment 51 prevents subsequent inward longitudinal movement of bolt 18 so said bolt may not be thrust back by end pressure exerted upon it and cannot be retracted by operation of either knob or independent retractor mechanisms. To free the dead-lock from within the door, it is necessary to grasp handle 52 and withdraw plunger 49; and to release said plunger 49 from locking engagement from the outside of the door, it is necessary to insert the proper key K within the lock cylinder, so locking tumbler 99 is cleared, and then thrust barrel 41 bodily to the right, as viewed in Fig. 4, against the action of spring 100; this movement of the barrel acting through bar 107 and plunger 66 to thrust locking extension 51 from behind bar 25. When barrel 91 is subsequently moved to normal position by spring 100, bolt 18 is again free to be retracted.

In the event both the dead lock and main lock are in locking positions, it will be seen that in order to open the door from the outside, it is necessary first to apply the proper key, thrust barrel 91 inwardly to free plunger 49 from bar 25, allow barrel 91 to return to normal position under the influence of spring 100, and then rotate cylinder 103 to actuate retractor tube 60.

In certain instances it is desirable that the dead lock release be operable only from within the door, that is, that while plunger 49 may be manually thrust into and out of locking position from within the door, that even the holder of a key may not unlock the door from the outer side thereof. I may readily adapt my lock to such a situation by substituting for the tumbler 99 a set screw 99^a, as in Fig. 15. It will be seen then that barrel 91 is incapable of movement longitudinally even though key K be applied, and therefore plunger 49 cannot be cleared from behind bar 25 except from within the door. It will be seen, however, that this variation does not render inoperative the key-control of the outer bolt retractor mechanism.

In other instances it is desirable that the dead lock be rendered entirely inoperative, and this may be done by the use of set screw 99^a as described above together with means for holding plunger 49 against longitudinal

movement with respect to sleeve 43, as for instance, by applying a second set screw 53ª (Fig. 16) to plunger 49 so there may be no lost motion between said plunger and tube 43.

It will be understood the drawings and description are to be considered merely as illustrative of and not restrictive on the broader claims appended hereto, for various changes in design, structure and arrangement may be made without departing from the spirit and scope of said claims.

I claim:

1. In a lock, a bolt adapted to be reciprocated longitudinally to and from extended position, yieldable means adapted normally to hold the bolt in extended position, a rotary spindle arranged axially perpendicular to the bolt and effective by its rotation to retract the bolt from extended position, and a pair of independent bolt retractors in the spindle and each operable independently of each other and of the spindle and from opposite ends of the spindle to retract the bolt from extended position.

2. In a lock, a bolt adapted to be reciprocated longitudinally to and from extended position, yieldable means adapted normally to hold the bolt in extended position, a rotary spindle arranged axially perpendicular to the bolt, a pair of independent bolt retractors in the spindle and controllable independently from opposite ends thereof, said spindle also being effective by rotation thereof to retract said bolt from extended position, and releasable means adapted to hold the spindle against rotation without affecting the operativeness of said pair of retractors.

3. In a lock, a bolt adapted to be reciprocated longitudinally to and from extended position, yieldable means adapted normally to hold the bolt in extended position, a rotary bolt retracting spindle arranged axially perpendicular to the bolt, and a pair of independent bolt retractors each rotatably mounted in the spindle and operable independently from opposite ends of the spindle to retract the bolt from extended position.

4. In a lock, a bolt adapted to be reciprocated longitudinally to and from extended position, yieldable means adapted normally to hold the bolt in extended position, a tubular rotary bolt retracting spindle arranged axially perpendicular to the bolt, and a bolt retractor in the spindle and controllable from one end thereof, said retractor embodying a cylindrical member journaled in the bore of the spindle, a segmental extension on the cylindrical member, and an angular lug on the extension and in operative association with the bolt.

5. In a lock, a bolt adapted to be reciprocated longitudinally to and from extended position, yieldable means adapted normally to hold the bolt in extended position, a rotary spindle arranged axially perpendicular to the bolt, said spindle being operable by virtue of its rotation to retract the bolt, releasable means adapted to hold the spindle against rotation, a knob fixed to one end of the spindle, a bolt retractor in said spindle, key-controlled means in said knob and adapted to actuate said retractor, auxiliary bolt-locking means in the spindle and operable from the opposite end thereof; said key controlled means being also operable to move said auxiliary locking means from locking to unlocked position.

6. In a lock, a bolt adapted to be reciprocated longitudinally to and from extended position, yieldable means adapted normally to hold the bolt in extended position, a rotary spindle arranged axially perpendicular to the bolt, said spindle being operable by virtue of its rotation to retract the bolt, releasable means adapted to hold the spindle against rotation, a knob fixed to one end of the spindle, a bolt retractor in said spindle, key controlled means in said knob and adapted to actuate said retractor, and auxiliary bolt-locking means in the spindle and operable from the opposite end thereof.

7. In a lock, a bolt adapted to be reciprocated longitudinally to and from extended position, yieldable means adapted normally to hold the bolt in extended position, a rotary bolt retracting spindle arranged axially perpendicular to the bolt, a tubular cylindrical bolt retractor rotatably mounted within the spindle, and releasable means within the tubular retractor adapted to hold said bolt against retraction.

8. In a lock, a bolt adapted to be reciprocated longitudinally to and from extended position, yieldable means adapted normally to hold the bolt in extended position, a rotary bolt retracting spindle arranged axially perpendicular to the bolt, a tubular cylindrical bolt retractor rotatably mounted within the spindle, releasable means within the tubular retractor adapted to hold said bolt against retraction, and key-controlled means for moving said holding means from holding to release position.

9. In a lock, a bolt adapted to be reciprocated longitudinally to and from extended position, yieldable means adapted normally to hold the bolt in extended position, a rotary bolt retracting spindle arranged axially perpendicular to the bolt, a tubular cylindrical bolt retractor rotatably mounted within the spindle, releasable means within the tubular retractor adapted to hold said bolt against retraction, said releasable means being movable to holding position from one end of the spindle, only, and key-controlled means operable from the other end of the spindle for moving said holding means from holding to release position.

10. In a lock, a bolt adapted to be reciprocated longitudinally to and from extended

position, yieldable means adapted normally to hold the bolt in extended position, a rotary bolt retracting spindle arranged axially perpendicular to the bolt, a tubular cylindrical bolt retractor rotatably mounted within the spindle, releasable means within the tubular retractor adapted to hold said bolt against retraction, said releasable means being movable to holding position from one end of the spindle, only, key-controlled means operable from the other end of the spindle for moving said holding means from holding to release position, and releasable means operable only from that side of the lock at which said one end of the spindle lies, for holding the spindle against rotation.

11. In a lock, a bolt adapted to be moved to and from locking position, a rotary bolt retracting spindle arranged axially perpendicular to the bolt, and a pair of independent bolt retractors in the spindle and each operable independently of each other and of the spindle and from opposite ends of the spindle to retract the bolt from locking position.

12. In a lock, a bolt adapted to be reciprocated longitudinally to and from extended position, yieldable means adapted normally to hold the bolt in extended position, a rotary spindle arranged axially perpendicular to the bolt, a pair of independent bolt retractors in the spindle and controllable independently from opposite ends thereof, said spindle also being effective by rotation thereof to retract said bolt from extended position, and releasable means adapted to hold the spindle against rotation without affecting the operativeness of one of said retractors.

13. In a lock, a bolt adapted to be moved to and from locking position, a rotary bolt retracting spindle arranged axially perpendicular to the bolt, and a pair of independent bolt retractors each rotatably mounted in the spindle and each operable independently from opposite ends of the spindle to retract the bolt from locking position.

14. In a lock, a bolt adapted to be moved to and from extended position, a spindle arranged axially perpendicular to the bolt, a bolt retractor associated with the spindle, key-controlled means near one end of the spindle and adapted to actuate the retractor, and releasable bolt-locking means near the other end of the spindle, said key-controlled means being also operable to move the locking means from locking to unlocked position.

15. In a lock, a bolt adapted to be moved to and from extended position, a spindle arranged axially perpendicular to the bolt, a bolt retractor associated with the spindle, key-controlled means adapted to actuate the retractor, and releasable bolt-locking means, said key-controlled means being also operable to move the locking means from locking to unlocked position.

16. In a lock, a bolt adapted to be moved to and from extended position, a tubular spindle arranged axially perpendicular to the bolt, a bolt retractor rotatably mounted in the spindle bore near one end, key-controlled means adapted to actuate the retractor, and bolt-locking means in the spindle bore near the other end, said key-controlled means also being operable to move the locking means from locking to unlocked position.

17. In a lock, a bolt adapted to be moved to and from extended position, a tubular spindle arranged axially perpendicular to the bolt, a bolt retractor rotatably mounted in the spindle bore near one end, key-controlled means movable rotatably to actuate the retractor, said means being also movable in the direction of the spindle axis, and bolt-locking means in the spindle bore near the other end and movable longitudinally therethrough into and out of locking position, said key-controlled means being operable by movement in the direction of the spindle axis to move the locking means from locking to unlocked position.

18. In a lock, a bolt adapted to be moved to and from extended position, a rotary spindle arranged axially perpendicular to the bolt, said spindle being operable by virtue of its rotation to retract the bolt, releasable means adapted to hold the spindle against rotation, a bolt retractor in the spindle, key-controlled means associated with one end of the spindle and adapted to actuate the retractor, and auxiliary bolt-locking means in the spindle and operable from the opposite end thereof.

19. In a lock, a bolt adapted to be moved to and from extended position, a rotary bolt retracting spindle arranged axially perpendicular to the bolt, a tubular bolt retractor rotatably mounted within the spindle, and a locking member movable longitudinally through the bore of the retractor into and out of position to hold said bolt against retraction.

20. In a lock, a bolt adapted to be moved to and from extended position, a rotary bolt retracting spindle arranged axially perpendicular to the bolt, a tubular bolt retractor rotatably mounted within the spindle, a locking member movable longitudinally through the bore of the retractor into and out of position to hold said bolt against retraction, and means actuatable for moving said holding means out of holding position.

21. In a lock, a bolt adapted to be moved to and from extended position, a rotary bolt retracting spindle arranged axially perpendicular to the bolt, a tubular bolt retractor rotatably mounted within the spindle, a locking member movable longitudinally through the bore of the retractor into and out of position to hold said bolt against retraction, means actuatable for moving said holding means out of holding position, a releasing

member movable from one position to another to move said holding means out of holding position, and a spring for returning said releasing means to said one position.

22. In a lock, a bolt adapted to be moved to and from extended position, a tubular bolt retractor arranged axially perpendicular to the bolt, releasable bolt-locking means within the retractor adapted to hold said bolt against retraction, said releasable means being movable to holding position from one end of the retractor, only, and means within and operable from the other end of the retractor for moving said holding means from holding to release position.

23. In a lock, a bolt adapted to be moved to and from extended position, a tubular bolt retractor arranged axially perpendicular to the bolt, releasable bolt-locking means within the retractor adapted to hold said bolt against retraction, said releasable means being movable to holding position from one end of the retractor, only, and key-controlled means within and operable from the other end of the retractor for moving said holding means from holding to release position.

24. In a lock, a bolt adapted to be moved to and from extended position, a tubular bolt retractor arranged axially perpendicular to the bolt, releasable bolt-locking means within the retractor adapted to hold said bolt against retraction, said releasable means being movable to holding position from one end of the retractor, only, and means operable from the other end of the retractor for moving said holding means from holding to release position and for thereafter retracting the bolt.

25. In a lock, a knob having a bore extending in the direction of its axis, a barrel mounted in said bore for movement longitudinally thereof, key-controlled means for releasably holding said barrel against such movement, a lock cylinder mounted for rotation in the barrel, and key-controlled means acting between the barrel and cylinder to hold them releasably against relative rotation.

26. In a lock, a knob having a bore extending in the direction of its axis, a barrel mounted in said bore for movement longitudinally thereof, key-controlled means for releasably holding said barrel against such movement, a lock cylinder mounted for rotation in the barrel, and key-controlled means acting between the barrel and cylinder to hold them releasably against relative rotation, the two key-controlled means being relatively arranged to be controlled by a single key.

27. In a lock, a knob having a bore extending in the direction of its axis, a barrel mounted in said bore for movement longitudinally thereof, means for releasably holding said barrel against such movement, a lock cylinder mounted for rotation in the barrel, and means acting between the barrel and cylinder to hold them releasably against relative rotation.

28. In a lock, a bolt adapted to be moved to and from extended position, a pair of axially alined bolt retractors arranged axially perpendicular to the bolt, said retractors being each operable independently to retract the bolt from locking position, one of said retractors being tubular, means normally movable directly longitudinally through the bore of said one retractor to a position to hold said bolt against retraction, and means for moving the holding means out of such holding position.

29. In a lock, a bolt adapted to be moved to and from extended position, a pair of axially alined bolt retractors arranged axially perpendicular to the bolt, said retractors being each operable independently to retract the bolt from locking position, one of said retractors being tubular, means normally movable directly longitudinally through the bore of said one retractor to a position to hold said bolt against retraction, and key-controlled means for moving the holding means out of such holding position.

30. In a lock, a bolt adapted to be moved to and from extended position, a pair of axially alined bolt retractors arranged axially perpendicular to the bolt, said retractors being each operable independently to retract the bolt from locking position, one of said retractors being tubular, means normally movable directly longitudinally through the bore of said one retractor to a position to hold said bolt against retraction, and means associated with the other retractor for moving the holding means out of such holding position.

31. In a lock, a bolt adapted to be moved to and from extended position, a pair of axially alined bolt retractors arranged axially perpendicular to the bolt, said retractors being each operable independently to retract the bolt from locking position, one of said retractors being tubular, means normally movable directly longitudinally through the bore of said one retractor to a position to hold said bolt against retraction, and key-controlled means associated with the other retractor for moving the holding means out of such holding position.

32. In a lock, a bolt adapted to be moved to and from extended position, a pair of axially alined tubular bolt retractors arranged axially perpendicular to the bolt, said retractors being each operable independently to retract the bolt from locking position, holding means normally movable directly longitudinally through the bore of one retractor to a position to hold said bolt against retraction, and means movable through the bore of the other retractor to move said holding means out of such holding position.

33. In a lock, a bolt adapted to be moved to and from extended position, a pair of axially alined tubular bolt retractors arranged axially perpendicular to the bolt, said retractors being each operable independently to retract the bolt from locking position, holding means normally movable directly longitudinally through the bore of one retractor to a position to hold said bolt against retraction, and key-controlled means movable through the bore of the other retractor to move said holding means out of such holding position.

34. In a lock, a bolt adapted to be moved to and from extended position, a pair of axially alined tubular bolt retractors arranged axially perpendicular to the bolt, said retractors being each operable independently to retract the bolt from locking position, holding means normally movable directly longitudinally through the bore of one retractor to a position to hold said bolt against retraction, and means movable longitudinally through the bore of the other retractor to move said holding means out of such holding position.

35. In a lock, a bolt adapted to be moved to and from extended position, a pair of axially alined bolt retractors arranged axially perpendicular to the bolt, said retractors being each operable independently to retract the bolt from locking position, and a pair of axially alined plungers mounted one in each of the retractors and normally movable directly longitudinally and independently into the retractive path of the bolt.

36. In a lock, a bolt adapted to be moved to and from extended position, a pair of axially alined bolt retractors arranged axially perpendicular to the bolt, said retractors being each operable independently to retract the bolt from locking position, and a pair of axially alined plungers mounted one in each of the retractors and normally movable directly longitudinally and independently into the retractive path of the bolt, one of said plungers being key-controlled.

37. In a lock, a bolt adapted to be moved to and from extended position and embodying a nose portion and an arm at one side of the nose and extending substantially in the direction of the nose axis, a cam member extending from said arm portion towards said axis, a rotary bolt retractor arranged axially perpendicular to the bolt and adapted to act, by virtue of its rotation, upon said cam member to retract the bolt, and a stop on said cam member adapted to limit the extent of rotation of the retractor.

38. In a lock, a bolt adapted to be moved to and from extended position and embodying a nose portion and a pair of spaced arms extending substantially in the direction of the nose axis, a cross bar extending between the arm portions, a rotary bolt retractor arranged axially perpendicular to the bolt and adapted to act, by virtue of its rotation, upon said bar to retract the bolt, and a stop member on the cross bar and substantially midway between the arm portions to limit the extent of rotation of the retractor.

39. In a lock mounted in a door, a bolt adapted to be moved to and from locking position, a bolt retractor arranged axially perpendicular to the bolt and extending to one side of the door, a knob associated with the retractor at said side of the door and operable to actuate said retractor, and means movable from the opposite side of the door into and out of engagement with said knob, said means being effective, when in engagement with the knob, to hold said knob from being operated.

40. In a lock mounted in a door, a bolt adapted to be moved to and from locking position, a rotary spindle arranged axially perpendicular to the bolt and extending to one side of the door, said spindle being operable by virtue of its rotation to retract the bolt, a knob fixed to the spindle at one side of the door, and means movable from the opposite side of the door into and out of engagement with said knob, said means being effective, when it is in engagement with the knob, to hold said knob and hence said spindle against rotation.

41. In a lock mounted in a door, a bolt adapted to be moved to and from locking position, a bolt retractor arranged axially perpendicular to the bolt and extending to one side of the door, a knob associated with the retractor at said side of the door and operable to actuate said retractor, means movable from the opposite side of the door into and out of engagement with said knob, said means being effective, when in engagement with the knob, to hold said knob from being operated; and a second bolt retractor operable from said opposite side of the door when said knob is so held from being operated.

42. In a lock mounted in a door, a bolt adapted to be moved to and from locking position, a bolt retractor arranged axially perpendicular to the bolt and extending to one side of the door, a knob associated with the retractor at said side of the door and operable to actuate said retractor, means movable from the opposite side of the door into and out of engagement with said knob, said means being effective, when in engagement with the knob, to hold said knob from being operated, and a key controlled bolt retractor operable from said one side of the door when said knob is so held from being operated.

43. In a lock mounted in a door, a bolt adapted to be moved to and from locking position, a bolt retractor arranged axially perpendicular to the bolt and extending to

one side of the door, a knob associated with the retractor at said side of the door and operable to actuate said retractor, means movable from the opposite side of the door into and out of engagement with said knob, said means being effective, when in engagement with the knob, to hold said knob from being operated; a second bolt retractor operable from said opposite side of the door when said knob is so held from being operated, and a key controlled bolt retractor operable from said one side of the door when said knob is so held from being operated.

In witness that I claim the foregoing I have hereunto subscribed my name this 18th day of June, 1926.

JAMES M. WEAVER.