Dec. 15, 1953 G. HAGSTROM 2,662,387

DOOR LOCK

Filed Dec. 1, 1950

4 Sheets-Sheet 1

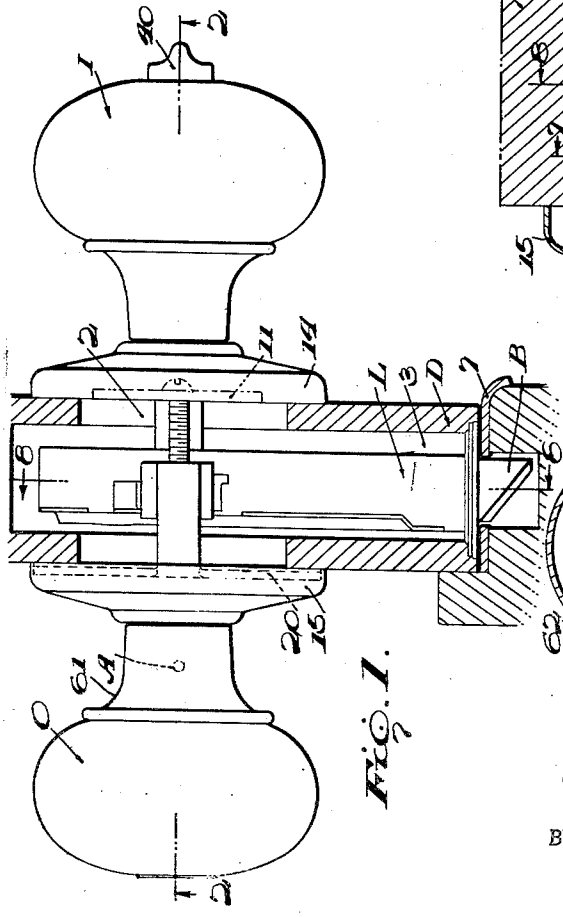


FIG. 1.

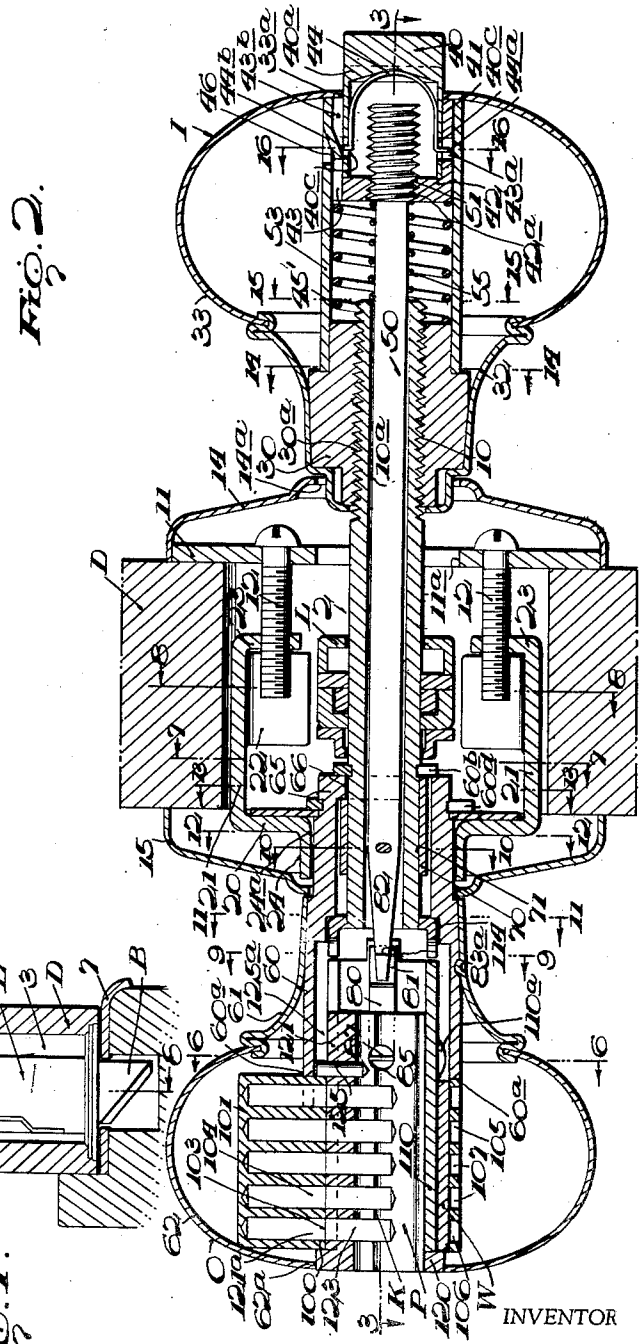


FIG. 2.

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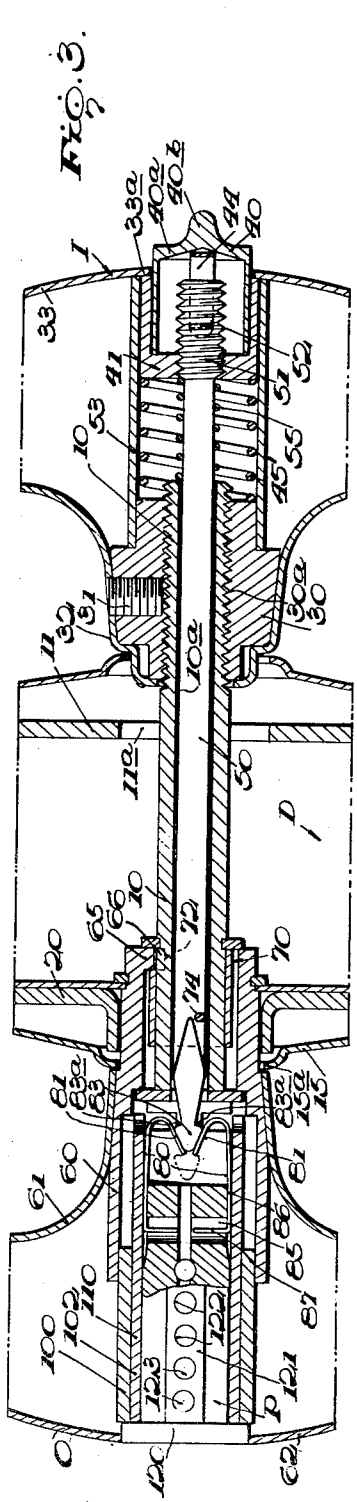


FIG. 3.

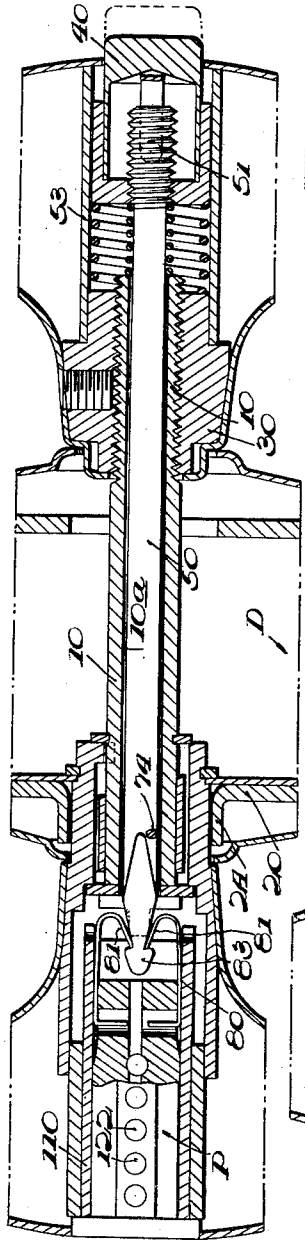


FIG. 4.

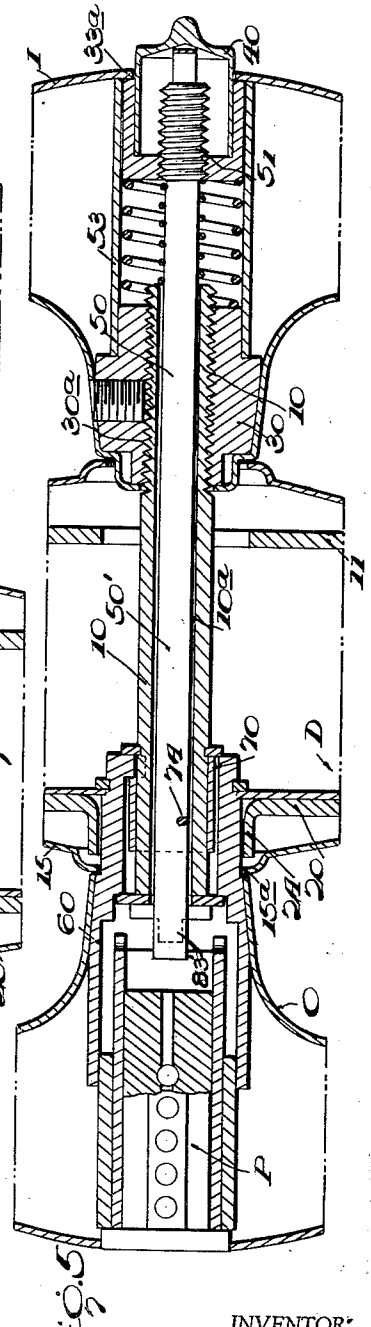


FIG. 5.

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DOOR LOCK

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Fig. 6.

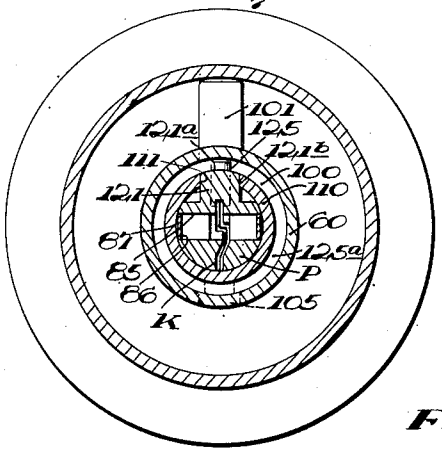



Fig. 9.

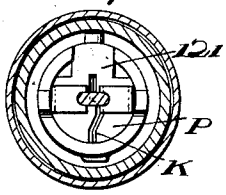



Fig. 10.

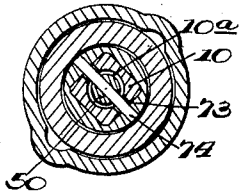



Fig. 11.

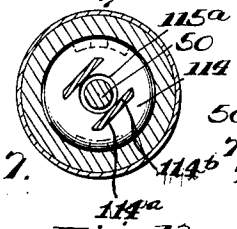



Fig. 12.

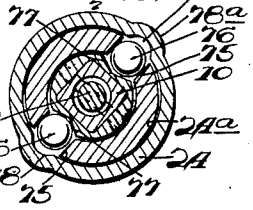



Fig. 7.

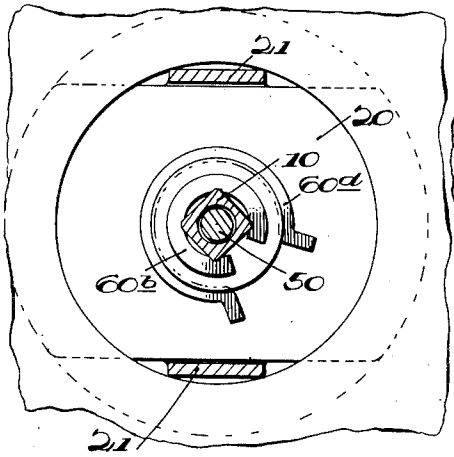



Fig. 13.

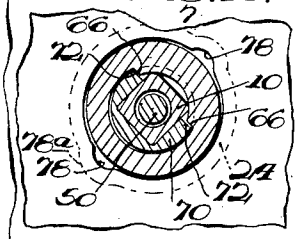



Fig. 14.

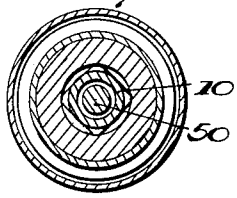



Fig. 15.

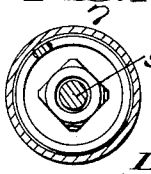



Fig. 16.

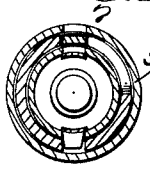
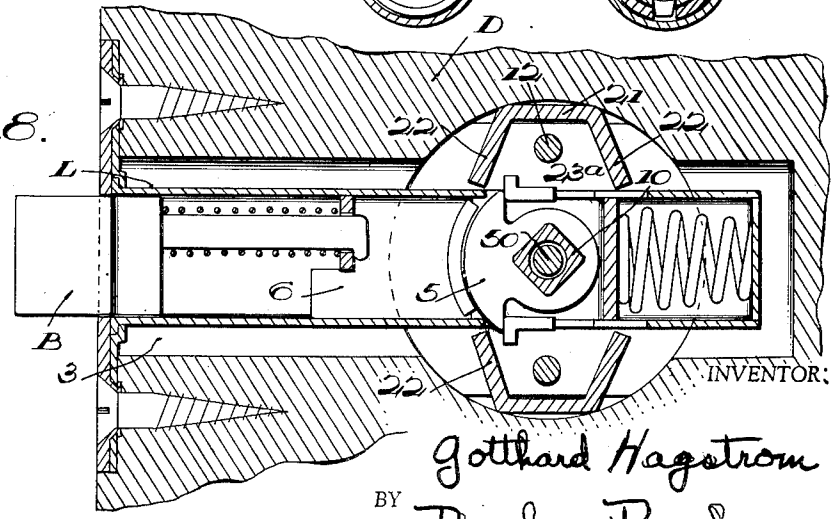



Fig. 8.




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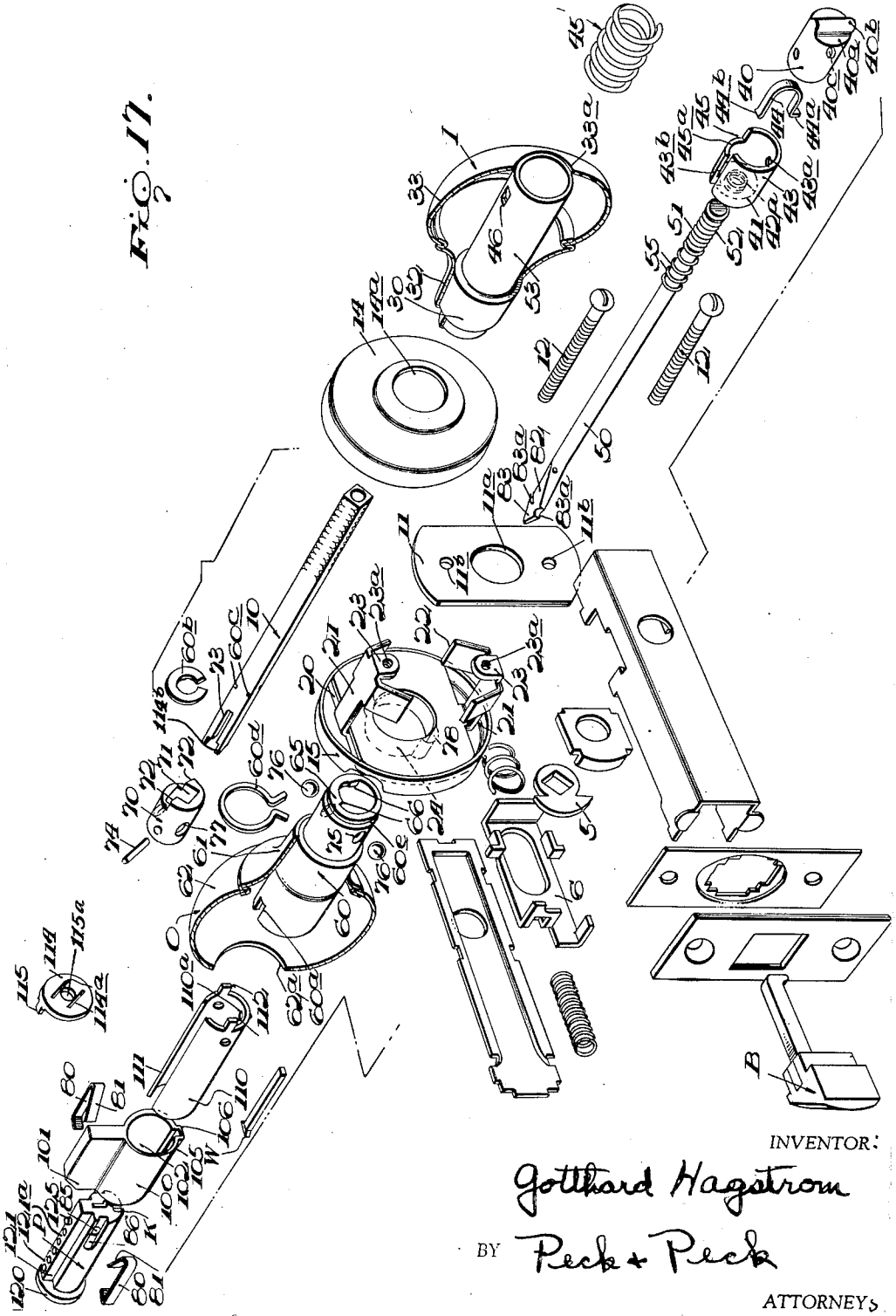
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Fig. 17.



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Patented Dec. 15, 1953

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# UNITED STATES PATENT OFFICE

2,662,387

## DOOR LOCK

Gotthard Hagstrom, Greenwich, Conn., assignor to The Safe Padlock and Hardware Company, Lancaster, Pa., a corporation of Pennsylvania

Application December 1, 1950, Serial No. 198,557

29 Claims. (Cl. 70—146)

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The invention relates to certain improvements in a door lock; and the nature and objects of the invention will be readily recognized by those skilled in the art in the light of the following explanation and detailed description of the accompanying drawings illustrating what I now believe to be the preferred embodiments or mechanical expressions of the invention from among various other embodiments, modifications, variations, combinations and constructions, of which the invention is capable within the broad spirit and scope thereof as defined by the claims hereto appended.

Primarily my invention is directed to those general types or classes of door lock units or sets used mainly for outside doors, and which are characterized by a cylinder lock mounted in the outer knob with a manually operable push button or the like member mounted in the inner knob by the selective operation of which the outer knob may be either connected with the latch bolt retracting spindle for latch bolt actuation by the outer knob, or by which the outer knob may be disconnected from the spindle and locked against rotation, so that, the spindle may then be rotated for latch bolt retraction only by key operation of the outer knob mounted lock unit. Door locks of this general class or type are in general use but their design and construction is mechanically and structurally complicated, with high cost of manufacture and with operating and maintenance difficulties in door installed operation and use.

One of the primary objects of my invention is to provide a design and construction of such type of door lock which is extremely simple structurally and mechanically, with a minimum number of parts designed for ready manufacture and ease of assembly, so that, the ultimate cost of such a door lock unit or set to the user may be substantially reduced.

Another object is to provide such a low cost mechanically efficient design and construction which will provide a door lock unit capable of efficient, precision operation with a minimum of operational or structural failures over a long life under all normal conditions to which such a door lock unit may be subjected in operation and use.

A further object is to provide such a unit in which the outer, lock mounting knob thereof may be latched by operation of an inside knob mounted button to releasably lock the outer knob to a fixed lock plate mounted on the door.

And another object is to provide a design in which the outer knob may be releasably clutched or declutched from the latch bolt retracting spindle, under the selective control of the inner knob mounted push button.

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A further object is to provide for simultaneous declutching of the outer knob from the bolt retracting spindle and locking of the outer knob against rotation, or conversely, simultaneous unlocking of the outer knob and clutching of such knob to the bolt retracting spindle.

Another object is to provide mechanism for automatically releasing the outer knob from the locked position thereof declutched from the latch bolt retracting spindle, by either the rotation of the inner knob or key operation of the outer knob mounted cylinder lock unit.

Another object is to provide means by which the automatic releasing mechanism may be rendered inactive, so that the outer knob will remain in latched position, declutched from the bolt retracting spindle, when either the spindle is rotated by the inner knob or is rotated by key operation of the cylinder lock unit in the outer knob.

A further object is to provide a mechanically simple means for locking or latching the outer knob to a fixed plate on the door, comprising locking balls cammed radially outwardly into locking position by moving of a clutch member for clutching and declutching the outer knob to and from the latch bolt retracting spindle.

A further object is to provide a design and construction of the outer knob mounted cylinder lock, by which the cylinder plug of the lock may be readily removed without the use of special keys or other implements, but merely by the partial disassembly and removal of the door lock set from installed position on a door, followed by simple manual manipulation of the cylinder plug and associated mechanism.

With the foregoing and various other objects, features and results in view, which other objects, features and results will be readily apparent from the following detailed description, my invention consists in certain novel features in design and construction, and in combinations and sub-combinations of parts and elements, all as will be more fully referred to and specified hereinafter.

Referring to the accompanying drawings, in which similar reference characters refer to corresponding parts and elements throughout the several figures thereof:

Fig. 1 is a view in horizontal section through a portion of a door with a lock unit or set of the preferred form of my invention installed thereon, the lock unit and latch bolt unit associated therewith being shown in top plan.

Fig. 2 is a view in vertical section taken as on

the line 2—2 of Fig. 1, the outer knob locking mechanism and operating button member therefor being shown in projected, outer knob releasing position.

Fig. 3 is a view in horizontal, longitudinal section through the mounted door lock unit of Fig. 1, taken as on the line 3—3 of Fig. 2.

Fig. 4 is a view in horizontal, longitudinal section similar to Fig. 3, but showing the outer knob locking mechanism in depressed, outer knob locking position.

Fig. 5 is a view in horizontal longitudinal section similar to Figs. 3 and 4, taken through another modified form of door lock unit, in which provision for releasably catching the button operated push rod in its depressed, outer knob latching position, is eliminated.

Fig. 6 is a view in transverse section taken as on the line 6—6 of Fig. 2.

Fig. 7 is a view in transverse section taken as on the line 7—7 of Fig. 2.

Fig. 8 is a transverse sectional view taken as on the line 8—8 of Fig. 1.

Fig. 9 is a transverse sectional view taken as on the line 9—9 of Fig. 2.

Fig. 10 is a transverse sectional view taken as on the line 10—10 of Fig. 2.

Fig. 11 is a transverse sectional view taken as on the line 11—11 of Fig. 2.

Fig. 12 is a transverse sectional view taken as on the line 12—12 of Fig. 2.

Fig. 13 is a transverse sectional view taken as on the line 13—13 of Fig. 2.

Fig. 14 is a transverse sectional view taken as on the line 14—14 of Fig. 2.

Fig. 15 is a transverse sectional view taken as on the line 15—15 of Fig. 2.

Fig. 16 is a transverse sectional view taken as on the line 16—16 of Fig. 2.

Fig. 17 is an exploded view of the door lock and latch bolt units of Fig. 1, showing the parts of such units in perspective in separated relation.

I have selected and disclosed herein as examples, several embodiments of door lock sets or units embodying the principles and various features of my present invention. The disclosed embodiments have been selected primarily for purposes of explaining the several features of the invention and not by way of limitations in all respects to the specific constructions of the example embodiments, or to the general types or classes of door lock units in which such embodiments have been incorporated. The door lock unit or set of each embodiment is shown as associated with a tubular latch bolt unit, and comprises a rotatable spindle, mounting thereon inner and outer knob units by which the spindle may be rotated from either the inside or the outside of the door to retract the latch bolt of the latch unit for door opening in the general manner familiar in this art.

In terms of my present invention, each of these example embodiments is characterized generally by a key operated cylinder lock of the pin tumbler type mounted in the outer knob unit; outer knob locking mechanism operable selectively from the inside of a door to either connect the outer knob to the spindle for spindle rotation thereby, or to disconnect such knob from the spindle and lock the knob against turning, with the spindle then being rotatable from the outside of the door only by key operation of the knob mounted cylinder lock; and a push button member mounted on the inner knob in operative association with the outer knob latching mechanism for effecting operation of that mechanism to either connect the outer knob to the spindle or to disconnect the knob from the spindle and lock the knob against hand rotation or turning.

In one of the example embodiments, which may be taken for present purposes of this disclosure as the preferred embodiment, the inner knob mounted button member when in its projected position effects connection of the outer knob to the spindle and when in its depressed position effects disconnection of the outer knob from the spindle and the locking of such knob against rotation. In this embodiment, the button member and outer knob latching mechanism when the button is in depressed position are releasably held automatically in such position but are released automatically to button projected position by either rotation of the inner knob or by key operation of the outer knob mounted lock. This embodiment also includes means by which the button member and the outer knob latching mechanism can be releasably held in depressed, outer knob latching positions, so that, rotation of the inner knob or key operation of the outer knob mounted lock will not effect automatic release and resulting unlatching of the outer knob. Such means permits of manual operation selectively by the operator to either effect locking of the button member against automatic actuation of the outer knob latching mechanism or to restore such mechanism and button member for automatic functioning to release from outer knob latching position by inner knob rotation or key operation of the outer knob mounted lock.

In another of the example embodiments hereof, the provision for retaining or locking the button member in its depressed, outer knob locking position, is eliminated, so that the button member is always released automatically from its depressed, outer knob locking position by either rotation of the inner knob or key operation of the cylinder lock in the outer knob.

In the other of the example embodiments, the provision for retaining and locking the button member in its depressed, outer knob locking position whenever it is depressed from projected position and for automatically restoring the button from depressed to projected position unlatching the outer knob, upon either inner knob rotation or operation of the outer knob mounted lock, is eliminated. However, provision is made in this embodiment for manually locking the button member in its depressed position to maintain the outer knob locked against rotation under all conditions of operation of either the inner knob or the lock in the outer knob, with the button member being only releasable from depressed, outer knob locking position by manual operation thereof by the operator.

In the example embodiment as disclosed in Figs. 1 to 3, and which is offered here as the preferred embodiment, the door lock unit or set is shown in Fig. 1 in mounted and installed position on a door D in operative association with a tubular latch bolt unit L. The door lock unit or set includes the spindle 10 of square or angular section, which is mounted in position extended through a transverse bore or passage 2 formed through the door, with an inner knob unit I mounted on the spindle end at the inner side of door D and an outer knob unit O mounted on the spindle end at the outer side of the door. The tubular latch bolt unit L of this example is mounted in the door D in a suitable bored or

mortised opening 3 formed therein and opening through the outer free edge of the door D, with the unit L being disposed in position with its longitudinal axis perpendicular to the axis of spindle 10 and with the spindle being extended transversely through latch bolt unit L in operative connection therewith for retracting the latch bolt B of unit L upon rotation of the spindle by either inner knob unit I or outer knob unit O, in the manner generally familiar in this art. Referring to Figs. 3 and 17, the latch bolt unit L is of the tubular type and includes a roll-back 5 having a squared opening through which spindle 10 extends and is engaged, a spring loaded yoke 6 reciprocally mounted in the unit and operatively connecting the rollback 5 with the latch bolt B, which latch bolt is reciprocally mounted in the unit for projection and retraction through one end thereof to be engaged in or disengaged from the usual keeper of a strike plate 7 (see Fig. 1). The latch bolt B is spring loaded and in the usual manner of the art is depressible independently of yoke 6, but retractible by the yoke.

The structure for mounting a door lock unit or set on the door D in accordance with my invention, provides for ready adjustment of the unit to doors of varying thicknesses, and, in this instance, comprises a back plate 11 located on the inner side of the door across spindle receiving bore 2, and a lock plate 20 located at the outer side of the door across the outer end of spindle receiving bore 2. The back plate 11 is provided with a bore 11*a* having an internal diameter greater than the external diameter of spindle 10, for receiving the spindle in position extended therethrough. The lock plate 20 is formed with a hub or collar-forming, annular flange 24 extended from the outer side thereof and providing a bore therethrough and through the plate for receiving the outer end length of the spindle 10 which extends therethrough in assembled position of the unit. The internal diameter of the hub or collar 24 of lock plate 20 is substantially greater than the external diameter of spindle 10 for a purpose to be hereinafter referred to in detail.

The lock plate 20 includes the spaced, generally parallel arms 21 extended laterally inwardly from the inner side of plate 20 at opposite sides of the spindle receiving bore through the plate, with these arms being extended into the bore or passage 2 in door D. The arms 21 are provided at their inner ends with the inwardly facing, spaced positioning flanges 22 between which the latch bolt unit L is received. The inner ends of arms 21 are provided with lugs 23 bent inwardly therefrom and being disposed generally parallel with the body of plate 20. Each of the lugs 23 is provided with a tapped bore 23*a* therethrough (see Fig. 17) having its axis generally parallel with the axis of the bore through plate 20. The back plate 11 and the lock plate 20 in mounted positions are connected and drawn tightly together against the outer and inner sides of door D over and across the adjacent end openings, respectively, of the bore or passage 2, by the threaded and headed bolts or long screws 12 which are extended inwardly through smooth wall bores 11*b* (see Fig. 17) formed in back plate 11, with the threaded inner ends of the screws being threaded into the tapped bores 23*a*, respectively, of lugs 23 of the lock plate 20. Thus, by such construction and arrangement of back plate 11, lock plate 20 and fastening screws 12, a lock unit may be readily mounted on doors of varying thicknesses by merely threading screws 12 the required distances into or from the lugs 23 to draw plates 11 and 20 inwardly toward each other to securely clamp the plates on and against opposite sides of the door in accordance with the door thickness.

An inner rose 14 is provided for mounting on and over the opposite ends of back plate 11 by a pressed or snap fit, while an outer rose 15 is provided for mounting on and over the opposite ends of lock plate 20 by snap or pressed fit. With the inner and outer roses 14 and 15 in mounted positions attached on plates 11 and 20, the ends of the spindle receiving bore 2, the plates and the fastening screws 12, are all enclosed within and concealed from view by the roses.

The spindle 10, which in this instance is of square section is externally threaded along its inner end length and the inner knob unit I is threaded onto and locked in position thereon. In this example, inner knob unit I includes a hub member or insert 30 having an internally threaded axial bore 30*a* therethrough by which this hub or insert member is threaded onto spindle 10. The hub member 30 is formed with a tapped, radial bore therethrough into which is threaded a lock or set screw 31 for releasably locking the hub member and knob unit in the desired position of adjustment axially of spindle 10. The inner knob unit includes an annular shank 32 which is secured on and around hub member 30, with the inner end of the shank bent radially inwardly over and around the inner end of the hub member. The inner rose 14 is formed with an axial bore therethrough having an inturned, annular flange 14*a* therearound which defines and provides a bearing member into which is rotatably received the inner end of hub member 30 and the inturned flange portion of the shank 32. The inner end of hub member 30 and the inturned flange portion of shank 32 secured thereabout are of reduced external diameter relative to the hub member and the shank. Shank 32 of knob unit I is flared radially outwardly and has its outer, annular edge portion formed to provide a flange therearound into which the inner annular edge of the knob forming cap 33 is secured. Knob-forming cap 33 is formed at its outer side with an axial bore 33*a* therethrough in axial alignment with spindle 10.

The inner knob unit I mounts the button member 40 by which the mechanism for connecting the outer knob to the spindle 10 and for disconnecting such knob from the spindle and latching the knob to the lock plate 20 against rotation, is selectively manually controlled by the operator. In this example, in accordance with my invention, the button member 40 is operatively connected with such mechanism through the medium of a push rod or plunger 50 which is reciprocally mounted in and extends through an axial bore 10*a* extending through spindle 10 from end to end thereof. This push rod 50 is formed at its outer end with an enlarged external diameter head 51 which is provided with external threading 52 having the same lead as the external threading of spindle 10. The external diameter of the threading 52 of head 50 is slightly less than the internal threading of the bore 30*a* of hub member 30, so that, the head 50 may slip freely through the hub member bore. The outer end portion of hub member 30 is formed of reduced external diameter and a cylinder-forming tube 53 is secured in position at its inner end on and over such reduced diameter portion of hub

member 30. Tube 53 is of a length to extend outwardly into the cap member 33 of the knob unit I to the inner side of the cap member around and surrounding the button receiving bore 33a in the outer side wall thereof.

The button member 40 is of tubular form open at one end and closed at the opposite end by an end wall 40a formed to provide thereacross a transverse rib 40b to provide a finger grip to facilitate turning or rotation of the button member. The button member 40 is provided with diametrically opposite bores 40c through the side wall thereof, as will be clear by reference to Figs. 2 and 17. The button member 40 is mounted in a sleeve member 41 which is open at one end for receiving therein the button member in telescopic relation therewith. Sleeve member 41 is closed at its opposite end by an end wall 42 having an internally threaded, axial bore 42a therethrough into which the externally threaded head 51 of push rod 50 is threaded to thereby adjustably attach the sleeve 41 and its contained button 40 to the push rod 50. In assembled position button 40 is secured in sleeve 41 against displacement with the closed end of the button member provided with the finger grip 40b outermost and the inner open end of the button member located at the inner side of end wall 42 of the sleeve 41.

In this example, I secure button member 40 in position in sleeve 41 by means of a U-shaped spring member 44 (see Fig. 17). Spring member 44 has the ends of the opposite arms thereof bent laterally outwardly to form a long finger 44a and a short finger 44b. The spring member 44 is inserted in button member 40 with the closed end thereof located at the closed end of the button, and with the fingers 44a and 44b thereof received in the diametrically opposite bores 40c, respectively, of the button member. The circular side wall 43 of sleeve 41, referring now to Fig. 17, is provided with a bore 43a through a side wall thereof. Diametrically opposite bore 43a the side wall 43 of sleeve 41 is provided with an axially disposed slot 43b which extends from end to end of the sleeve, so that, it opens at its opposite ends through the forward end edge of the sleeve and through the rear face of the end wall 42 of the sleeve. The long finger 44a of the button retaining member 44 is of a length to project outwardly through the side wall of the button, and in mounted, assembled position of the button member the finger 44a engages in the side wall bore 43a of sleeve 41 to thereby retain the button member in the sleeve against displacement. The side wall 43 of sleeve 41 is cut away or recessed to form what is in effect a circumferentially disposed, bayonet slot 45 perpendicular to and opening at one end into the slot 43b. The slot 45 provides along its inner side a guiding edge or shoulder 45a, as clearly shown in Fig. 17.

The sleeve 41 is slidably mounted and confined in the outer end of the tube 53, which extends between inner knob hub member 30 and the end wall of the knob, cap 33, with the button member 40 positioned projected outwardly through the bore or opening 33a in the cap. The push rod 50 extends outwardly into tube 53 with the threaded head 51 thereof threaded into the bore 42a of the end wall 42 of the button mounting sleeve. Thus, sleeve 41 and button member 40 are reciprocal in tube 53 as a unit to project and retract the push rod 50 connected thereto.

In this example embodiment of my invention, I provide for rotation of sleeve 41 as a unit with button member 40 in tube 53 on and relative to push rod 50. The rotation provided for is a limited one and amounts to approximately a quarter turn counterclockwise of the button when depressed to rotate it to locked position and a quarter turn clockwise to rotate it from locked position. The limitation and confining of this rotary movement is effected through the medium of a finger or lug 46 which is bent inwardly from the side wall of tube 53 and which is engageable in the slots 43b and 45 formed in the side wall of sleeve 41 (see Figs. 2 and 17). In normal operation, lug 46 is received in slot 43b and confines the button member and its mounting sleeve 41 to straight line reciprocation axially in tube 53 as the button and push rod 50 are depressed or projected. When button member 40 and sleeve 41 are in depressed position, the slot 45 of sleeve 41 is aligned with the lug 46 of tube 53. Hence, if it is desired to lock or hold the button member and push rod 50 in depressed position, it is only necessary to rotate button member 40 and sleeve 41 counter-clockwise, so that lug 46 then moves into slot 45 and upon release of the button member will be engaged by shoulder 45a to prevent projection or outward displacement of the assembly of push rod 50, sleeve 41 and the button member. Clockwise rotation of the button member 40 from this locked position wil return sleeve 41 to position with the slot 43b thereof lined up with lug 46, so that, the button member and its sleeve together with push rod 50, may then move outwardly as a unit in tube 53 to projected position with push rod 50 retracted.

The button member 40, sleeve 41 and push rod 50 connected therewith, are continuously biased outwardly through tube 53 to the projected position of button member 40 and the retracted position of push rod 50, as shown in Fig. 3, by the biasing springs 45' and 55. Spring 45' is a coil spring mounted in position in tube 53 under compression between the outer end of hub member 30 and the inner side of end wall 42 of button mounting sleeve 41. Spring 45' has an external diameter to slidably engage the inner surface of tube 53. Spring 45' thus continuously acts to project sleeve 41 outwardly to position with the outer open end edge thereof engaged against the under side of cap 33 which forms a limiting stop therefor. The spring 55 is of the coil type having an internal diameter to fit over and slidably engage push rod 50, and is mounted on the push rod under compression between the outer end of spindle 10 and the annular shoulder presented by the inner end of the externally threaded head 51 of push rod 50. It will thus be noted that sleeve 41 can be threaded axially of push rod 50 toward and from spindle 10 and knob hub 30 without thereby varying the distance between the inner end of head 51 and the outer end of spindle 10, so that, adjustments of the knob unit I and button 40, on and relative to spindle 10, may be made without varying the degree of compression of spring 55. Springs 45' and 55 thus together load sleeve 41 and push rod 50 to continuously bias these members with the button member 40, outwardly to normal projected position thereof. Button member 40 and sleeve 41 may be depressed as a unit from projected position to thereby force push rod 50 inwardly, against the combined forces of the springs 45' and 55.

Attention is here directed to the fact that by providing the external threading 52 of head 51 of the push rod 50 with the same lead as the threading of spindle 10 in knob hub member 30, the same spacing with button 40 in projected

position is maintained between spindle 10 and the inner end wall 42 of sleeve 41, irrespective of the axial position of adjustment of inner knob unit I on spindle 10. In this manner the maximum position of projection of button 40 outwardly from knob unit I will remain the same in any position of adjustment of the knob unit on spindle 10 to meet the conditions of installation on doors of different thicknesses.

The outer knob unit O includes an insert sleeve 60 on which the annular shank 61 of the knob unit is secured with the sleeve member extended outwardly a distance beyond this shank. Shank 61 is radially outwardly flared and has secured to the outer annular edge flange thereof the knob cap 62. Knob cap 62 is provided with an axial, circular opening 62*a* therethrough in axial alignment with the inner end of the hub-forming, insert sleeve 60. Sleeve 60 terminates at its outer end within cap 62 spaced a distance inwardly from the inner side of the outer end wall of the cap. The knob unit O with the lock unit in mounted, installed position on the door D, has the outwardly projected length of hub-forming sleeve 60 of the knob unit extended through an axial opening 15*a* formed through outer rose 15, and through the lock plate 20, with the insert sleeve 60 rotatably received in and extended through the hub forming flange 24 of the lock plate. In this mounted position, the spindle 10 extends a distance into knob insert sleeve 60, which sleeve has an internal diameter greater than the maximum effective external diameter of the spindle. Referring now to Fig. 17, in connection with Figs. 2 and 3, the open inner end of knob insert sleeve 60 which receives the spindle 10, is provided with an inturned flange portion 65, which provides at its opposite ends the clutch teeth forming shoulders 66. The radial depth of the flange 65 is such that the flange is spaced from and does not engage spindle 10, so that the spindle and the knob unit O with its insert sleeve 60, are rotatable relative to each other in the absence of connecting means therebetween.

The outer knob unit O may be secured against inward displacement on spindle 10, by a retaining ring 60*b* removably mounted on the spindle at the inner end of insert sleeve 60. Ring 60*b* may be seated in suitable notches 60*c* formed in the spindle 10. Displacement of knob unit O outwardly on spindle 10 may be restrained by a suitable ring 60*d* secured in an annular seating groove 60*e* formed around insert sleeve 60 at the inner side of lock plate 20 (see Figs. 2 and 17).

By my present invention I have provided a clutching mechanism actuated by push rod 50 under the control of the button member 40, for releasably connecting the insert sleeve 60 of the outer knob unit O with the spindle 10, so that rotation of knob O in either direction will effect rotation of spindle 10 to retract latch bolt B of the latch bolt unit L. In the examples hereof, I have expressed this mechanism in the form of a clutch sleeve 70 having a squared, axial passage 71 therethrough which is dimensioned to slidably receive the square section spindle 10. Clutch sleeve 70 is of circular external contour and is slidably mounted on spindle 10 for rotation with that spindle in any position of adjustment axially of the clutch sleeve on the spindle. Referring to Fig. 17, in connection with Fig. 13, clutch sleeve 70 at the inner end thereof is cut away across one side thereof for a distance inwardly from the rear or inner edge of the sleeve to provide the spaced clutch teeth forming shoulders or edges 72, which are complementary to and adapted to be engaged with the clutch teeth-forming shoulders 66 at the inner end of knob insert sleeve 60.

The clutch sleeve 70 is mounted on spindle 10 in position located within the knob insert sleeve 60 with the cutaway end thereof which provides the clutch teeth-forming shoulder 72, innermost and adjacent the clutch teeth-forming shoulders 66 at the inner end of insert sleeve 60. Clutch sleeve 70 has an external diameter such that it may be freely moved axially of spindle 10 within insert sleeve 60, between a position moved rearwardly with shoulders 72 thereof engaged with shoulders 66, respectively, at the inner end of insert sleeve 60, and a position moved outwardly on the spindle with the shoulders 72 completely disengaged from shoulders 66 of the insert sleeve. When the clutch sleeve 70 is in its inwardly moved position in clutching engagement with insert sleeve 60, the outer knob unit O is then connected with spindle 10 through the engagement of the square section spindle in the square passage 71 of clutch sleeve 70, so that rotation of the outer knob unit O in either direction will correspondingly rotate the spindle 10 to thereby retract latch bolt B. When clutch sleeve 70 is displaced outwardly on spindle 10 to position with the teeth-forming shoulders 72 thereof disengaged from the teeth-forming shoulders 66 of insert sleeve 60, then outer knob unit O is disconnected from the spindle and the spindle may be rotated independently of the outer knob unit.

The clutch sleeve 70 is displaced axially in either direction on spindle 10 between position clutching outer knob unit O to spindle 10 and position declutching the knob unit and spindle, by means of the push rod 50. I effect such operation of clutch sleeve 70 by providing a slot 73 transversely through spindle 10 with this slot opening through the outer end of the spindle and being extended inwardly a distance therefrom inwardly through the spindle. A pin 74 is secured at its opposite ends in diametrically opposite bores formed through the clutch sleeve 70, with this pin extending across square passage 71 of the sleeve and through the slot 73 in the spindle 10. The push rod 50 extends completely through the spindle 10 and projects at its outer end a distance outwardly beyond the spindle to a location within the knob insert sleeve 60. The pin 74 is extended through a suitable bore formed in push rod 50, so that the clutch sleeve 70 is thereby secured to the push rod. Thus, the clutch sleeve 70 will be displaced axially of spindle 10 by axial movements inwardly or outwardly of the push rod in the bore 10*a* of the spindle. The mounting and positioning of clutch sleeve 70 and pin 74 relative to each other and to push rod 50 and spindle 10, is such that with the push rod in retracted position with the button member 40 projected from inner knob unit I, the clutch sleeve 70 will be in position in clutched engagement with the insert sleeve 60, but with push rod 50 projected into outer knob unit O by depression of button member 40, the clutch sleeve will be moved outwardly on spindle 10 to position in the inner end of insert sleeve 60 with the clutch teeth-forming shoulders 72 thereof declutched and disengaged from the teeth-forming shoulders 66 of insert sleeve 60.

When the clutch sleeve 70 is moved outwardly in insert sleeve 60 on spindle 10 to position declutched from the insert sleeve and knob unit O, I provide a locking mechanism for locking the freed outer knob unit O against rotation, which

mechanism functions automatically by the outward movement of the clutch sleeve to declutched position. Referring to Figs. 12 and 17, diametrically opposite bores 75 are formed through the inner end portion of insert sleeve 60 at locations such that the clutch sleeve 70 is always positioned in the insert sleeve between these bores. In each of these bores I locate a locking ball 76. The diameter of each of the balls 76 is greater than the thickness of the side wall of the insert sleeve member 60, while the diameter of each of the ball-receiving bores 75 is slightly greater than the diameter of the balls, so that the balls may freely move axially, inwardly and outwardly through the bores and radially relative to and through insert sleeve 60. Conical camming recesses 77 are formed in the outer side of clutch sleeve 70 at diametrically opposite locations thereon. In the normal position of the door lock unit with the latch bolt B projected and the button member 40 and push rod 50 in normal projected positions, the camming recesses 77 are opposite and axially aligned with the ball receiving bores 75 of insert sleeve 60, so that, the locking balls 76 may be received and seated in such recesses. This position of the balls 76 is clearly shown in Fig. 12. The diameter of each of the locking balls 76 is the same, and is such that when these balls are in positions seated in camming recesses 77, they have a loose bearing engagement at their outer sides with the inner surface 24*a* of the hub-forming sleeve 24 of lock plate 20. This inner surface 24*a* is concentric with the external surface of the clutch sleeve 70, there being a clearance between these surfaces. Thus, in such positions the inner end length of insert sleeve 60 which extends through locking plate 20, is freely rotatable in and relative to that plate and its hub-forming flange 24, for rotation of the outer knob unit O in either direction to rotate the spindle 10 to retract latch bolt B.

When the clutch sleeve 70 is moved axially of spindle 10 from its position with the locking balls 76 received in the camming recesses 77, the locking balls will be cammed or forced by the camming recesses radially outwardly through the ball receiving bores 75 in the insert sleeve 60. I utilize this action to effect locking of the outer knob unit O to the lock plate 20 against rotation when the clutch sleeve 70 is moved outwardly on spindle 10 by depression of button member 40 to thus declutch and disconnect the knob unit O from the spindle 10. In the example embodiments here disclosed, I provide ball receiving, locking recesses 78 in the hub forming flange 24 of the locking plate 20. These recesses 78 are located at diametrically opposite positions in flange 24. The recesses are disposed longitudinally of the flange relative to the axis thereof and are open at their inner sides facing the clutch sleeve 70. For instance, such recesses may be formed by outwardly bent or pressed channel portions 78*a* on the flange.

In normal position of the door lock mechanism, the locking recesses 78 are located opposite and in position for receiving thereinto the locking balls 76, respectively. Thus, when clutch sleeve 70 is moved outwardly on spindle 10 to position declutching or disconnecting outer knob unit O from the spindle, the balls 76 are cammed radially outwardly into the locking recesses 78 and are constrained against displacement radially inwardly therefrom by the outer surface of the clutch sleeve 70. The diameters of the locking balls 76 relative to the internal diameter of flange 24 and the external diameter of clutch sleeve 70 is such that with clutch sleeve displaced to position with the balls 76 cammed into the locking recesses 78, the balls will have rolling bearing engagement at their inner sides with the external surface of clutch sleeve 70. Upon movement of the clutch sleeve 70 inwardly on spindle 10 by the push rod 50 to the normal projected position of the push rod and button member 40, the outer knob unit O is again clutched to spindle 10 and the locking balls 76 are lined up with camming recesses 77, so that outer knob unit O may then be rotated to rotate spindle 10.

In the example embodiment of Figs. 1 to 3, a spring catch means is provided for automatically engaging and releasably retaining the push rod 50 in its position outwardly projected by depression of button member 40. Such spring catch means in this example, takes the form of a pair of spring arms 80 which are suitably mounted and located in insert sleeve 60 of the outer knob unit O in positions spaced apart in generally parallel relation and being extended rearwardly to the outer end of spindle 10 and the adjacent free end of push rod 50. The inner ends of arms 80 are bent inwardly toward each other to provide the converging, inclined spring fingers 81. These spring fingers are located at the opposite sides of the axis of push rod 50 with the outer end of the push rod adapted to be engaged therewith. The outer end of push rod 50 is formed flattened at opposite sides 82 thereof and the outer end of the rod is formed to provide an arrow-head 83 providing at opposite sides thereof the laterally outwardly projected shoulders 83*a*. In normal projected position of button member 40 with the push rod 50 in its retracted position clutching outer door knob unit O to spindle 10, the arrow-head 83 forming the outer end of the push rod is positioned between the converging spring fingers 81 of arms 80 with the inclined opposite side edges of head 83 engaged with the adjacent inclined sides of the converging spring fingers 81, as will be clear by reference to Fig. 3. When, however, button member 40 is depressed and push rod 50 is projected outwardly to declutch the spindle 10 from outer knob unit O and lock the latter unit against rotation, the arrow-head 83 is forced outwardly between spring fingers 81, forcing these fingers apart until their ends snap into positions behind the arrow-head 83 engaged with the shoulders 83*a*. This position of push rod 50 and head 83 is shown in dotted lines in Fig. 3. When the arrow-head 83 of push rod 50 is thus engaged by the spring fingers 81, the push rod is constrained and held in such position against retraction under the action of the biasing springs 45 and 55.

Push rod 50 is released automatically from position engaged by spring fingers 81, by either rotation of the inner knob unit I relative to the spring fingers, or by rotation of the spring fingers relative to the push rod and its arrow-head 83. For example, when inner knob unit I is rotated, the spindle 10 and push rod 50 will be likewise rotated and such rotation will turn the arrow head 83 through approximately 90° to thereby turn the shoulders 83*a* thereof out of engagement with the ends of the spring fingers 81, such spring finger ends then engaging against the flat sides 82 of head 83. As soon as push rod 50 and its arrow-head 83 have assumed this position, the push rod is released and the springs 45 and 55 function instantly to project button member 40 and retract the push rod to its position unlocking outer knob unit O and clutching

that unit to the spindle 10. In the same manner push rod 50 is released automatically from the spring fingers 91 by rotation of arms 90 to position the fingers at the flat sides 82 of the push rod arrow-head 83.

The outer knob unit O mounts therein a key operated cylinder lock of the pin tumbler type for effecting rotation of spindle 10 to retract the latch bolt B when the outer knob unit has been latched or dogged against rotation by depression of the button member B in the inner knob unit I at the inside of the door. This cylinder lock embodies various features of my present invention, both in its combination with and relationship in the door lock unit or set and in its design and construction as a cylinder lock of the removable plug type. This cylinder lock in the form thereof disclosed herein, as adapted to the example embodiments of door lock units of the invention, comprises basically a cylinder body 100 having a driver pin case 101 extended longitudinally therealong outwardly from one side thereof, and a cylinder plug P which is rotatably mounted in the body 100 and which is provided with the usual keyway or slot K opening through one side of the plug for receiving therein an operative key.

Referring to Figs. 2 and 17, the cylinder body 100 is of tubular form providing a circular bore or opening 102 extending axially therethrough and opening through the opposite ends of the body. The cylinder body 100 is provided with a series of spaced bores 103 therethrough along the under side of an opening into driver case 101 for reciprocal projection therethrough of the usual spring loaded driver pins 104 reciprocally mounted in the driver case. Diametrically opposite driver case 101, the cylinder body 100 is provided with a rib formation 105 extending longitudinally therealong and projected outwardly therefrom to form at the inner side thereof a groove 106 opening at its opposite ends through the ends of the cylinder body and being provided with spaced bores 107 therethrough actually aligned with the bores 103 at the driver case side of the cylinder body. This groove 106 is open at the inner side thereof throughout its length into the bore 102 of the cylinder body. The cylinder body 100 is mounted in assembled position within the outer knob unit O by securing the inner end of the body to the outer end of the insert sleeve 60. In this example, insert sleeve 60 is formed with diametrically opposite recesses or slots 60a therethrough (see Fig. 2) which receive therein the inner end portions of driver case 101 and rib 105, respectively, of the cylinder body. The forward end portion of insert sleeve 60 is formed with an internal diameter to snugly receive therein the rear, externally cylindrical end portion of the cylinder body 100. The cylinder body is thus rigidly held in assembled position in knob unit O with the body being disposed and enclosed within knob cap 62 and the forward open end of the body being located adjacent the inner side of and axially aligned with the opening 62a in the cap.

In accordance with a feature of the invention, the cylinder plug P is assembled with and is adapted to rotate an actuator sleeve 110, by which rotation of the cylinder plug by a key inserted therein will effect latch bolt retracting rotation of the spindle 10. This actuator sleeve 110 in the example embodiment, is formed as a cylindrical, tubular member having a longitudinal slot 111 through one side thereof and being extended to and opening through opposite ends of the sleeve. The actuator sleeve 110 has an external diameter to be rotatably received and journaled in bore 102 of cylinder body 100. In mounted position of the actuator sleeve 110 in cylinder body 100, the sleeve extends completely through bore 102 with its forward end at the forward or outer end of the cylinder body but with its inner end portion projected a distance inwardly into the insert sleeve 60 beyond the inner end of the cylinder body 100. At its inner end actuator sleeve 110 is provided with a pair of rearwardly extended teeth 112 positioned at opposite sides of slot 111 in diametrically opposite locations on the sleeve. The spindle 10 is provided at the outer end thereof with a head 114 which is suitably fixed thereto, and which is provided with an axial bore or opening 115c through which the push rod 50 extends. For attachment to the spindle 10, the head 114 may be provided with the slots 114a to receive therein the tongues 114b formed on the end of the spindle (see Fig. 17). This head 114 is provided with a pair of forwardly extended teeth 115 located at diametrically opposite positions on the head. The actuator sleeve 110 extends inwardly into insert sleeve 60 a distance to locate the teeth 112 thereof in positions for engaging upon rotation of the sleeve, the forwardly extended teeth 115 of spindle head 114, as will be clear by reference to Fig. 11 in connection with Figs. 2, 3 and 17. In normal position, the pairs of teeth 112 and 115 are approximately 90° apart, so that upon rotation of the actuator sleeve 110 through the required number of degrees, the teeth 112 thereof will engage the teeth 115 of spindle head 114, and upon further rotation of sleeve 110 in the same direction the spindle 10 will be rotated thereby.

The cylinder plug P is formed at the forward end thereof with a radially extended flange 120 therearound for engagement against the forward end edge of the actuator sleeve 110, when the plug P is mounted in assembled position in the sleeve. The key slot K open through the forward flanged end of plug P in the usual manner familiar in this art. Along one side disposed longitudinally thereof from the end flange 120 to the inner end of the plug P there is formed a rib portion 121 having a width to be slidably received in the longitudinal slot 111 of the actuator sleeve 110. The outer face or surface 121a of the rib portion 121 is formed on a radius transversely thereof, such that surface 121a with the plug mounted in the actuator sleeve 110, lies in the plane and forms a continuation of the cylindrical outer surface of the sleeve. A series of spaced bores 122 are formed in and along the rib portion 121, which bores open at their outer ends through the outer surface of such rib portion and at their inner ends open into and along the key slot K. These bores 122 are so located and spaced as to be axially aligned with the bores 103 which open through body 100 from the driver case 101. Bores 122 are adapted to reciprocally mount therein the tumbler pins 123 in the generally conventional manner for this type of tumbler pin lock.

The opposite longitudinal sides 121b of rib 121 are adapted to engage the adjacent longitudinal side edges of the slot 111 in the actuator sleeve 110, to thereby form the operative connection between the plug and the sleeve for rotation of the latter by key rotation of the plug. The cylinder plug P has a length greater than the length of

the cylinder body 100 and in mounted, assembled position of the actuator sleeve 110 with the plug P therein, the plug extends a distance inwardly through the sleeve beyond the inner end of the cylinder body but terminating a distance spaced inwardly from the inner end of the sleeve. A fixed pin or lug 125 is formed from, or as a separate member secured in and extends radially outwardly from the rib portion 121 of plug P in position to slidably engage against the inner end edge of the cylinder body 100 in the assembled position of the actuator sleeve 110 and plug P in the cylinder body. The outer end of insert sleeve is formed of enlarged internal diameter to provide an annular space 125a for receiving pin 125. In this manner the plug P is secured against outward displacement in or removal from the actuator sleeve, while being freely rotatable as a unit with that sleeve in the cylinder body 100.

In the example hereof, the spring catch means comprised by the spring arm 80, is mounted on and is rotatable as a unit with the cylinder plug P. This is effected by providing a bore 85 through cylinder plug P between the inner end thereof and the inner end of the cylinder body 100, with the opposite sides of the plug being provided with longitudinally disposed grooves 86 extending across the opposite ends, respectively, of bore 85. Grooves 86 extend to and open through the inner end of the plug. Each of the spring arms 80 has the end thereof opposite the spring finger 81 bent laterally to provide a mounting leg 87. The spring arms 80 are mounted on and secured to the plug P by seating the arms in the grooves 86 with the mounting legs 87 thereof being extended into the bore 85 and with the spring fingers 81 of the arms in positions projected rearwardly or inwardly from the plug. When the plug P is in mounted, assembled position in the actuator sleeve 110, the spring arms 80 are secured and maintained in proper assembled position against displacement so as to be rotatable with the plug as a unit for functioning in the manner hereinbefore described.

With the door lock unit or set of the preferred embodiment of Figs. 1 to 3, in installed and mounted position on a door D, when button member 40 in the inner knob unit I is in projected position, the push rod 50 is in retracted position with the clutch sleeve 70 engaged with the insert sleeve 60 of the outer knob unit O and with the arrow-head 83 of push rod 50 in inactive position disengaged from the spring catch arms 80. Under such conditions the latch bolt retracting spindle 10 is rotatable by either the inner knob unit I or the outer knob unit O for latch bolt retraction, so that the door D may be opened from either side by solely knob operation.

When it is desired to latch or dog the outer knob unit O against rotation, so that the door cannot be opened from the outside except by the use of a key to unlock the cylinder lock in the outer knob unit, the button member 40 is depressed in the inner knob unit I. This depression projects push rod 50 outwardly to move clutch sleeve 70 to position disconnecting or declutching outer knob unit O from spindle 10, and at the same time effects displacement of the locking balls 76 into locking engagement in the lock plate 20 to thereby lock outer knob unit O against rotation. The projection of push rod 50 to such position engages the arrow-head 83 thereof in locking relation with spring arms 80, so that the push rod and button member 40 are releasably locked in such position with the outer knob unit O locked against rotation. With the outer knob unit O locked, then door opening, latch bolt retraction of the spindle 10 from the outside may only be effected by key operation of the cylinder lock in the outer knob unit. Insertion of the proper key in the key slot K of the lock cylinder plug P will set the tumbler pins 123 and driver pins 134 in the usual manner for rotation of plug P in the lock. Rotation of cylinder plug P rotates actuator sleeve 110 so that the teeth 112 thereof engage the teeth 115 on spindle head 114 with resulting rotation of the spindle and retraction of the latch bolt.

In this preferred exampled embodiment, when the button member 40 is depressed with the outer knob unit latched or dogged against rotation, the door D may be opened by latch bolt retracting rotation of the inner knob unit I. Rotation of the inner knob unit will rotate push rod 50 with spindle 10 and turn the arrow-head 83 into position released from spring arms 80, whereupon the push rod and button member 40 will snap back to normal position. Similarly, upon key operation of the cylinder plug P, the arrow-head 83 of push rod 50 will be released from the spring arms 80 by rotation of those arms with the actuator sleeve 110 and plug P, to push rod releasing position.

In the event that it is desired to lock the mechanism against automatic release and projection of push button member 40 and push rod 50 from depressed position upon rotation of spindle 10 by either the inner knob unit or key operation of the cylinder plug P, it is only necessary after depressing button member 40 to rotate that member to engage lug 46 over the shoulder 45a of the bayonet-forming slot 45 of button mounting sleeve 41. When it is desired to restore the mechanism to automatic releasing functioning, the button member 40 may be turned to the normal position with the lug 46 lined up with the longitudinal slot 43b of sleeve 41.

In Fig. 4 of the drawings I have shown a modified form of the example embodiment of Figs. 1 to 3, in which the provision for releasably locking the push button member 40 and push rod 50 against automatic release from spring catch arms 80, is eliminated. In this example, this has been effected by eliminating from the button member mounting sleeve 41, the bayonet slot 45 for engagement by lug 46 of tube 53 of the inner knob unit I. If desired, the longitudinal slot 43b together with the lug 46 may be retained for maintaining button member 40 and sleeve 41 against rotation as the button and sleeve are reciprocated between projected and depressed positions. In this form of the invention, therefor, the push rod 50 and button member 40 are always automatically released under all conditions from locking engagement by the catch arms 80 in depressed position of the button member, whenever either the inner knob unit I is rotated to rotate the spindle 10 or the catch arms 80 are rotated by key operated rotation of the cylinder plug P of the cylinder lock mounted in the outer knob unit O.

In another modified form of the invention, as shown in Fig. 5, I have provided a form of push rod 50' which eliminates the arrow head 83 of the push rod 50. The push rod 50' has the inner end length 83' thereof formed of substantially constant external diameter therealong. In this modified form the springs 80 of the form of Figs. 1 through 3 may, if desired, be eliminated, as shown by Fig. 5. By utilizing such push rod 50',

the automatic, releasable locking of the push rod in its projected, actuating button-depressed position, is eliminated. However, the arrangement of bayonet slot 45 in the button mounting sleeve 41 with the lug 46 in tube 53 of the inner knob unit I, or some equivalent arrangement, is included for releasably locking the button in depressed, push rod projected position, by manual turning of the button. In operation, when it is desired to lock or dog the outer knob unit O in its locked position, declutched from spindle 10, the button member 40 is depressed and then rotated a quarter turn to locked position. After depression of button 40, the outer knob unit O will remain locked under all conditions of operation of the spindle 10 by either inner knob or lock rotation, until the button member 40 is manually turned back to unlocked position for projection by the combined action of springs 45' and 55. Projection of button member 40 retracts push rod 50' and thereby unlocks outer knob unit O and again clutches that unit to spindle 10 for latch bolt retraction by rotation of the outer knob unit. This modified form of Fig. 5 provides for functioning of the door lock unit in a manner which is referred to generally in the art as a "vestibule action."

Except for the changes hereinabove described, the modified forms of Figs. 4 and 5 are in all other respects identical with the example embodiment of Figs. 1 to 3.

*Removable cylinder plug*

An important feature of the invention resides in the design construction and arrangement of the cylinder lock unit and its cylinder plug P and actuator sleeve 110, and in the combination of such unit and its components with certain of the components of the door lock unit or set, to permit of the efficient removal and replacements of the cylinder plug P.

In mounted and assembled position in the door lock units of the example embodiments, the cylinder plug P is constrained or restricted to a maximum range of rotation of approximately 140°, that is, to a maximum range substantially less than 180°, so that the cylinder plug cannot be rotated through a complete half turn of 180° to thereby align pin 125 with the inner end of the longitudinal slot 106 formed by the rib portion 105 of the cylinder body 100. This limitation of the angular range through which cylinder plug P may be rotated, is due to the engagement of teeth 112 of actuator sleeve 110 with the teeth 115 of head 114 on spindle 10, and to the connection of the spindle into the latch bolt unit L with the limited reciprocation provided thereby for the latch bolt B.

The cylinder plug P is, however, readily and efficiently removable from the cylinder body 100 and the outer knob unit O, without the use of special keys or implements, special or otherwise, and in such a manner that neither the tumbler pins 123 in the plug, nor the driver pins 104 in the driver case 101, will be displaced inadvertently from their receiving bores.

In order to remove the cylinder plug P from the cylinder body 100 and the outer door knob unit O, the inside knob I is first removed by unscrewing it completely from spindle 10. The plate securing screws 12 are then unthreaded from lugs 23 on arms 21 of locking plate 20 to detach back plate 11 and lock plate 20. The outside knob unit O is then drawn outwardly from the door D to remove therewith as a unit the spindle 10, lock plate 20 and the associated mechanism. The outside knob unit O with its attached mechanism is then held in an upside down position with the marker A which is provided on shank 61, as shown in Fig. 1, in visible position at the upper side of the shank. The locking plate 20 is then lined-up so that the ball receiving recesses 78 thereof will be in positions in a plane midway between the vertical and the horizontal, to permit the locking balls 76 to enter the recesses.

With the outer knob unit O held in the foregoing position, the push rod 50 is then depressed by pressing upon the outer, free end thereof, and while the push rod is thus depressed, the spindle 10 is twisted or rotated in either direction to thereby release the clutch sleeve 70 with resulting release of this sleeve for rotation. A key for the cylinder lock unit may then be inserted in normal position in the key slot K of plug P to set the tumbler pins 123 and driver pins 104 to unlock and release the cylinder plug for rotation in the cylinder body 100.

The key is then turned to rotate cylinder plug P and its actuator sleeve 110 through 180°, until plug pin 125 is lined-up with the slot 106 in cylinder body 100 at the inner end of that slot. During such rotation it is of importance to note that the actuator sleeve 110 is rotated to position the closed side wall thereof over and across the driver pin bores 103 which open into passage 102 of the cylinder body, so that the actuator sleeve 110 then functions as a guard or retainer to prevent displacement of these spring loaded pins. During the rotation of the cylinder plug P, the tumbler pins 123 of the rib portion 121 of the plug which is received in slot 111 of actuator sleeve 110, are closed against tumbler pin displacement by the side wall of body 100. In order to prevent displacement of the tumbler pins 123 from their bores into the groove 106 of cylinder body 100 when the cylinder plug P is rotated through its half turn with rib portion 121 lined-up with and along slot 106, I have provided a removable wedge strip W within slot 106 to completely occupy that slot from end to end thereof with the inner surface defining bore 102 at opposite sides of the groove 106. Thus, when the cylinder plug P has been rotated through the half-turn from normal position to position with pin 125 lined up with groove 106, the tumbler pins 123 are retained against displacement by the wedge strip W. From this position, the cylinder plug P may then be drawn outwardly with pin 125 sliding through groove 106, the wedge strip W being of course located on the upper side of the plug and being withdrawn therewith and being held by the fingers in position over the tumbler pin bores until the plug is completely removed.

In the present example, in order to insure against the inadvertent withdrawal of the sleeve 110 from the cylinder body when the cylinder plug P is withdrawn, I have provided the sleeve with a small projection 110*a* for arresting engagement with the rear or inner edge portion of the cylinder body which surrounds the bore therethrough. This projection 110*a* is shown in Figs. 2 and 17, and is located on the sleeve intermediate the inner end of the sleeve and the inner end of the cylinder body when the sleeve is in assembled, cylinder plug receiving position in the cylinder body. In such assembled position the projection 110*a* is located at the under side of the sleeve spaced a distance inwardly from the

inner or rear end of the cylinder body. When the cylinder plug P and sleeve 110 are rotated to position with the pin 125 in line with groove 106, the sleeve projection is rotated to position to engage the inner edge portion of the cylinder body in the event that the sleeve should be withdrawn with the plug, so as to insure against complete withdrawal of the sleeve from the cylinder body. In the initial assembly of the lock unit the sleeve 110 may be inserted into position from the outer end of the cylinder body through the bore 102 by aligning the projection 110a with the body groove 106, then after the projection is clear of the groove at the inner end of the body, rotating the sleeve to its proper assembled position with the slot 111 uppermost and the projection then in position to engage the cylinder body and prevent inadvertent withdrawal of the sleeve.

After cylinder plug P has been reloaded with the desired combination of tumbler pins, the reloaded plug may be readily replaced in the cylinder body 100 by placing a wedge strip W over the tumbler pin bores and inserting the plug and wedge into the cylinder body with the wedge and pin 125 sliding through and along groove 106 of the cylinder body. After the plug P is in fully inserted position it may be then rotated through 180° to its normal position of assembly with pin 125 engaged against the inner edge portion of the cylinder body 100. The key may then be removed and spindle 10 turned in the proper direction to engage the clutch sleeve 70 with the spindle. The spindle 10 may then be inserted through door opening 2 and through the latch bolt unit L in the usual manner of assembly. The fastening screws 12 may then be inserted to position and screwed up to clamp plates 11 and 20 in position against the door, after which the inner knob unit I is screwed onto the inner end of the spindle to complete the reassembly and remounting of the lock unit on the door.

No claim is made herein to the cylinder lock unit per se as such unit and the arrangement and construction thereof are claimed in my pending application Serial No. 259,565, filed December 3, 1951, as a division of this present application.

The design and construction of the cylinder lock unit comprised by body 100, actuator sleeve 110, cylinder plug P, and wedge strip W, is shown in an adaptation thereof for the combination with the particular door lock units or sets of the example embodiments. However, it is to be understood that the various features of the removable plug of the invention are not restricted to the example adaptation, as such features are capable of other adaptations to cylinder locks generally, and the invention contemplates and includes such adaptations.

It will also be evident to those skilled in the art, that various changes, modifications, substitutions, eliminations and additions may be resorted to without departing from the broad spirit and scope of my invention, and, hence, it is not my intention to limit the invention in all respects to the exact and specific disclosures of the example embodiments herein illustrated and described, except as may be required by clearly intended specific limitations thereto included in any of the appended claims.

What I claim is:

1. In a door lock, in combination; a latch bolt retracting spindle; an inner knob mounted on said spindle; an outer knob mounted on said spindle for rotation independently thereof; a clutch sleeve mounted on said spindle for movement in either direction axially thereof; a clutch member on said outer knob for clutching engagement by said clutch sleeve in one position thereof and for disengagement therefrom in another position thereof; a push button member reciprocally mounted in said inner knob; said spindle being provided with an axial bore therethrough; a push rod reciprocally mounted in said spindle bore and being attached at its outer end to said push button member; and said push rod being operatively connected to said clutch sleeve for moving said sleeve under the control of said push button member to and from clutching engagement with said outer knob clutch member.

2. In a door lock unit, in combination; a latch bolt retracting spindle; an inner knob mounted on said spindle; an outer knob mounted on said spindle for rotation independently thereof; a clutch operable to positions to connect said outer knob with or disconnect said knob from said spindle; a manually operable member mounted in said inner knob and being operatively connected with said clutch for selectively operating the clutch to outer knob connecting or disconnecting positions; biasing means continuously biasing said manually operable member to position with said clutch in position connecting said outer knob with said spindle member; means adapted to hold said clutch in outer knob disconnecting position; and said last named means being operable automatically by rotation of said spindle member to release said clutch for biasing to its position connecting said outer knob with said spindle member.

3. In a door lock, in combination; a latch bolt retracting spindle; an inner knob mounted thereon; an outer knob mounted on said spindle for rotation independently thereof; a clutch sleeve slidably mounted on said spindle within said outer knob; a clutch member on said outer knob adapted to be engaged and disengaged by said clutch sleeve to connect and disconnect said outer knob from said spindle; manually operable means on said inner knob operatively connected with said clutch sleeve; biasing means connected with said manually operable means and being adapted to continuously bias said member to position with said clutch sleeve engaged with said outer knob clutch member; catch means adapted to be automatically engaged by and to releasably hold said manually operable means in position with said clutch sleeve in position disengaged from said outer knob clutch member; and said catch means being adapted to automatically release said manually operable means upon rotation in either direction of said latch bolt retracting spindle.

4. In a door lock unit, in combination; a latch bolt retracting spindle; an inner knob mounted on said spindle; a fixed lock plate; an outer knob journaled in said lock plate, said spindle being extended axially through said lock plate into said outer knob; a sleeve member mounted on said spindle within said outer knob for reciprocation on said spindle; locking members operable by reciprocation of said sleeve member between positions locking said outer knob to said lock plate against and releasing said knob for rotation; a push button reciprocally mounted in said inner knob; a push rod connecting said push button with said sleeve member; means adapted to continuously bias said push button to position with said sleeve member releasing said locking members from latching engagement with said lock plate; and means for releasably holding said push

rod and sleeve member in position with said locking members in locking position to maintain said outer knob against rotation.

5. In a door lock unit, in combination; a latch bolt retracting, rotary spindle; an inner knob mounted on said spindle for rotation therewith; a fixed lock plate; an outer knob rotatably mounted in said lock plate, said spindle being extended through said lock plate and into said outer knob axially thereof; a sleeve member mounted on said spindle within said outer knob for reciprocation on said spindle; locking members mounted in said outer knob for movements radially to and from locking positions engaged with said lock plate; said sleeve member being adapted to engage said locking members to move said members in one position of said sleeve into locking engagement with said plate and in another position of said sleeve to release said members from locking position; a push button reciprocally mounted in said inner knob; a push rod connecting said push button with said sleeve member; means adapted to continuously bias said push button to position with said sleeve member releasing said locking members from locking engagement with said lock plate; and means for releasably holding said push rod and sleeve member in position with said locking members in locking engagement with said lock plate.

6. In a door lock unit, in combination; a latch bolt retracting, rotary spindle; an inner knob mounted on said spindle; a fixed lock plate; an outer knob rotatably mounted in said lock plate, said spindle being extended through said plate and into said outer knob axially thereof; a clutch sleeve reciprocally mounted on said spindle within said outer knob; a clutch member mounted on said outer knob and being adapted to be engaged by said clutch sleeve in one position of said sleeve to connect said knob with said spindle and to be disengaged from said sleeve in another position of the sleeve; locking members mounted in said outer knob and being adapted to be moved radially to and from outer knob locking engagement with said lock plate by reciprocation of said clutch sleeve; said locking members being adapted to be moved to locking position by movement of said clutch sleeve from position engaged with said clutch member and to be released for displacement from locking position by movement of said clutch sleeve to position engaged with said clutch member; a push button reciprocally mounted in said inner knob; a push rod connecting said push button with said clutch sleeve; means adapted to continuously bias said push button to position with said clutch sleeve engaged with said clutch member; and means for releasably holding said push rod and clutch sleeve in position disengaged from said clutch member and with said locking members in locking engagement with said lock plate.

7. In a door lock unit, in combination; a latch bolt retracting, rotary spindle; an inner knob mounted on said spindle for rotation therewith; a fixed lock plate; an outer knob rotatably mounted in said lock plate, said spindle being extended through said lock plate into said outer knob axially thereof and being rotatable independently of said outer knob; a clutch sleeve reciprocally mounted on said spindle within said outer knob; a clutch member mounted in said outer knob adapted to be engaged by said clutch sleeve to connect said knob to said spindle in one position of the sleeve and adapted to be disengaged from said clutch sleeve to disconnect said knob from said spindle in another position of the sleeve; locking members mounted in said outer knob for movements to and from locking positions engaged with said lock plate to latch and unlatch said outer knob from said spindle; said locking members being engageable with said clutch sleeve and being adapted to be moved to locking positions by movement of said sleeve to position disengaged from said clutch member and to positions released from said lock plate by said clutch sleeve when in position engaged with said clutch member; and manually operable means mounted on said inner knob and being operatively coupled with said clutch sleeve for selectively operating said sleeve.

8. In a door lock unit, in combination; a latch bolt retracting, rotary spindle; an inner knob mounted on said spindle; a fixed lock plate having a hub portion, said hub portion and plate having an axial bore therethrough, and said hub portion being provided with spaced recesses therein opening into said bore; an outer knob having a hub-forming sleeve rotatably mounted in and extended through said lock plate hub portion; said spindle being extended through the bore of said lock plate and hub portion and axially into said hub-forming sleeve of the outer knob and being rotatable independently of said knob sleeve and said lock plate; a sleeve member reciprocally mounted on said spindle within said outer knob sleeve; said knob sleeve being provided with radially disposed bores therethrough; locking ball members mounted in said sleeve bores for movements therein; said sleeve member being formed to force said ball members outwardly through said knob sleeve bores to locking engagement in said lock plate hub recesses, respectively, when in one position on said spindle and being formed to release said ball members for movements inwardly through said sleeve bores to positions disengaged from said lock plate hub recesses when in another position on said spindle; and clutch means adapted to be actuated by reciprocation of said sleeve member to connect and disconnect said outer knob and spindle.

9. In the combination as defined in claim 8, manually operable means mounted on said inner knob and being operatively connected with said sleeve member for reciprocating said member on said spindle.

10. In the combination as defined in claim 8, said spindle being provided with an axial bore therethrough, a push rod reciprocally mounted in said bore and being connected at one end thereof to said sleeve member, the opposite end of said push rod being extended into said inner knob, and a push button reciprocally mounted in said inner knob and being connected with the adjacent end of said push rod.

11. In a door lock unit, in combination; a rotary spindle; an inner knob mounted on said spindle; a fixed lock plate having a bore therethrough and being provided with recesses therein at opposite sides of and opening into said bore; an outer knob having an insert sleeve rotatably mounted in said lock plate in position extended through the bore of said plate, said spindle being extended axially into said insert sleeve of the outer knob and being rotatable independently of said sleeve; a clutch sleeve reciprocally mounted on said spindle within said knob insert sleeve and being adapted to be moved inwardly into clutching engagement with said insert sleeve to connect said outer knob to said spindle and being movable outwardly on said spindle to position

disengaged from said insert sleeve to disconnect said knob from said spindle; said outer knob insert sleeve being formed with bores disposed radially therethrough opening at their inner ends into said sleeve opposite said clutch sleeve and at their outer ends opening into said lock plate bore; ball members mounted in said sleeve bores for movements freely axially therethrough; said clutch sleeve being formed with camming surfaces adapted to engage and cam said ball members outwardly to positions in locking engagement in said lock plate recesses when said clutch sleeve is moved inwardly to position disengaged from said outer knob insert sleeve; said clutch sleeeve being also formed for receiving said ball members in positions moved inwardly through said bores out of engagement with said lock plate recesses when said clutch sleeve is moved outwardly to position engaged with said insert sleeve; and manually operable means connected with said clutch sleeve for selectively moving said sleeve between positions engaged with and disengaged from said outer knob insert sleeve.

12. In a door lock unit, in combination; a latch bolt retracting, rotary spindle; an inner knob mounted on said spindle: an outer knob mounted for rotation; said spindle being extended axially into said outer knob and being adapted to be rotated independently thereof; a clutch operable to position engaging said outer knob with said spindle and to position disengaging said spindle from said outer knob; means operatively associated with said clutch and being adapted to be actuated thereby to lock said outer knob against rotation when said clutch is in position disengaging said knob from said spindle and to unlock and release said knob when said clutch is in position connecting said knob with the spindle; a manually operable push button mounted in said inner knob; a push rod extended from said push button to and being operatively connected with said clutch for selective operation of the latter by said push button; a cylinder lock unit mounted in said outer knob and including a key operable cylinder plug therein; and an actuating member adapted to operatively connect said cylinder plug with said spindle for rotation of the latter by key rotation of said cylinder plug when said outer knob is locked against rotation by said clutch operated locking means.

13. In a door lock unit in combination; a latch bolt retracting, rotary spindle; an inner knob mounted on said spindle; a fixed lock plate; an outer knob rotatably mounted in said lock plate; said spindle being extended axially into said outer knob; a clutch member mounted on said spindle within said outer knob for reciprocation on the spindle between a position engaged with said knob to connect the knob to the spindle and a position disconnected from said knob to free said spindle for rotation independently of the knob; locking means connected with said spindle mounted clutch member for actuation thereby to lock said outer knob to said lock plate when said clutch member is disconnected from the knob and to release said knob from said lock plate when said clutch member is engaged with the knob; a lock unit mounted in said outer knob and including a key rotatable cylinder plug therein; and actuating means connected with said cylinder plug and being adapted to engage said spindle for rotating the spindle upon key rotation of said cylinder plug.

14. In a door lock unit, in combination; a latch bolt retracting, rotary spindle; an inner knob mounted on said spindle; a fixed lock plate having a bore therethrough of greater diameter than said spindle, said spindle being extended axially through said lock plate; an outer knob including an insert sleeve disposed axially thereof and being rotatably mounted in and extended through said latch plate bore between and concentric with said spindle and said plate; a clutch sleeve reciprocally mounted on said spindle within said outer knob insert sleeve; said insert sleeve being provided with a clutch member adapted to be engaged by said sleeve in one position thereof to connect said knob to said spindle and to be disengaged by said clutch sleeve in another position thereof to disconnect said knob insert sleeve and said spindle; locking means operatively connected with said clutch sleeve for locking said insert sleeve to and unlocking the same from said lock plate, said locking means being adapted to be actuated by said clutch sleeve to lock said outer knob to said lock plate when said clutch sleeve is disconnected from said knob insert sleeve and to unlock said knob from said lock plate when said clutch sleeve is engaged with said insert sleeve clutch member; manually operable means mounted in said inner knob and being operatively connected with said clutch sleeve for selectively reciprocating said sleeve; a lock unit mounted in said outer knob and including a key operable cylinder plug rotatably mounted therein; and actuating means connected with said cylinder plug and being adapted to engage said spindle to rotate the latter upon key rotation of said plug.

15. In a door lock unit, in combination; a latch bolt retracting, rotary spindle; an inner knob mounted on said spindle; a fixed lock plate having a bore therethrough; an outer knob rotatably mounted in the bore of said lock plate; said spindle being extended into said outer knob axially thereof; a lock unit mounted in said outer knob and including a key operable cylinder plug rotatably mounted therein; actuating means connected with said cylinder plug and being adapted to engage and rotate said spindle upon key rotation of said cylinder plug; clutch means on said spindle within said outer knob adapted for selective operation to engage said knob and connect the knob to said spindle or to disengage said knob to disconnect the knob from the spindle; a push button reciprocally mounted in said inner knob; a push rod reciprocally mounted in and extending axially through said spindle; said push rod being connected at one end thereof to said clutch means for actuating said means by reciprocation of said rod and being connected at the opposite end to said push button for reciprocation by said button; a spring catch mounted within said outer knob between the inner end of said spindle and said lock unit and being adapted to be releasably engaged by the inner end of said push rod upon reciprocation of that rod inwardly by said push button; and said spring catch being adapted to be actuated to release said push rod upon rotation of said spindle; and biasing means adapted to continuously bias said push button and said push rod in a direction to withdraw said push rod from said spring catch.

16. In a door lock unit, in combination; a latch bolt retracting, rotary spindle; an inner knob mounted on said spindle; a fixed lock plate; an outer knob rotatably mounted in said lock plate; said spindle being extended axially into said outer knob and being adapted for rotation inde-

pendently thereof; a clutch member mounted on said spindle within said outer knob for movements between a position engaged with said knob to connect the knob to the spindle and a position disconnected with said knob to free said spindle for rotation independently of the knob; means for locking said outer knob against rotation when said clutch member is in position disengaged with said knob and for unlocking said outer knob when said clutch member is engaged with the knob; a cylinder lock unit mounted in said outer knob and including a key rotatable cylinder plug therein; tooth members on the inner end of said spindle within said outer knob; an actuator sleeve connected with said cylinder plug and being extended rearwardly therefrom into said outer knob; and said actuator sleeve being provided at its inner end with tooth members adapted upon key rotation of said cylinder plug to engage said spindle tooth members to thereby rotate said spindle.

17. In a door lock unit, in combination; a latch bolt retracting, rotary spindle; an inner knob mounted on said spindle; a fixed lock plate; an outer knob rotatably mounted in said lock plate; said spindle being extended axially into said outer knob; a clutch member movably mounted on said spindle within said outer knob and being adapted in one position thereof to engage said knob to connect the knob with said spindle and in another position thereof to disengage said knob to disconnect the knob from the spindle for rotation of the spindle independently of the knob; locking means connected with said spindle mounted clutch member for actuation thereby to lock said outer knob to said lock plate when said clutch member is in position disengaged from said knob and to unlock said knob from said lock plate when said clutch member is engaged with the knob; a manually operable member mounted in said inner knob; mechanism connecting said manually operable member with said spindle mounted clutch member for selective movement of the latter to either of its aforesaid positions; a cylinder lock unit mounted in said outer knob and including a key rotatable cylinder plug therein; spaced tooth members mounted on the inner end of said spindle within said outer knob; an actuator member connected with and rotatable by said cylinder plug and being extended inwardly therefrom into said outer knob; and spaced tooth members on said actuator member adapted upon rotation of said latter member by said cylinder plug to engage said spindle tooth members for rotation of said spindle.

18. In a door lock unit, in combination; a latch bolt retracting, rotary spindle; an inner knob mounted on said spindle; an outer knob rotatably mounted independently of said spindle and said spindle being extended axially thereinto for rotation independently of said knob; a clutch member movably mounted on said spindle within said outer knob and being adapted in one position thereof to engage and connect said outer knob with said spindle and in another position to be disengaged from said spindle to release said spindle for independent rotation; a push rod reciprocally mounted in and extending through said spindle with one end thereof being extended into said inner knob and the other end thereof being extended beyond the adjacent end of said spindle into said outer knob; said clutch member being connected with said push rod and being adapted to be moved thereby to and from positions engaged and disengaged with said outer knob; a push button reciprocally mounted in said inner knob and being connected with the adjacent end of said push rod for reciprocating said rod; a cylinder lock unit mounted in said outer knob and including a key rotatable cylinder plug therein; tooth members mounted on the end of said spindle within said outer knob; an actuator sleeve connected with said cylinder plug and being extended inwardly therefrom in axial alignment with said spindle; said actuator sleeve being provided at its inner end with tooth members adapted to engage said spindle tooth members when said actuator sleeve is rotated by key rotation of said cylinder plug.



19. In the combination as defined in claim 18; a spring catch mounted in said actuator sleeve and being adapted to releasably engage the inner end of said push rod when said rod is actuated to move said clutch member to position disengaged from said outer knob.

20. In the combination as defined in claim 18; biasing means adapted to continuously bias the push button and push rod into position with said clutch member engaged with said outer knob; and a spring catch mounted in said outer knob and being adapted to engage and releasably hold the adjacent end of said push rod when said rod is in position with said clutch sleeve disengaged from said outer knob.

21. In the combination as defined in claim 18; a spring catch mounted in and rotatable with said actuator sleeve and being adapted to releasably engage and hold said push rod when the latter is in position with said clutch member disengaged from said outer knob and when said cylinder plug is in normal locking position; and said spring catch and push rod end being constructed and arranged for automatic release of said push rod upon relative rotation between said push rod and spring catch.

22. In a door lock, in combination; a spindle having external threading and an axial bore therethrough; a knob unit threaded on to said spindle; a push rod reciprocally mounted in said spindle bore and being extended into said knob unit; a push button unit reciprocally mounted in said knob unit in axial alignment with said push rod; said push rod being provided with external threading thereon having the same lead as the external threading of said spindle; and said push button unit being threaded onto said push rod to connect said push rod to said button unit.

23. In a door lock unit, in combination; a rotary spindle provided with external threading thereon and having an axial bore therethrough; a hollow knob unit threaded onto said spindle; a push rod reciprocally mounted in said spindle bore and being extended into said knob unit, said push rod being formed with an enlarged diameter head within said knob unit having external threading thereon of the same lead as the lead of the external threading on said spindle; a push button unit threaded on said externally threaded head; and a biasing spring mounted on said push rod between said enlarged diameter head and the adjacent end of said spindle within said knob unit.

24. In a door lock unit, in combination, a rotary spindle provided with external threading and having an axial bore therethrough; a hollow knob unit having a hub insert provided with an internally threaded bore therethrough threaded onto said spindle; a push rod reciprocally mounted in said spindle bore and being extended into said knob unit, the end of said push rod within said knob unit being provided with an en-

larged diameter head having external threading of the same lead as the lead of the external threading of said spindle; the external diameter of the threading of said head being less than the internal diameter of the threading in said knob insert bore; said knob unit having a bore therethrough in the outer side thereof in axial alignment with said push rod; a tube member mounted on said hub insert and being extended therefrom in position surrounding said spindle; a push button unit reciprocally mounted in said tube member and being extended through said knob unit bore; and said push button unit being threaded onto said externally threaded head of said push rod.

25. In combination, in a door latch unit; a rotary spindle; a fixed lock plate having a bore therethrough; a knob having an insert sleeve rotatably mounted in said lock plate bore; said spindle being extended axially into said insert sleeve of said knob for rotation independently thereof; a camming sleeve member mounted on the exterior of said spindle for rotation therewith and being also mounted for reciprocation on said spindle within said knob insert sleeve independently of the spindle; said insert sleeve being formed with bores disposed radially through opposite sides thereof at opposite sides of said camming sleeve member; ball members mounted in said insert sleeve bores; said lock plate being formed with recesses therein opening into said lock plate bore at opposite sides of said knob insert sleeve for alignment with said insert sleeve bores; said camming sleeve member in one position thereof on said spindle being adapted to cam said ball members outwardly into locking engagement in said insert sleeve bores and said lock plate recesses to lock said knob against rotation and in another position thereof being adapted to release said balls for inward movement to positions disengaged from said lock plate recesses to release said knob for rotation; and said camming member in the position thereof releasing said ball members to release said knob for rotation being adapted to engage and connect said insert sleeve with said spindle for rotation of said spindle by said knob.

26. In the combination as defined in claim 25, manually operable means for reciprocating said camming sleeve member selectively to either a position camming or a position releasing said ball members.

27. In the combination as defined in claim 25, manually operable means for selectively reciprocating said camming sleeve member; biasing means adapted to continuously bias said camming sleeve member to position releasing said ball members from locking engagement with said lock plate; and means for releasably holding said camming sleeve member in the position thereof camming said ball members into locking engagement with said lock plate.

28. In combination, in a door latch unit; a rotary spindle; a fixed lock plate having a bore therethrough; a knob having an insert sleeve journalled in said lock plate bore; said spindle being extended axially into said insert sleeve of said knob for rotation independently thereof; a camming sleeve member reciprocally mounted on said spindle for reciprocation thereon within said knob insert sleeve; said insert sleeve being formed with bores disposed radially through opposite sides thereof at the opposite sides of said camming sleeve member; ball members mounted in said insert sleeve bores; said lock plate being formed with recesses therein opening into said lock plate bore at opposite sides of said knob insert sleeve for alignment with said insert sleeve bores; said camming sleeve member in one position thereof on said spindle being adapted to cam said balls outwardly into locking engagement in said insert sleeve bores and said lock plate recesses and in another position thereof being adapted to release said ball members for inward movements to positions disengaged from said lock plate recesses to release said knob for rotation; and said camming sleeve member being also formed to engage said knob insert sleeve to connect said sleeve to said spindle when said camming sleeve member is in position releasing said ball members from locking engagement in said lock plate recesses.



29. In a door lock unit, in combination; a latch bolt retracting, rotary spindle; an inner knob mounted on said spindle for rotating the spindle; an outer knob rotatably mounted independently of but receiving therein the said spindle; a clutch sleeve reciprocally mounted on said spindle; a fixed locking member; movable locking means connected with said clutch sleeve and being operable to position engaged with said fixed locking member to lock said outer knob against rotation in one position of said clutch sleeve and being operable to position disengaged from said fixed locking member to release said outer knob for rotation in another position of said clutch sleeve; said clutch sleeve and said outer knob each being formed with fixed members thereon adapted to be interengaged to lock said outer knob with said spindle when said clutch sleeve is in position with the outer knob released by said movable locking means and to be disengaged when said clutch sleeve is in position with the outer knob locked by said movable locking means; and manually operable means connected with said clutch sleeve for selectively reciprocating said sleeve between position engaged with and position disengaged from said outer knob.

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