June 7, 1955 F. J. RUSSELL 2,709,911

DOOR LOCK

Filed Dec. 8, 1952 10 Sheets-Sheet 1

Fig. 1.

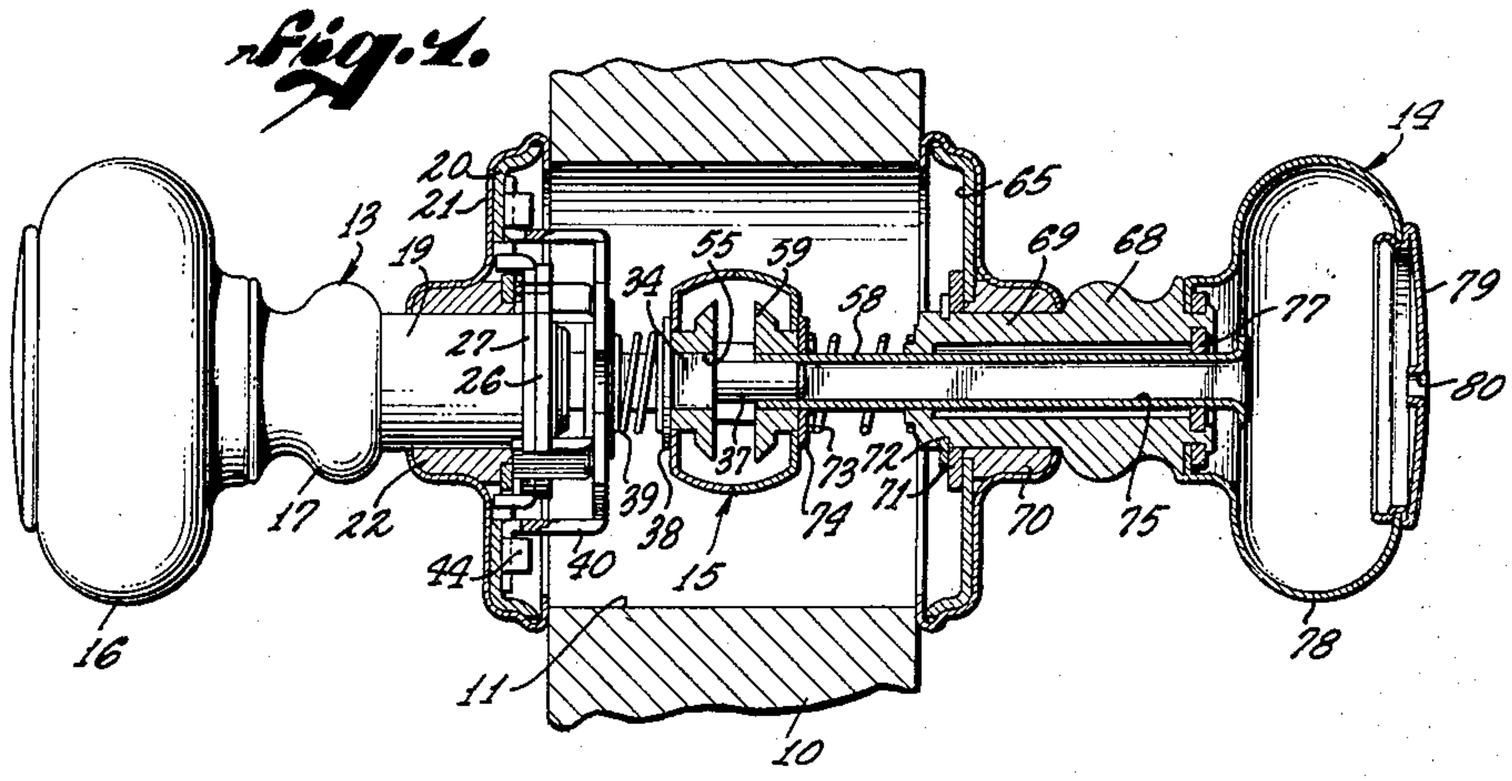
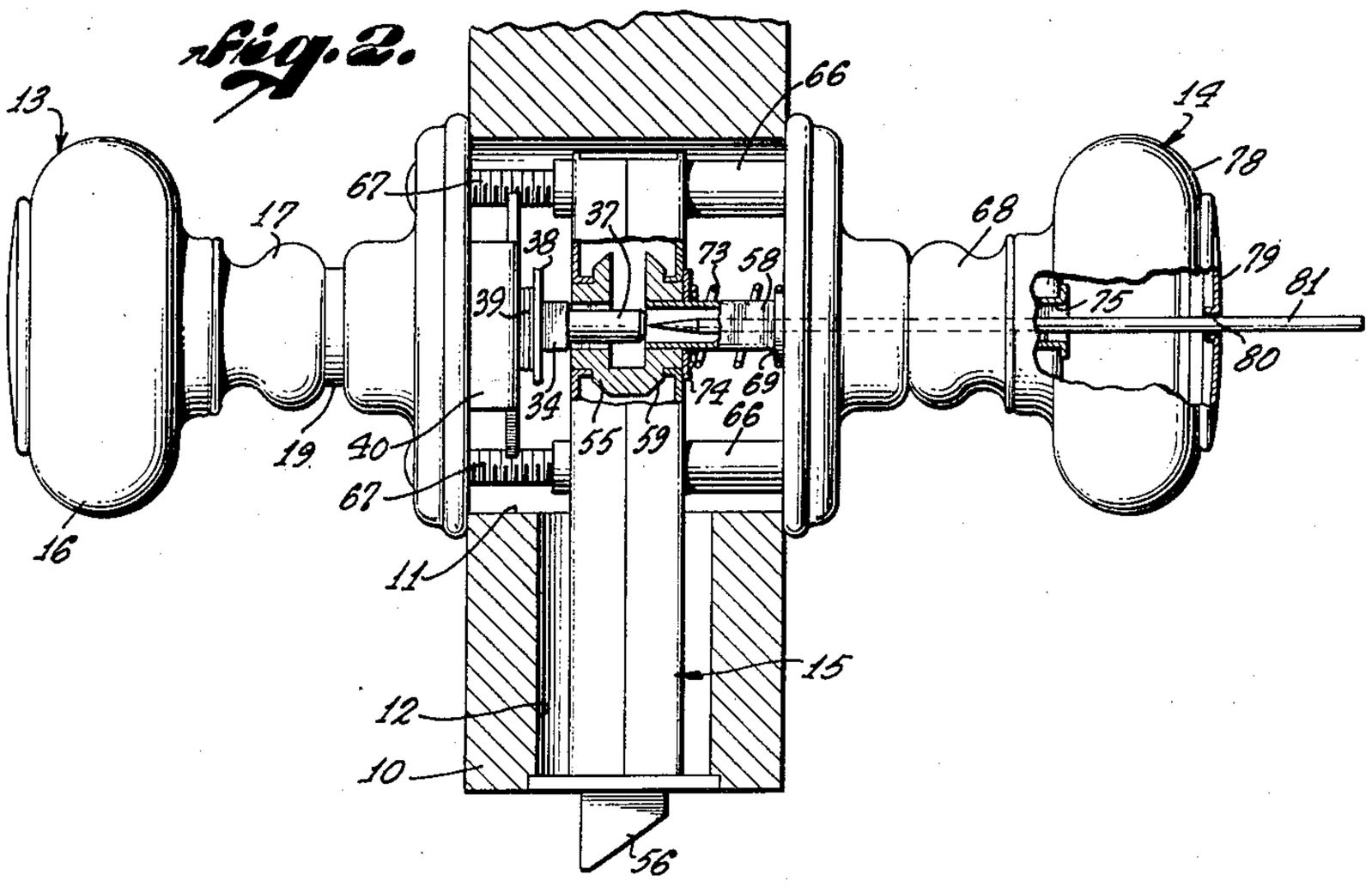


Fig. 2.



FRED J. RUSSELL
INVENTOR

HUEBNER, BEEHLER,
WORREL & HERZIG,
ATTORNEYS.

BY

June 7, 1955 F. J. RUSSELL 2,709,911

DOOR LOCK

Filed Dec. 8, 1952 10 Sheets-Sheet 2

Fig. 3.

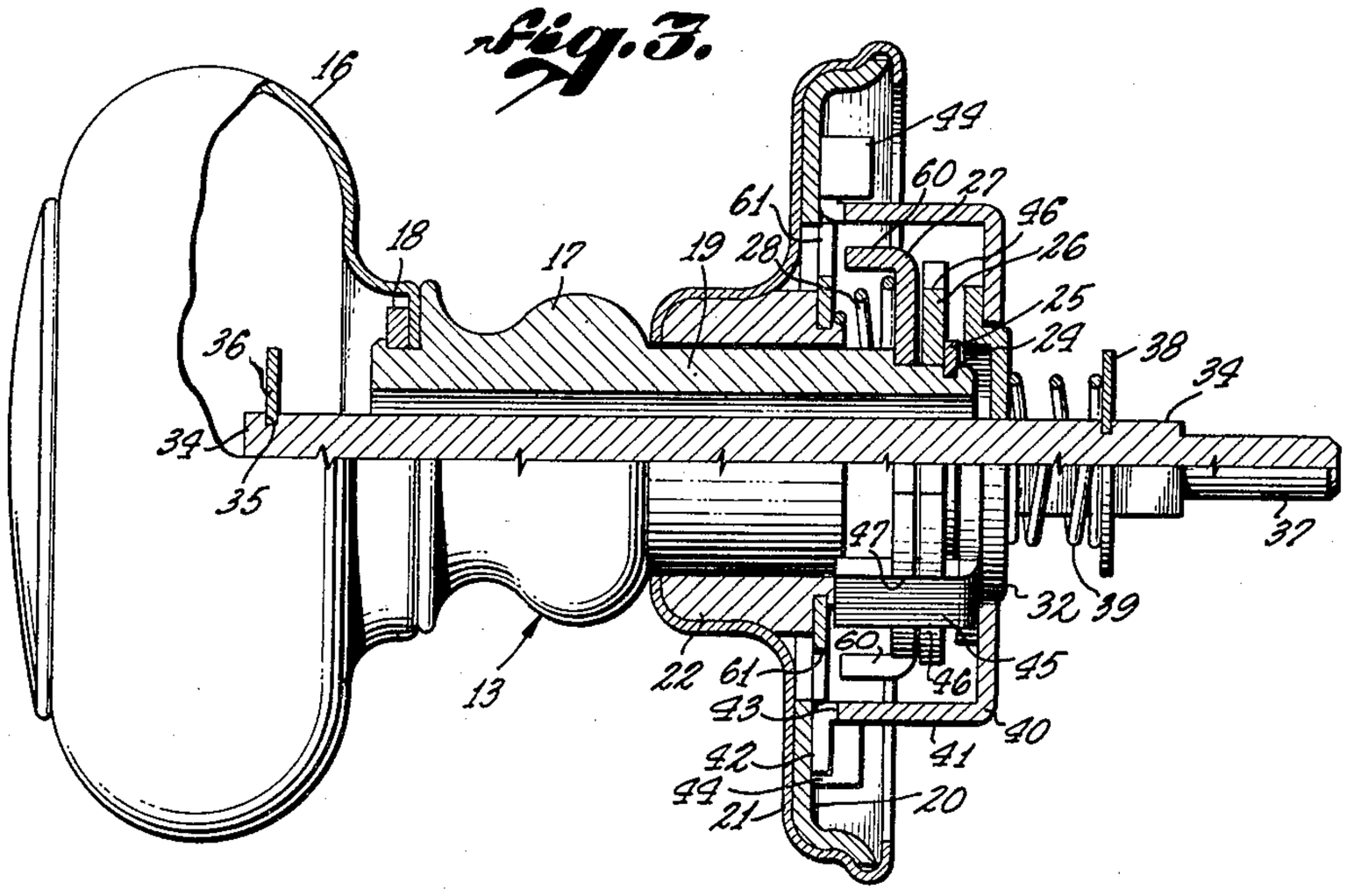
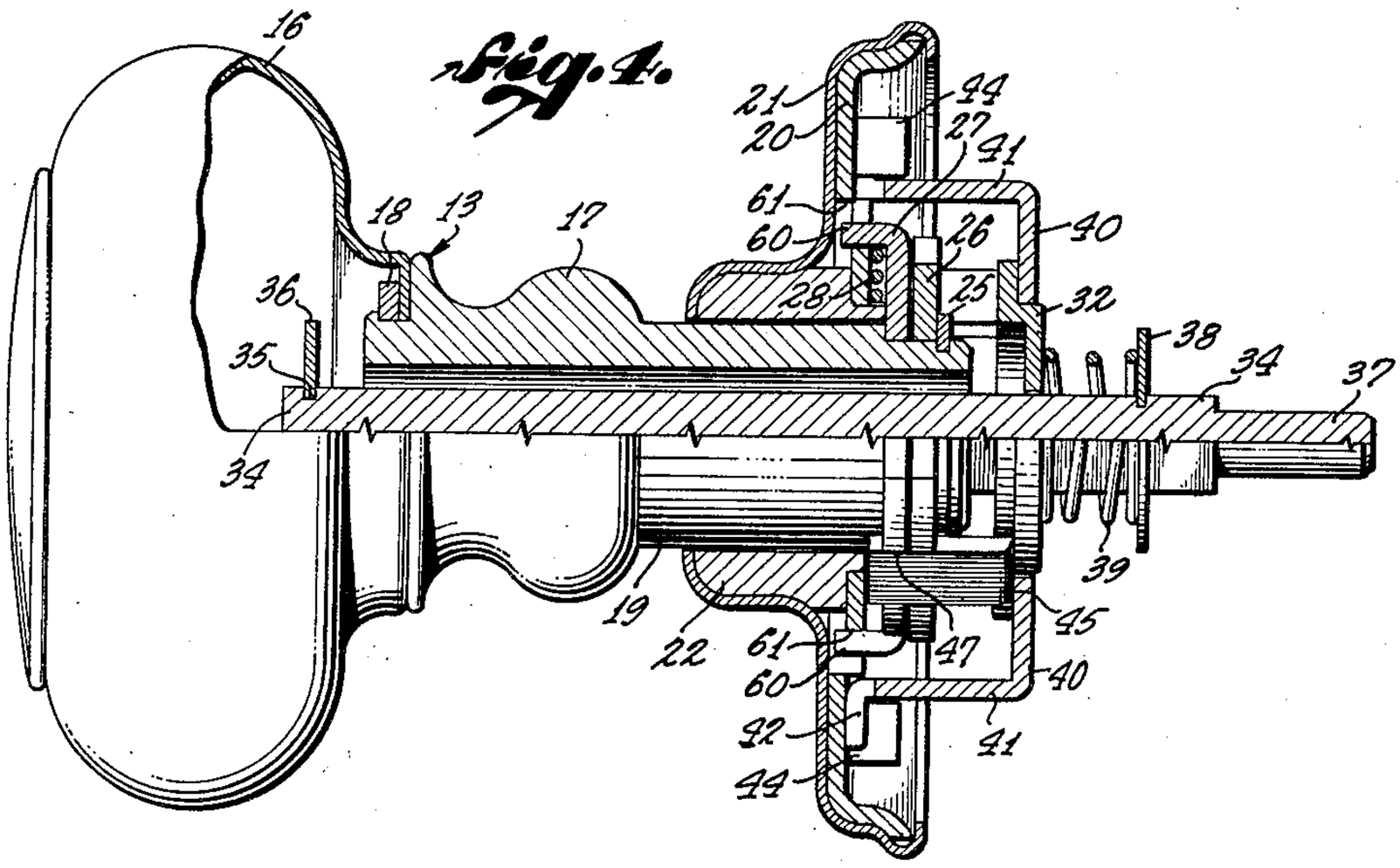


Fig. 4.



FRED J. RUSSELL
INVENTOR

HUEBNER, BEEHLER,
WORREL & HERZIG,
ATTORNEYS.

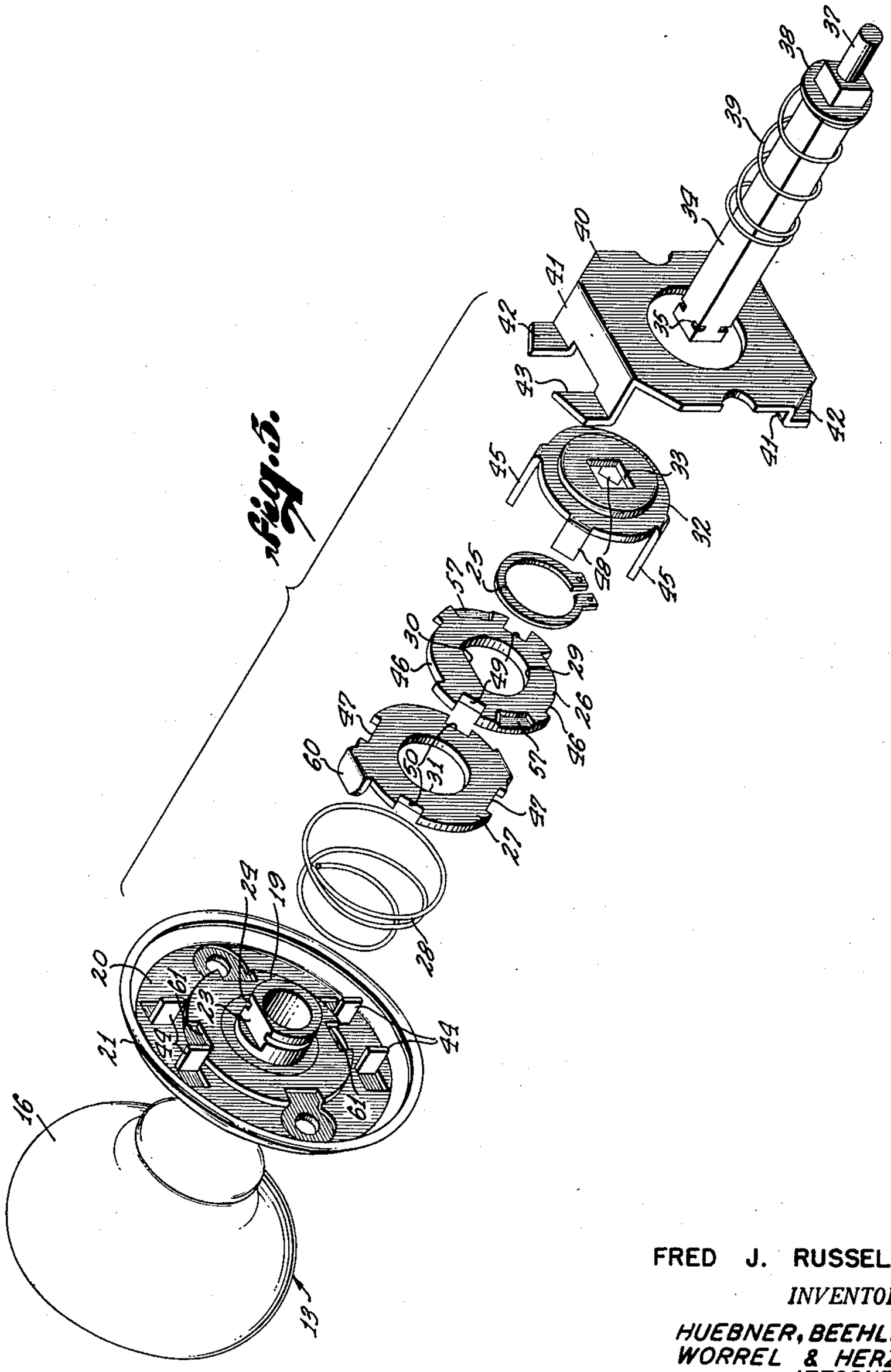
BY

June 7, 1955 F. J. RUSSELL 2,709,911

DOOR LOCK

Filed Dec. 8, 1952 10 Sheets-Sheet 3

Fig. 3.



FRED J. RUSSELL
INVENTOR
HUEBNER, BEEHLER, WORREL & HERZIG,
ATTORNEYS.
BY Vernon K. Beehler

June 7, 1955 F. J. RUSSELL 2,709,911

DOOR LOCK

Filed Dec. 8, 1952 10 Sheets-Sheet 4

Fig. 6.

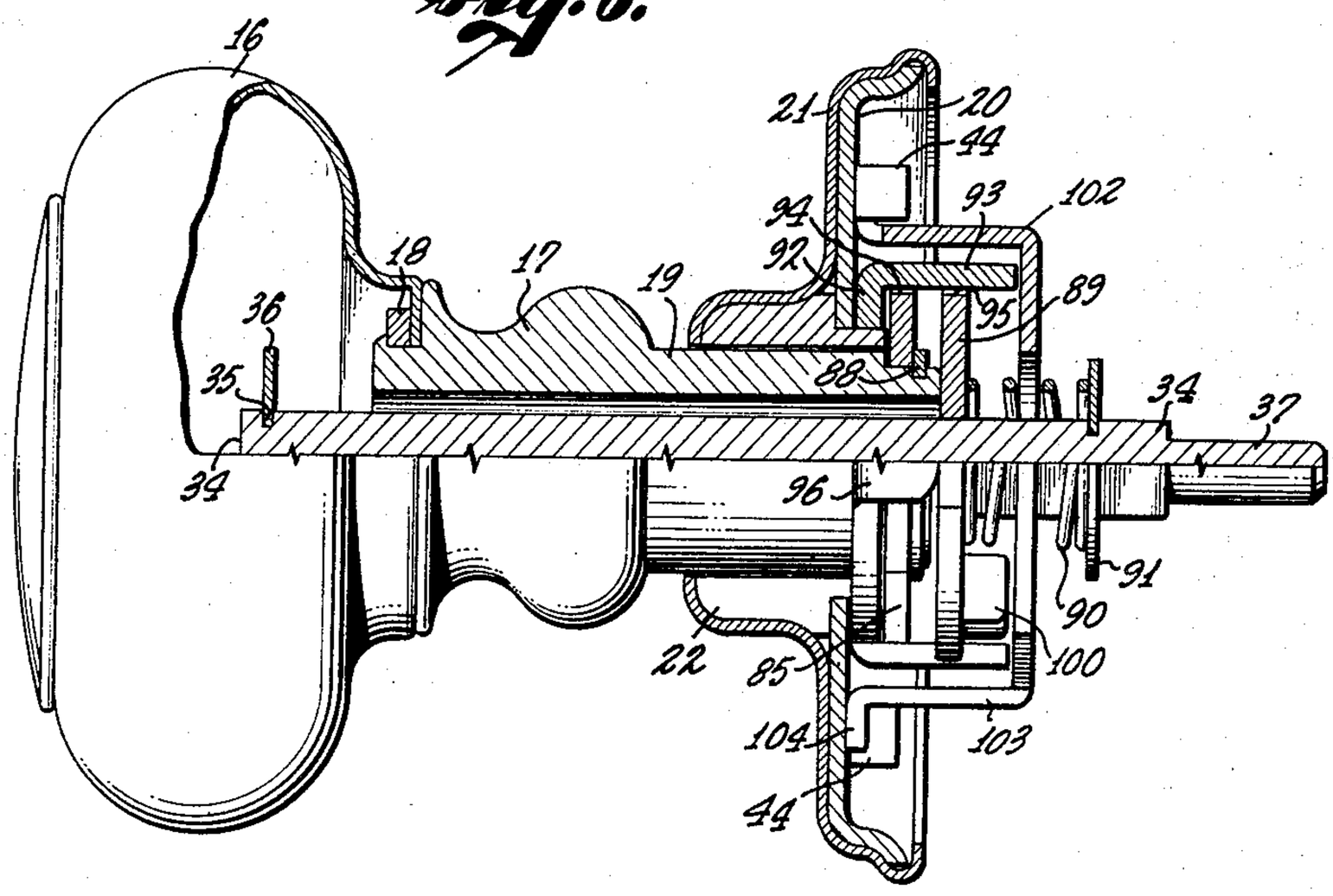
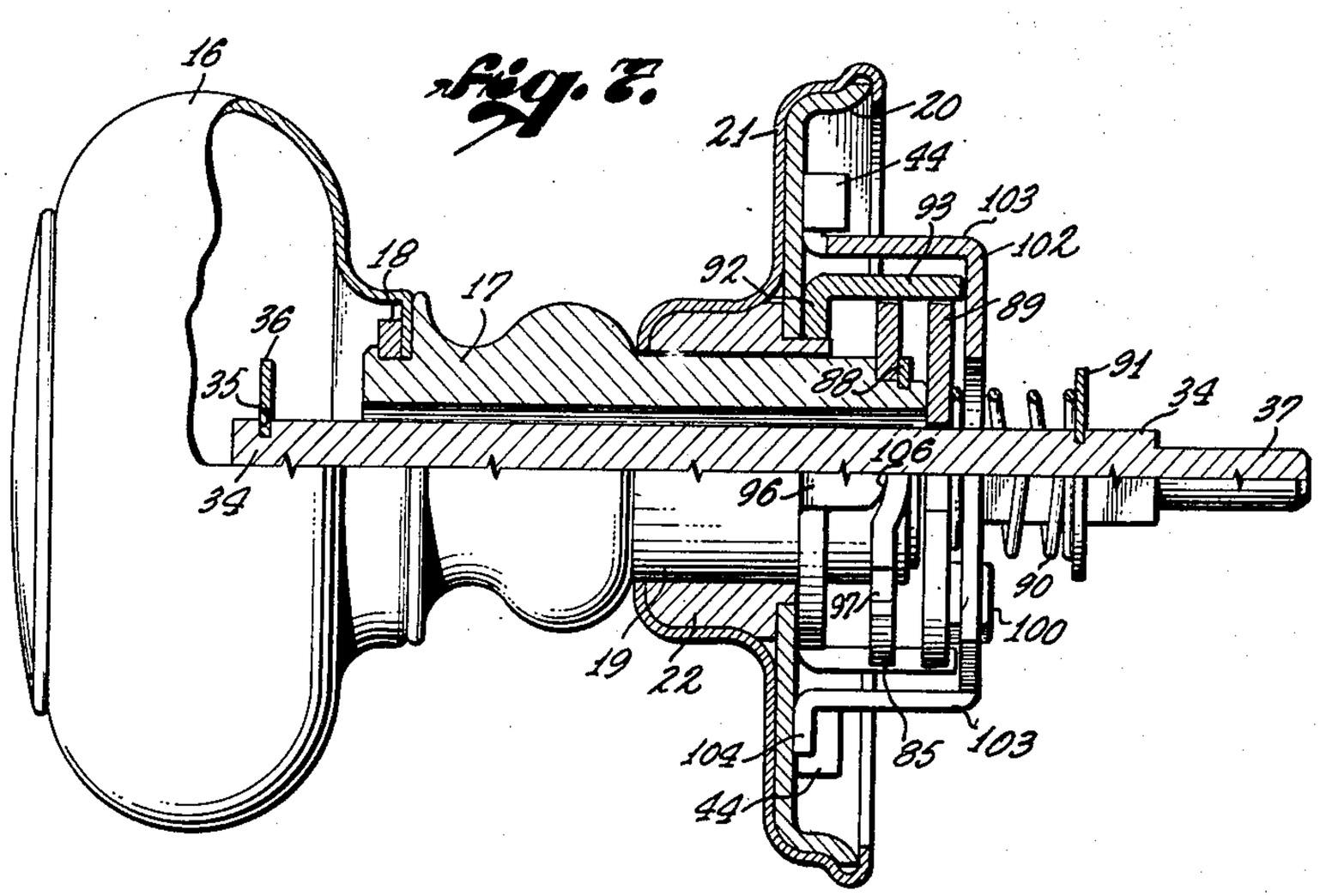


Fig. 7.



FRED J. RUSSELL

INVENTOR

HUEBNER, BEEHLER, WORREL & HERZIG,

ATTORNEYS.

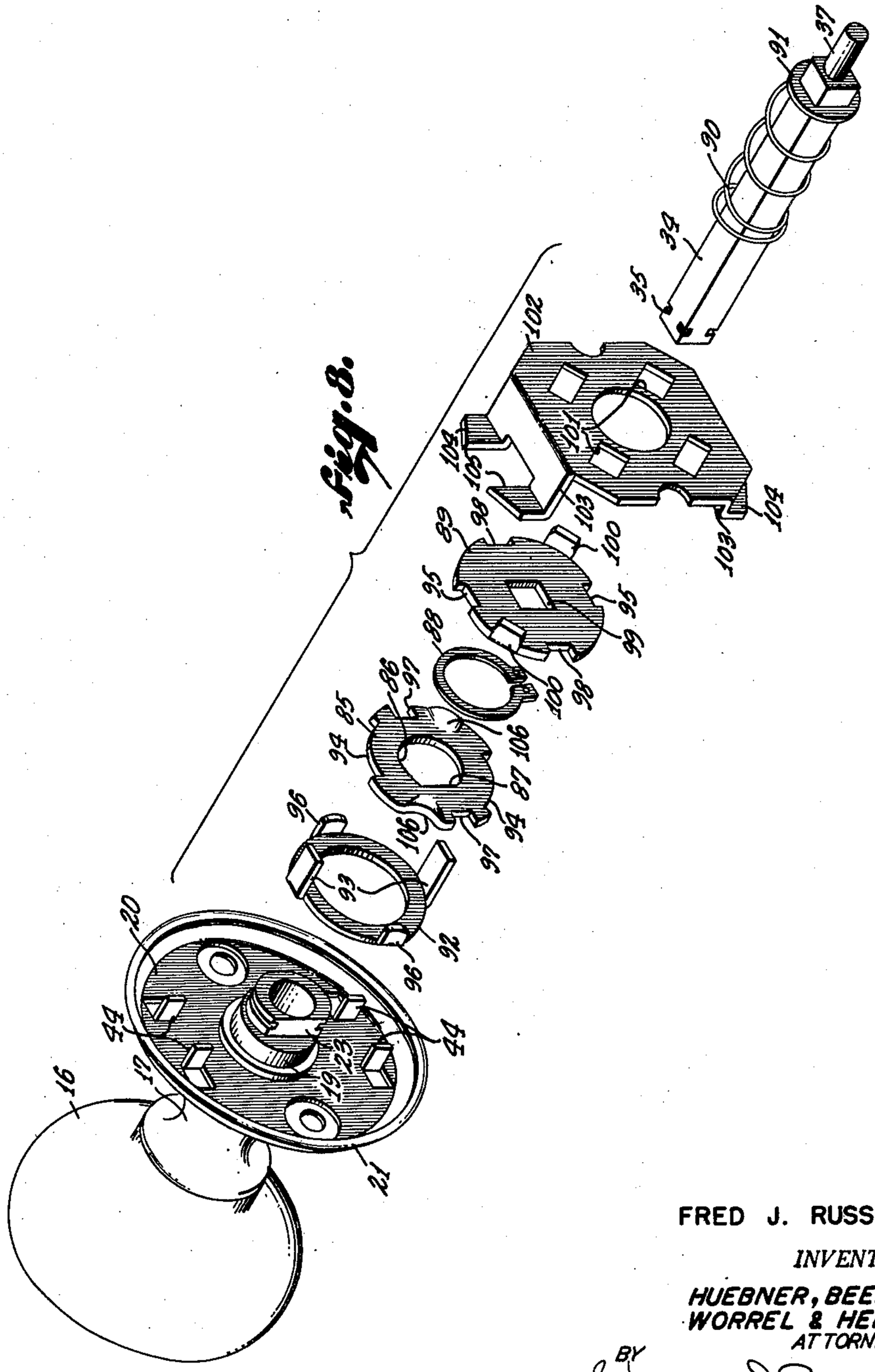
BY Vernon D Beehler

June 7, 1955 F. J. RUSSELL 2,709,911

DOOR LOCK

Filed Dec. 8, 1952 10 Sheets-Sheet 5

Fig. 8.



FRED J. RUSSELL

INVENTOR

HUEBNER, BEEHLER, WORREL & HERZIG,
ATTORNEYS.

BY Vernon A. Beehler

June 7, 1955 F. J. RUSSELL 2,709,911

DOOR LOCK

Filed Dec. 8, 1952 10 Sheets-Sheet 6

Fig. 9.

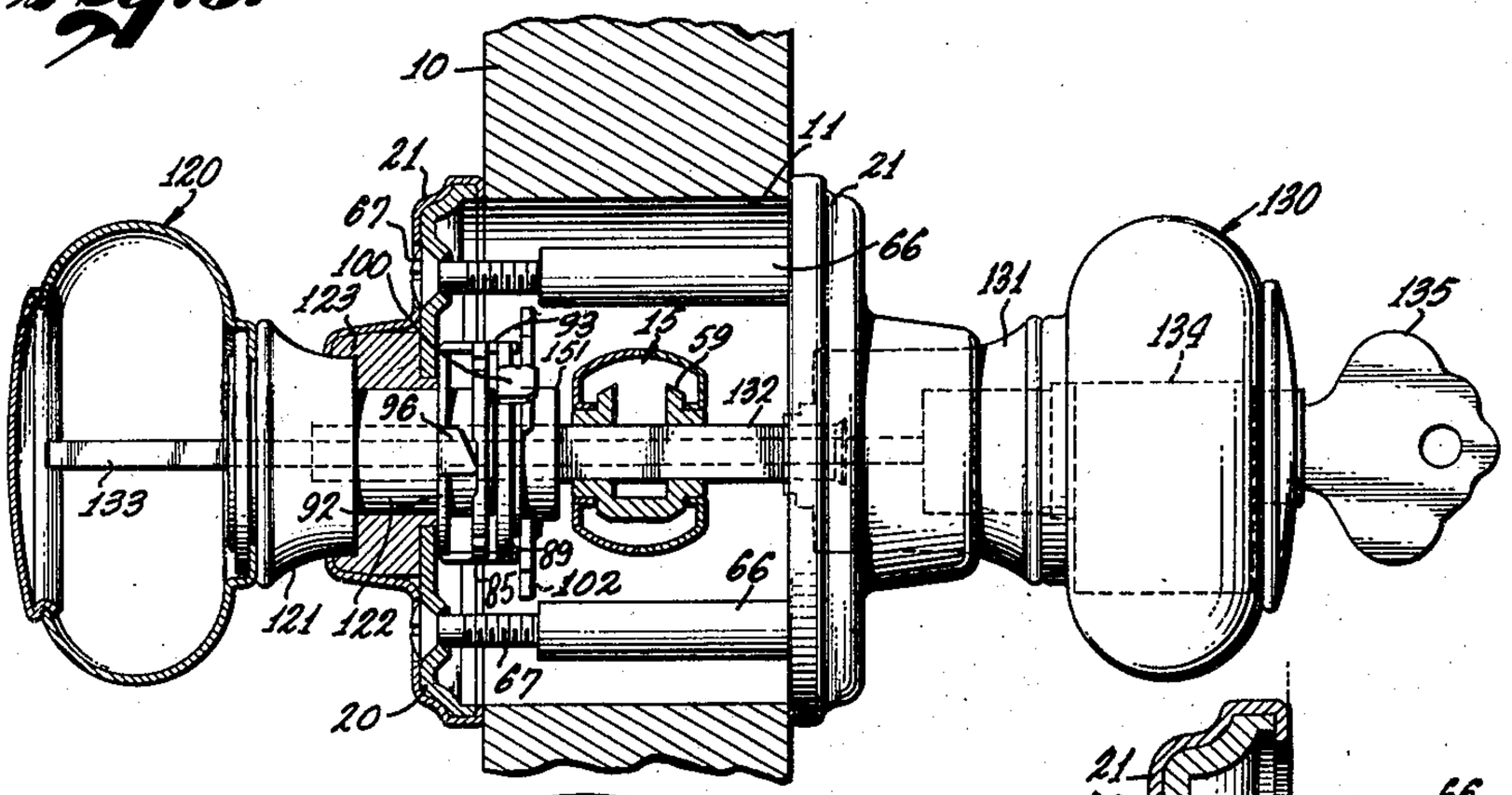


Fig. 10.

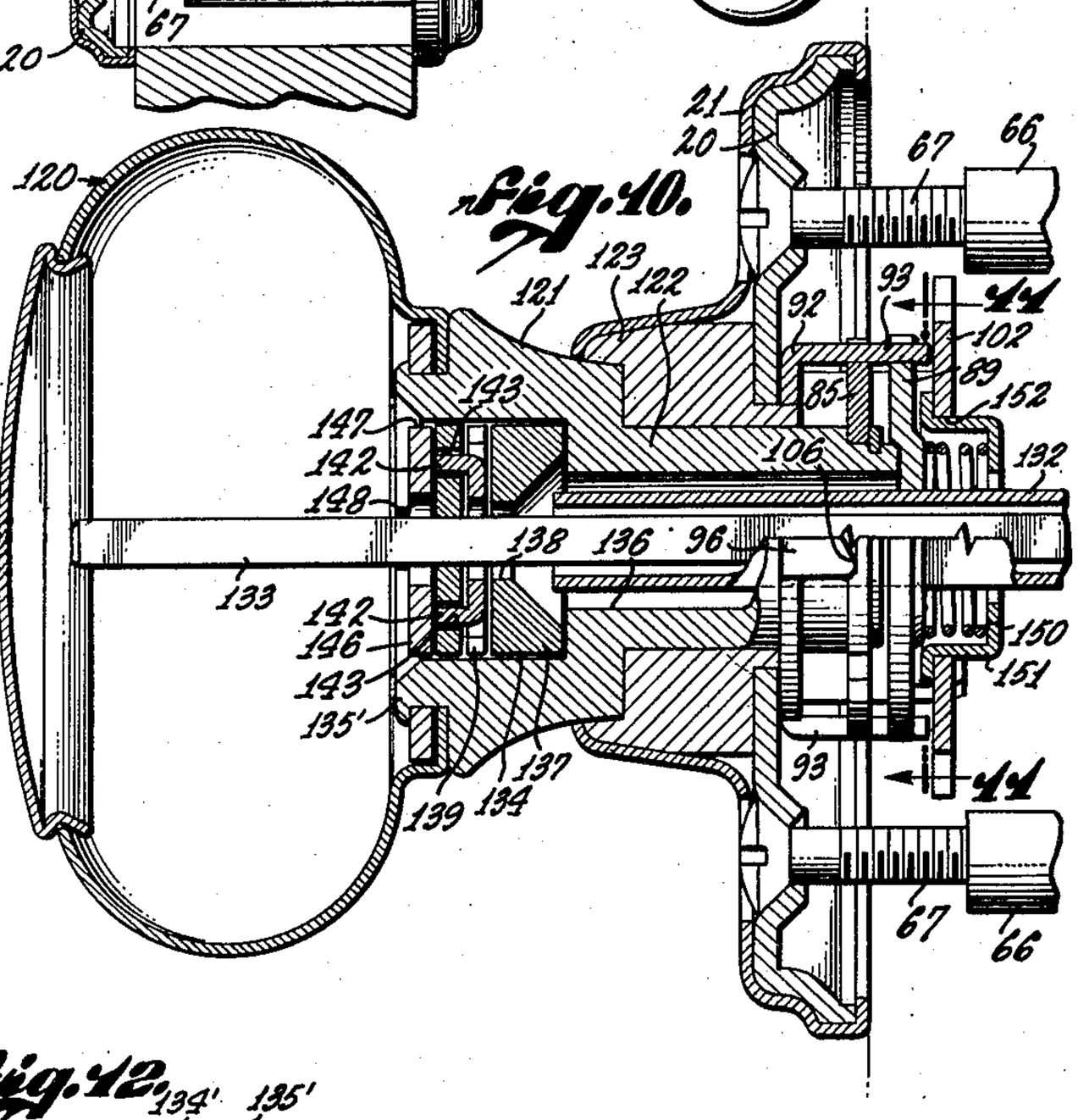


Fig. 11.

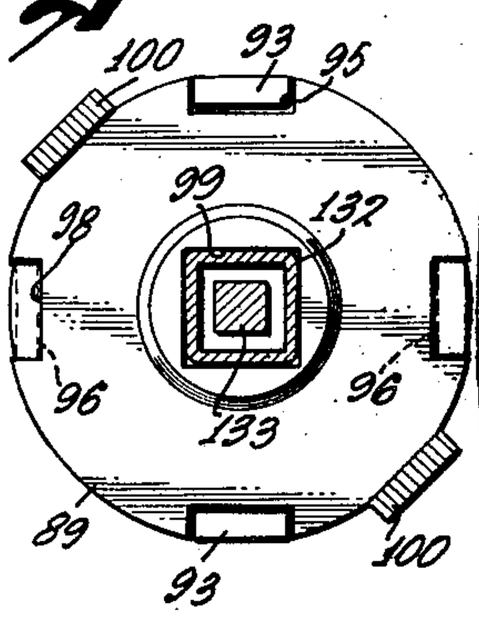
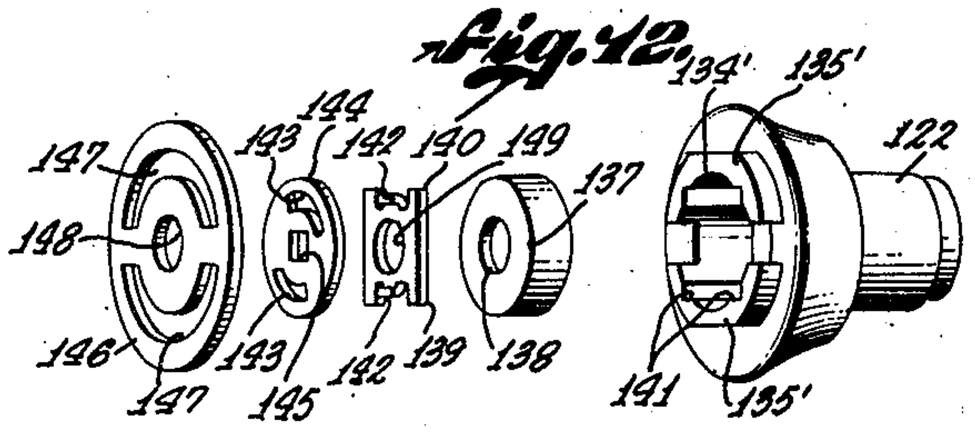


Fig. 12.



FRED J. RUSSELL

INVENTOR

HUEBNER, BEEHLER, WORREL & HERZIG, ATTORNEYS.

BY Vernon D. Beehler

June 7, 1955 F. J. RUSSELL 2,709,911

DOOR LOCK

Filed Dec. 8, 1952 10 Sheets-Sheet 7

Fig. 13.

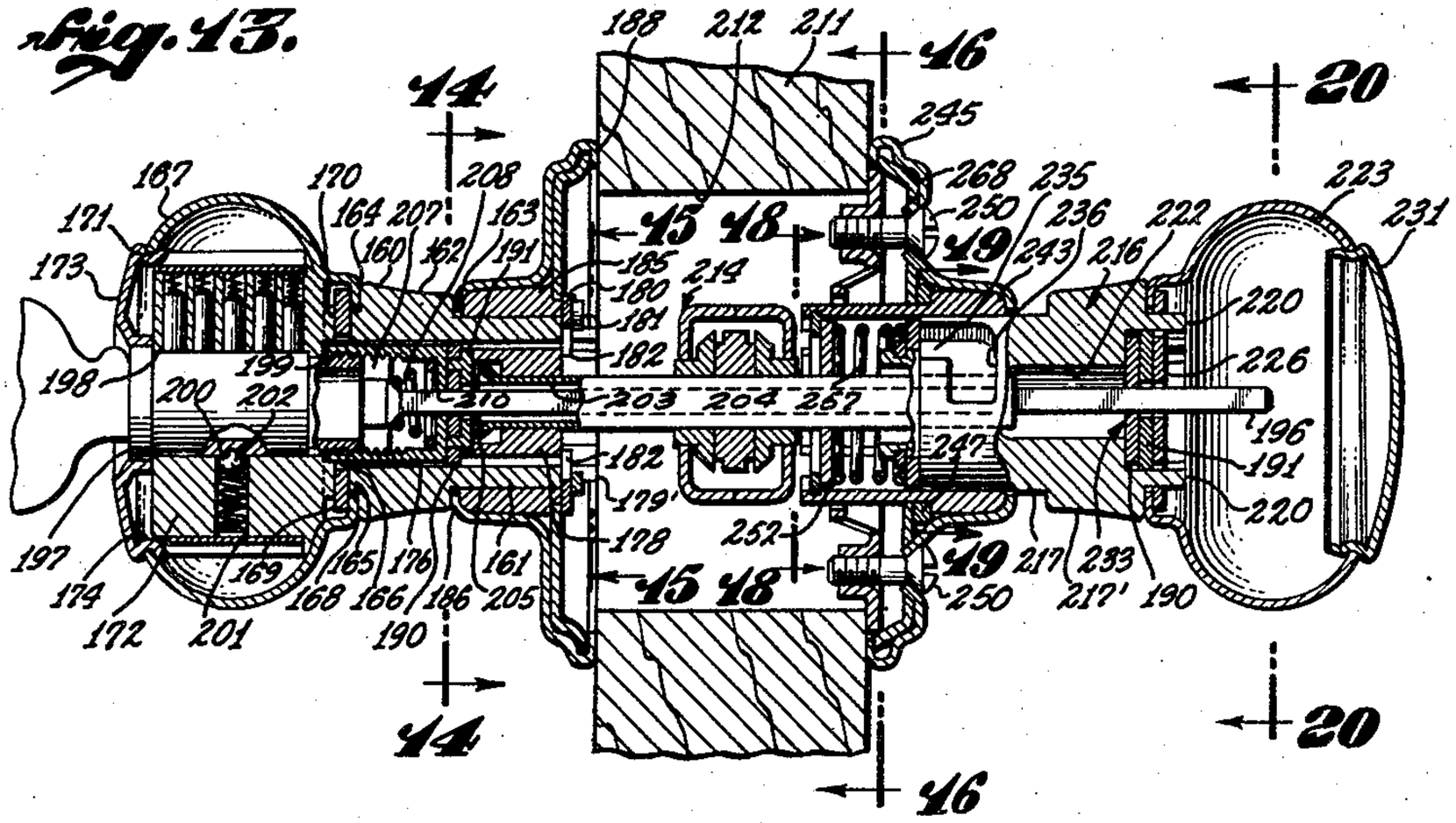


Fig. 14.

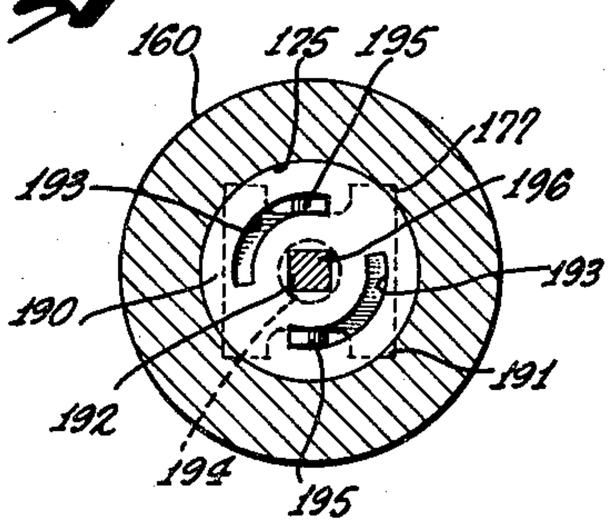


Fig. 16.

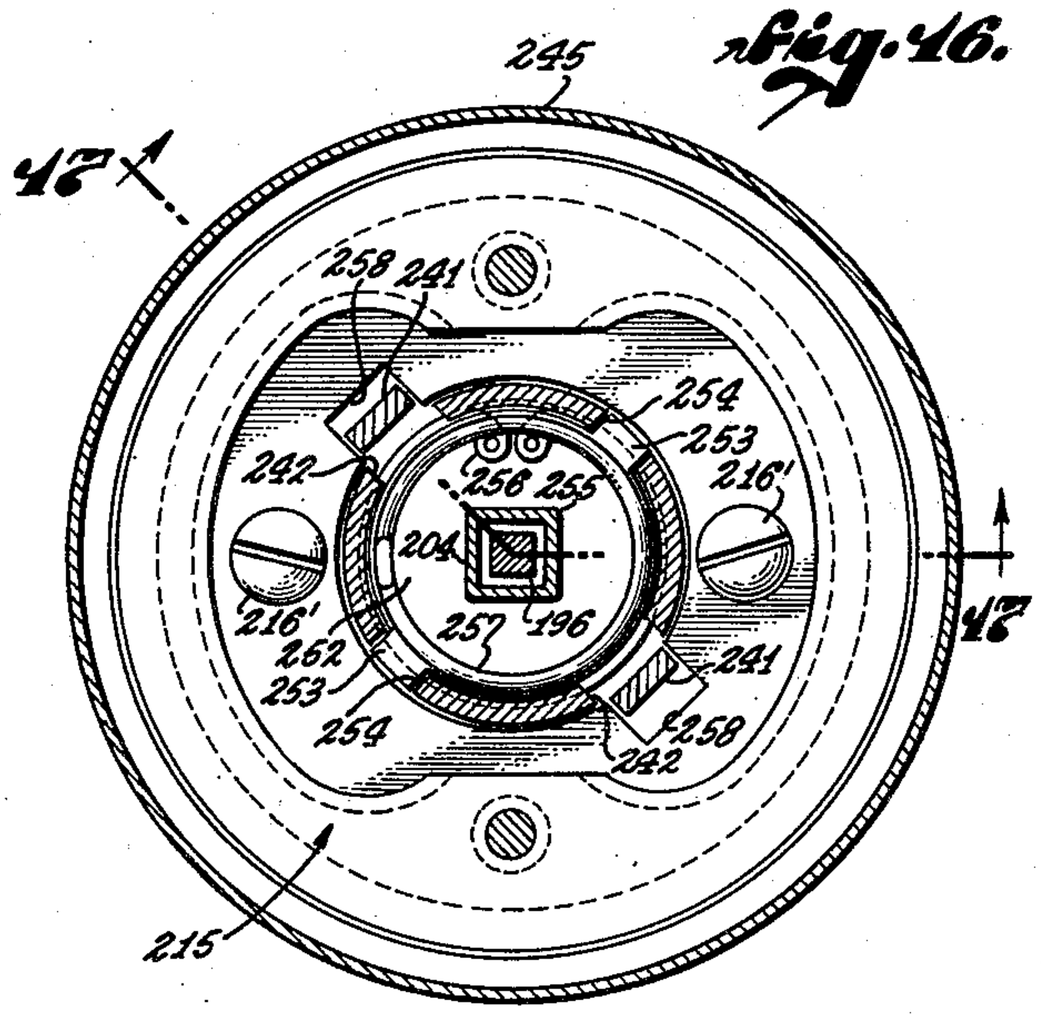
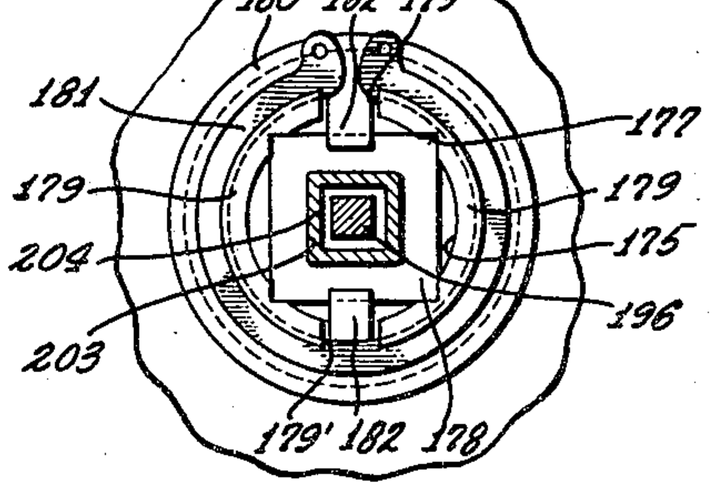


Fig. 15.



FRED J. RUSSELL,
INVENTOR.

HUEBNER, BEEHLER,
WORREL & HERZIG,
ATTORNEYS.

BY Vernon D. Beehler

June 7, 1955 F. J. RUSSELL 2,709,911

DOOR LOCK

Filed Dec. 8, 1952 10 Sheets-Sheet 8

Fig. 17.

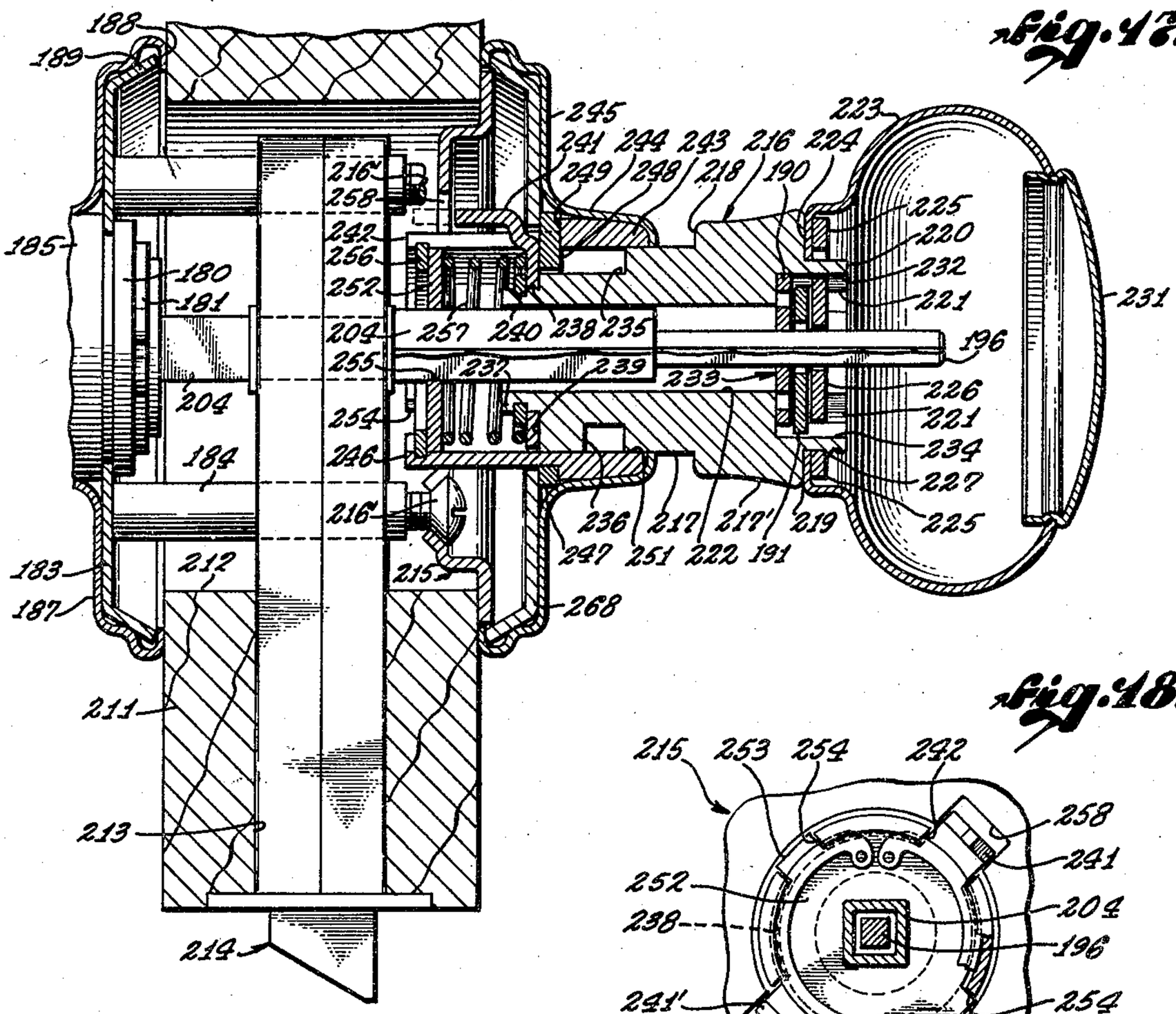


Fig. 18.

Fig. 20.

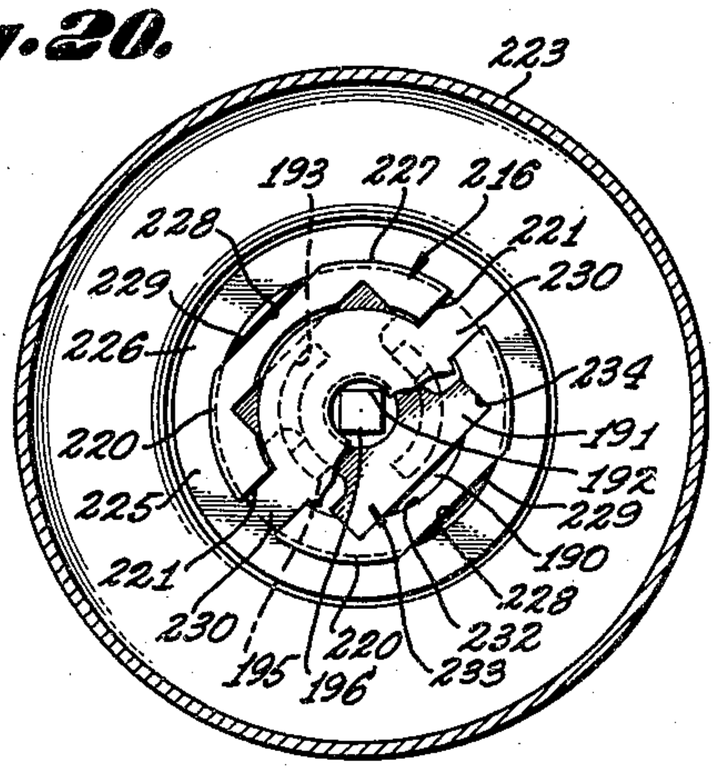
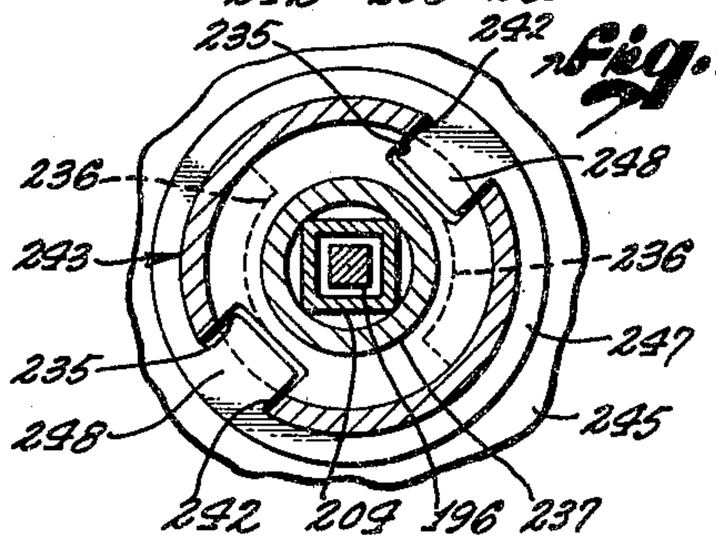


Fig. 19.



FRED J. RUSSELL,
INVENTOR.

HUEBNER, BEEHLER,
WORREL & HERZIG,
ATTORNEYS.

BY Vernon D. Beehler

June 7, 1955 F. J. RUSSELL 2,709,911

DOOR LOCK

Filed Dec. 8, 1952 10 Sheets-Sheet 9

Fig. 21.

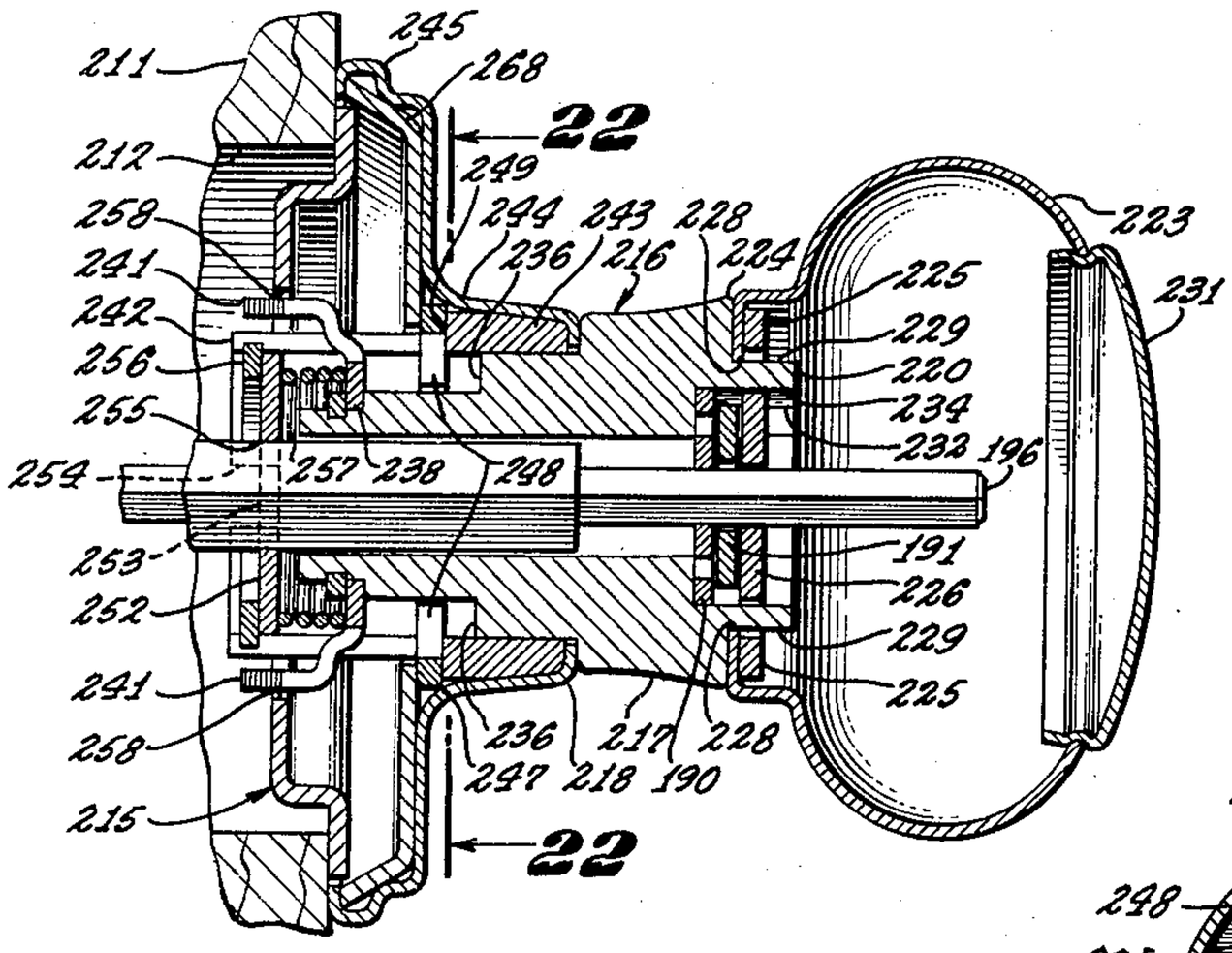


Fig. 22.

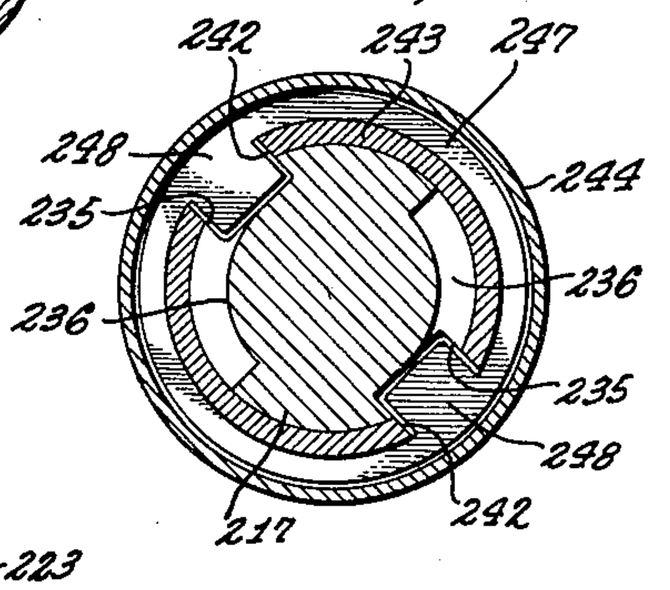


Fig. 23.

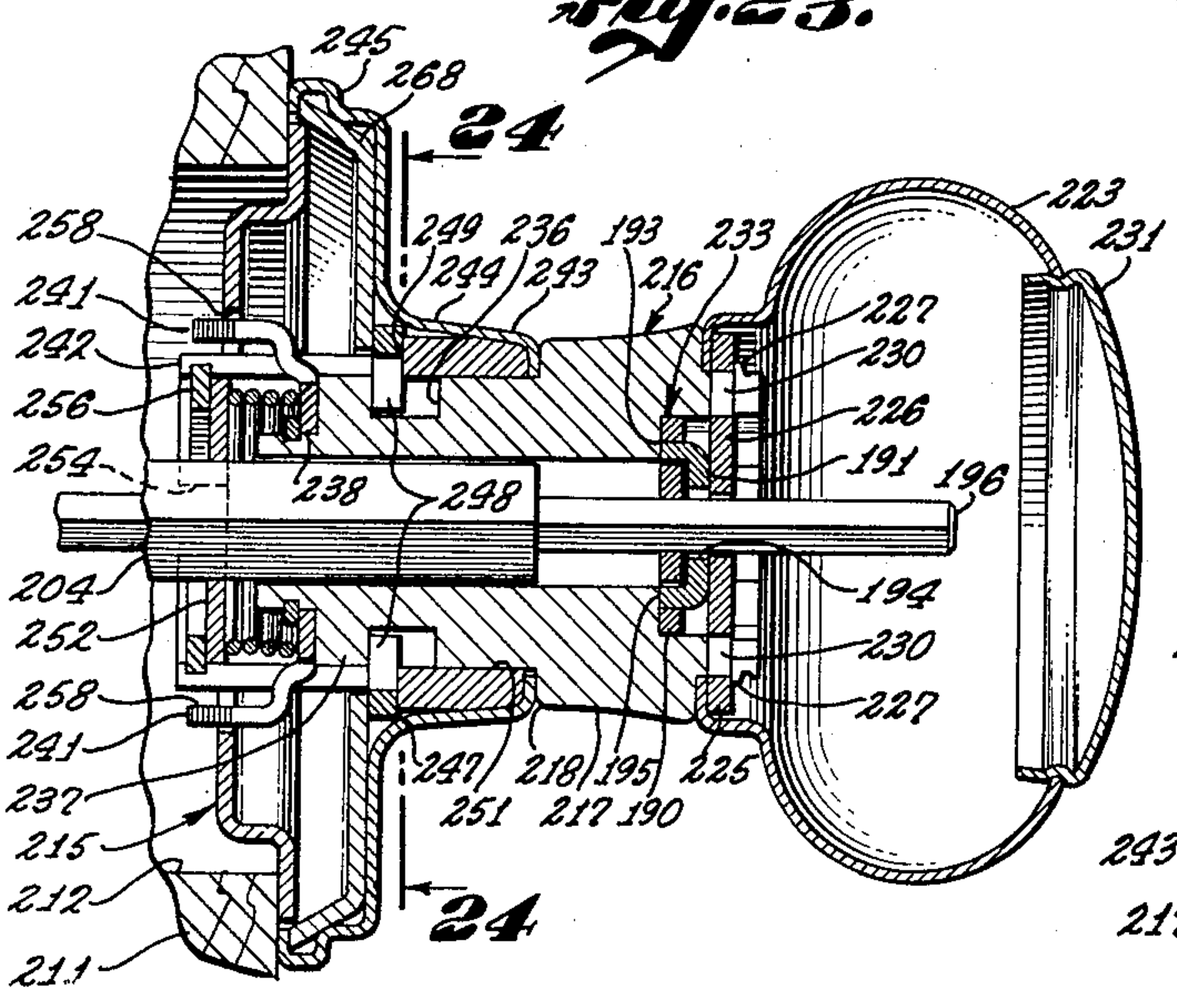
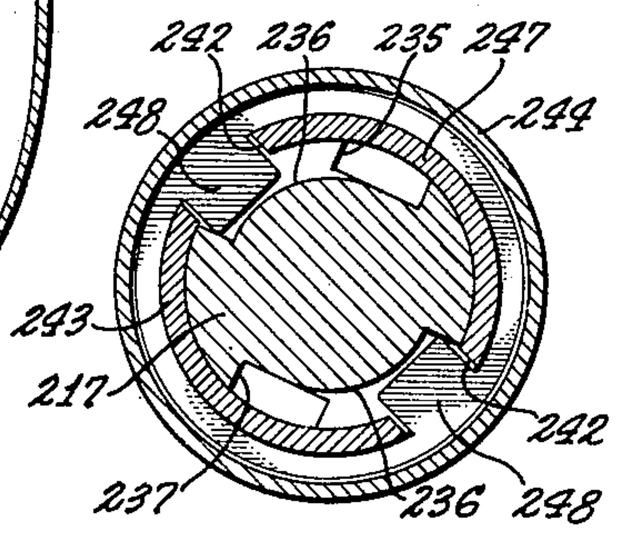


Fig. 24.



FRED J. RUSSELL,
INVENTOR.

HUEBNER, BEEHLER,
WORREL & HERZIG,
ATTORNEYS.

BY Vernon D. Beehler

June 7, 1955 F. J. RUSSELL 2,709,911

DOOR LOCK

Filed Dec. 8, 1952 10 Sheets-Sheet 10

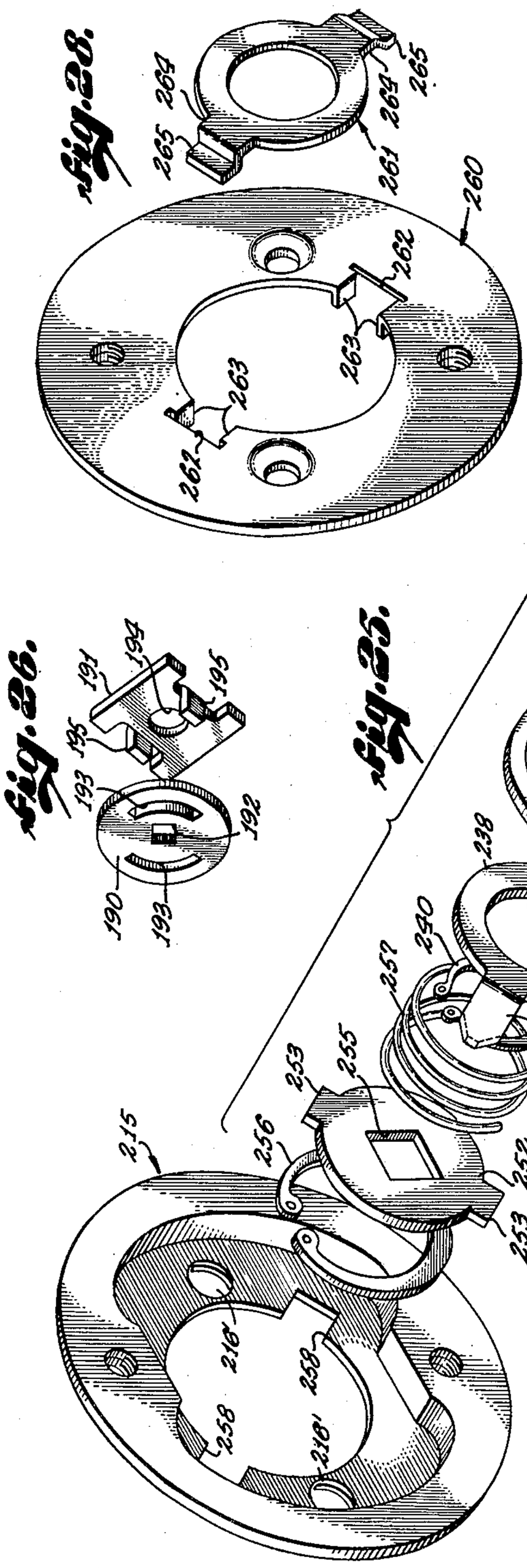


Fig. 28.

Fig. 26.

Fig. 25.

Fig. 27.

FRED J. RUSSELL,
INVENTOR.

HUEBNER, BEEHLER,
WORREL & HERZIG,
ATTORNEYS.

BY Vernon D. Beehler

United States Patent Office

2,709,911

Patented June 7, 1955

2,709,911

DOOR LOCK

Fred J. Russell, Los Angeles, Calif.

Application December 8, 1952, Serial No. 324,715

37 Claims. (Cl. 70—147)

The invention relates to door locks and has particular reference to door locks customarily known in the trade as tubular lock sets and latch sets differing from the old conventional door locks and latches to the extent that the tubular lock sets are compact with the knob assemblies and spindles associated therewith usually confined within a cylindrical housing of relatively small circumference and wherein the latch mechanism is a separate part attachable to the spindle when the lock is set in a door.

The application is a continuation-in-part of copending applications Serial No. 108,136, filed August 2, 1949, now abandoned, and Serial No. 275,736, filed March 10, 1952, now abandoned.

The invention here involved is more especially devoted to a door lock frequently referred to as a privacy lock or screen door set wherein the door can be temporarily locked from the inside by manipulation of the handle or some part of the handle so as to lock the door against inadvertent opening from the outside but with the parts so arranged that the door can be readily opened from the inside merely by turning the knob so as to release the mechanism. Following current requirements, the lock may be so arranged that when used as a privacy lock for a bathroom door, it can be opened from the outside if need be by some instrument, such as either a wire, screw driver, or other simple instrument to gain access to the inside under special circumstances or, if preferred, by the usual tumbler lock and key.

It is therefore among the objects of the invention to provide a new and improved privacy lock set which is simple in its construction and assembly and which incorporates a new mechanism to achieve the temporary locking of the door and its ready release by manipulation of the inside knob.

Another object of the invention is to provide a new and improved privacy lock set which incorporates a series of elements on the spindle of such character that by relatively little change and following the same general principle of construction and operation the door may be temporarily locked either by pushing the inside knob inward or by pulling it away from the door, and then turning it a small fraction of a turn to temporarily lock it in a privacy locked position but subject to ready release by reversing the same short turn, after which the knob will be returned automatically to its initial unlocked position.

Still another object of the invention is to provide a new and improved privacy lock set which can be made particularly compact sufficient to have it fit doors of minimum thickness as well as being operable with doors of conventional or greater thickness without any change whatsoever in the structure of the lock set.

Also included among the objects of the invention is to provide a new and improved privacy lock set which is relatively inexpensive to manufacture, which incorporates parts which can be made to such a broad tolerance that all parts are readily interchangeable without sacrificing the smoothness and dependability of operation of the device and also to provide a privacy lock set which is easy to assemble at the factory as well as simple to install in the door by persons relatively unskilled in the installation of lock hardware.

Still another object of the invention is to produce a door lock of the character described which cannot be unlocked by jarring it, even with an excessive blow.

An object of one form of the invention is to produce a lock of the general character referred to wherein the lock can be put into locked position by an inward thrust of the inner knob assembly followed by a slight rotation thereof, the inward thrust bringing a tabbed lock washer into locking engagement with a binding plate, and the rotational movement shifting a slotted retaining element into engagement with stops on a retaining washer by which the inner knob assembly is retained in locking position, and can be released to unlocking position only by a reverse rotation of the inner knob or actuation of a spindle by the cylinder lock in the outer knob, and in which the locking engagement of the retaining element with the retaining ring is such that an external blow or jarring will not disengage the parts.

The objects include moreover the provision of a new and improved privacy lock set with the locking such that it is locked and also unlocked from the inside by merely rotating the handle so that persons relatively unfamiliar with locks of this kind would instinctively by turning the handle lock or unlock it, the lock set being further so constructed that once unlocked by rotation of the inside knob, the lock set must be relocked by the same rotation of the handle and would not automatically lock upon a closing of the door.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device whereby the objects contemplated are attained as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a longitudinal sectional view of a complete lock set installed in a door.

Figure 2 is a longitudinal sectional view of the lock set of Figure 1 taken on a horizontal plane.

Figure 3 is a longitudinal sectional view of one form of the inside knob assembly and associated parts of a design wherein the knob pulls out in order to place it in locked position, the figure showing the parts in unlocked position.

Figure 4 is a view similar to Figure 3 showing the parts of Figure 3 in locked position.

Figure 5 is an exploded view of the form of device illustrated in Figures 3 and 4.

Figure 6 is a longitudinal sectional view of the inside knob assembly and associated parts of a construction which requires that the knob be pushed in for locking the door, Figure 6 being one showing the knob assembly in unlocked position.

Figure 7 is a view similar to Figure 6 showing the parts of Figure 6 in locked position.

Figure 8 is an exploded view of the construction illustrated in Figures 6 and 7.

Figure 9 is a longitudinal sectional view of an embodiment of the device constructed so that it can be unlocked by a key inserted in the outside knob assembly.

Figure 10 is an enlarged longitudinal sectional view showing details of a key actuated spindle for unlocking the device.

Figure 11 is a cross-sectional view through the device on the line 11—11 of Figure 10.

Figure 12 is an exploded view of a mechanism facilitating unlocking of the device by the key actuated spindle.

Figure 13 is a sectional elevational view of a door lock

embodying the principles of the invention showing the parts in unlocked position.

Figure 14 is a sectional view of part of the outer knob assembly taken on the line 14—14 of Figure 13.

Figure 15 is a fragmentary sectional view taken on the line 15—15 of Figure 13.

Figure 16 is a sectional view taken on the line 16—16 of Figure 13.

Figure 17 is a somewhat enlarged sectional angular plan view of the door lock shown in Figure 13 with the inner knob assembly predominating and omitting most of the outer knob assembly. The figure is taken on the line 17—17 of Figure 16, and the parts are shown in unlocked position.

Figure 18 is a fragmentary sectional view taken on the line 18—18 of Figure 13.

Figure 19 is a fragmentary sectional view taken on the line 19—19 of Figure 13.

Figure 20 is a sectional view through the inner knob taken on the line 20—20 of Figure 13.

Figure 21 is a view generally similar to Figure 16 but more fractional in nature illustrating parts of the inner knob assembly with the lock in initial locked position but prior to rotation of the inner knob for holding the lock in locked position.

Figure 22 is a sectional view taken on the line 22—22 of Figure 21.

Figure 23 is a view similar to Figure 21 wherein the inner knob has been turned to retain the lock in locked position.

Figure 24 is a fragmentary section taken on the line 24—24 of Figure 23.

Figure 25 is an exploded perspective view of several axially aligned cooperating parts of the inner knob assembly and binding plate.

Figure 26 is an exploded perspective view of the parts forming a lost motion washer assembly incorporated in the knob assemblies.

Figure 27 is a partial perspective view of the inside spindle and a tubular latch actuating spindle partly enclosing the same.

Figure 28 is a perspective view illustrating a different form of binding plate and locking washer.

Pull release lock

In a form of the device chosen to illustrate the principle involved, there is shown a door 10 in section having a transverse aperture 11 therein for reception of the operating assemblies and having an edgewise extending bore 12 designed to connect to the aperture 11 and to receive the latch. These two holes, namely, the aperture 11 and bore 12 are the only two apertures which need be cut into the door for the reception and mounting of the lock. Both may be circular holes made with a bit and brace.

The lock comprises in general an inner operating assembly 13, an outer operating assembly 14, spindles and a latch mechanism 15 which extends to a location in axial alignment with the inner and outer operating assemblies 13 and 14 respectively so that the latch mechanism may be manipulated by the operating assemblies. The latch mechanism 15 is of conventional construction, details of which have been omitted for simplifying the description of the invention here involved. More particularly, and as illustrated to larger scale in Figure 3, the inner operating assembly 13 is here shown as comprising an inner knob 16 having a shank or spindle 17 non-rotatably secured thereto by the swaging of same over a washer 18. A binder plate 20 is here shown serving also as a rose insert on the outside of which is fitted a rosette 21. Centrally disposed relative to the binder plate and the rosette is a bushing 22 within which portion the shank 19 of reduced diameter is adapted to rotate.

As shown in Figures 3 and 4 but as is more readily discernible in Figure 5, the shank diameter 19 has a flattened portion 23 and a substantially annular recess 24 near the end adapted to receive a snap ring 25. The snap

ring is designed to retain upon the shank parallel discs 26 and 27 and a coil spring 28. The disc 26 has an aperture 29 therein on one side of which is flat 30 designed to engage the flat face 23 of the shank 19 so that the disc 26 is non-rotatably mounted upon the shank and therefore turned when the inner knob 16 is turned. The disc 27 has a circular aperture 31 therein which fits freely and rotatably about the portion of the shank 19 and therefore cannot be turned by rotation of the knob except through an interlocking arrangement which will be presently described in detail. Another disc 32 is provided with a square hole 33 by means of which it is non-rotatably mounted upon a square spindle 34. The square spindle 34 has a recess 35 at its inside end within which can be mounted a snap washer 36 so as to lock the spindle within the inner knob 16. The opposite end of the square spindle has a rounded extension 37. Adjacent the rounded extension there is mounted a spring-keeping washer 38 for retaining a spring 39 which in turn is adapted to bear against the outer face of the disc 32. A dished part or spider 40 is provided with legs 41 and feet 42 in which are slots 43 by means of which the spider may be held non-rotatable with respect to the binder plate 20. This is accomplished by lodging flanges 44 of the binder plate within the slots 43.

Reference will first be made to the relationship of the parts as illustrated in Figure 3 which is the unlocked position. In that position long legs 45 of the disc 32 extend through arcuate slots 46 of the disc 26 and recesses 47 of the disc 27. At the same time short legs 48 of the disc 32 extend through recesses 49 of the disc 26 and also through recesses 50 of the disc 27. It will be apparent therefore that because of the position of the short legs 48, the discs 26 and 27, in one position, will be locked together and also locked to the disc 32 and hence also locked to the spindle 34. Consequently when the inner knob 16 is rotated, rotating as it necessarily must the disc 26, the spindle 34 will also be rotated and, in turn, will retract the latch 15 inasmuch as the spindle 34 in this position of adjustment lies within a square hole 55 of a bushing forming part of the latch mechanism as illustrated in Figure 1. Rotation of the inner knob 16 will manipulate the latch mechanism sufficient to withdraw a latch bolt 56. When inner operating assembly 13 is in unlocked position, the latch bolt may also be withdrawn by the outer operating assembly 14 which includes a square tube 58 adapted to engage a square hole in an outside portion 59 of the bushing 55.

When it is desired to lock the door against opening by manipulation of the outer knob assembly, the inner knob 16 is drawn inwardly from the position shown in Figure 3 to the position shown in Figure 4. This is the locked position. When the inner knob is drawn to this position, the shank diameter 19 of the knob moves a short distance from right to left. The distance is such that the disc 27 and the disc 26 are pulled toward the left a distance sufficiently great that the recesses 50 and 49 are drawn clear of the short legs 48. At the same time the recess 47 is not drawn clear of the long leg 45 of the disc 32 and the long leg remains within the arcuate recess 46 of the disc 26 in each case. After the knob is thus pulled in, it is rotated in a clockwise direction a short distance, limited by the length of the arcuate recesses 46, as viewed in Figure 5. The knob is permitted to rotate because although the long legs 45 lie within the recesses 46, they initially occupy a position at one end of same before rotation and at the other end of same after rotation. The degree of rotation is sufficient to shift shallow cup or dished portions 57 on the disc 26 to a position beneath the ends of short legs 48 in each case. When the cup on each side thus falls beneath the respective short leg 48, the coiled spring 28 will shift the disc 26 slightly so that the short leg falls within the cup and is there releasably held. This is to prevent inadvertent walking off or climbing of the parts out of locked position.

Further, when the inner knob assembly is pulled from right to left, the disc **27** in being pulled from right to left is moved to a new position wherein flanges **60** on the disc **27** fall into slots **61** in a mid-portion of the binder plate **20**. This mid-portion of the binder plate is necessarily a stationary portion of the lock device inasmuch as it is a portion non-rotatably fastened to the door. Therefore, when the flanges **60** anchor themselves non-rotatably in the slots **61**, the disc **27** cannot be rotated. Since the long legs **45** of the disc **32** lie in the recesses **47**, the disc **32** cannot be rotated and consequently the spindle **34** cannot be rotated. Also the bushing **55** is blocked from rotation by the agency of the square spindle **34**. Hence the latch mechanism cannot be operated by the outer operating assembly **14** to withdraw the latch bolt **56**. The locking just described, however, does not prevent the short rotational movement of the inner knob **16** and disc **26** a distance sufficient to place the cups **57** beneath the short legs **48**. Consequently the short rotational motion is one which temporarily retains the parts in the blocking position described aided by action of the spring **28**.

When the device is to be unblocked, the inner knob **16**, as viewed in Figure 5, is rotated a short distance counter-clockwise. Rotation of the knob causes rotation of the disc **26** and sloping walls of the cup **57** cause the short legs **48** to ride up to the surface of the disc after which as the disc continues to be rotated its short permitted distance, the recesses **49** again align themselves with the short legs **48**. When this is accomplished, the spring **28** urges the discs **27** and **26** from left to right, pushing the recesses **49** and **50** into positions of engagement with short legs **48** in each case. At the same time the flanges **60** are pushed clear of the slots **61** and the disc **27** is no longer engaged non-rotatably with the binder plate or stationary portion of the lock. The parts have thus been returned to initial unlocked position wherein the square spindle is free to rotate and wherein the outer knob assembly **14** can therefore again be rotated to withdraw the latch bolt **56**.

When the device is installed in the door **10**, the outside or outer knob assembly **14** is interconnected to the inner knob assembly. This is accomplished by providing the outer knob assembly with a binder plate **65** which has attached thereto a pair of threaded sleeves **66**. Bolts **67** extend through the inner binder plate and are threadedly attached to the sleeves **66** thus fixing the binder plates in position on the door.

Additionally the outer knob assembly is provided with a shank or spindle **68** having a portion **69** of the shank of somewhat reduced diameter rotatable within a bushing **70** in much the same manner as is found in the inner knob assembly. The shank is secured within the bushing by the interposition of a washer **71** and snap ring **72**. The square tube **58** is fixed non-rotatably in a square aperture at the inner end of the shank and by means of a disc **77** at the outer end. Because of the sliding fit of the square tube in the bushing **59**, the tube can slide in or out to accommodate the outer operating assembly to doors of different thickness. The coiled spring **73** by pressing between the inside end of the shank and a washer **74** tends to press the washer against the housing of the latch mechanism **15** thereby to urge the engagement of the square tube **58** with the bushing **59**. Alignment of the spindle **34** and tube **58** is improved by means of the rotating fit of the rounded end **37** in the tube.

An outer knob **78** is provided with a cap **79** in which is a central aperture **80** in alignment with an interior bore **75** of the tube **58**. As illustrated in Figure 2, a long instrument such as a wire **81** may be inserted through the cap and the tube **58** so as to be pressed against the rounded extension **37** of the square spindle **34** by which means the spindle can be pushed endwise from right to left as viewed in Figure 2 so as to push the square portion of the spindle **34** out of engagement with the bushing **55**.

When the square spindle has thus been pushed out of engagement, the outer knob assembly when rotated can withdraw the latch bolt **56**, thus opening the door even though the spindle **34** is locked against rotation by the manipulation of the inner knob assembly **16**.

Push release lock

In another embodiment chosen to illustrate the invention, illustrated in Figures 6, 7 and 8, the inner knob assembly is so arranged that the inner knob assembly is pushed toward the door in order to set the privacy lock and then rotated a small fraction of a revolution in order to secure the privacy lock in locked position. Figure 6 shows the relationship of the parts in unlocked position and Figure 7 the relationship of the parts in locked position.

In the modified form the inner operating assembly **13** comprises the same inner knob **16**, shank **17**, and parts thereof, as was described in connection with Figures 3 and 4 and is designed to be attached to the door **10** by the same binder plate **20** and appropriate bolts.

In the form of Figures 6, 7 and 8 there is provided a disc **85** in which is an aperture **86** having a flat side which is adapted to secure the disc **85** non-rotatably on the portion **19** of the shank by engagement of the flat side with the flat face **23**, the disc being there secured by the snap ring **88**. Another disc **89** is normally pressed against the disc **85** by a compression spring **90** kept on the square shaft **34** by a washer **91**.

A disc **92** is provided with long legs **93** which extend through arcuate recesses **94** in the disc **85** and substantially rectangular recesses **95** in the disc **89** thus essentially interlocking together the discs **85** and **89** except for the freedom of motion allowed by the length of the arcuate recesses **94**.

The disc **92** is additionally provided with short legs **96** which in unlocked position, as illustrated in Figure 6, extend through substantially rectangular recesses **97** in the disc **85** and similar rectangular recesses **98** in the disc **89**. Thus in unlocked position the discs **85** and **89** are in fact interconnected so that one must rotate in union with the other. Hence, since the disc **89** is provided with a square hole **99** receiving the square spindle **34**, the spindle **34** is locked non-rotatably to the inner knob **16** when the inner operating assembly is in unlocked position as illustrated in Figure 6.

Moreover in unlocked position ears **100**, two in number, are in positions out of engagement with apertures **101** in a dished plate **102** which is designed to receive them.

The dished plate **102** is provided on opposite sides with legs **103** having feet **104** thereon, the feet being provided with slots **105**. These slots, as illustrated in Figures 6 and 7, are designed to engage the flanges **44** on the binder plate **20** as previously described, thus rendering the dished plate **102** relatively stationary.

When the inner operating assembly of the design illustrated in Figures 6 and 7 is to be manipulated to lock the mechanism, the knob **16** is pressed inwardly toward the door from the position of Figure 6 to the position of Figure 7. Pressing the knob inwardly shifts the disc **85** and the disc **89** in a direction from left to right as viewed in Figures 6, 7 and 8 a distance far enough so that the rectangular recesses **98** are moved out of engagement with the short legs **96** but not so far but what the long legs **93** remain in engagement with the rectangular recesses **95**. The same shift in location of the disc **89** is far enough so that the ears **100** move into engagement with the apertures **101** of the dished plate **102**. In this new position the disc **89** thus becomes interlocked with the dished plate **102** which exemplifies the stationary portion of the lock. Hence the spindle **34** is locked against rotation and consequently the latch mechanism cannot be manipulated by the outer knob assembly to withdraw the latch bolt **56**.

In order to temporarily secure the outer operating assembly in locked position, namely, the position of Figure 7, the inner knob **16** and parts attached thereto is permitted a partial rotation throughout the distance limited by the length of the arcuate recess **94**. Let it be assumed that in unlocked position the long legs **93** occupy a position at the left end of the arcuate recess **94** as viewed in Figure 8. In this position the knob is depressed toward the door and the short legs **96** released from the rectangular recesses **98** and **97**, respectively, of the discs **89** and **85**. The short legs **96** will then clear the adjacent face of the disc **85**. The knob **16**, as viewed in Figure 8, is then rotated in a clockwise direction the distance permitted by the travel of the long legs **93** in the recesses **94**, that is, until the long legs abut the right-hand end of the respective recesses. Rotation throughout this distance is sufficient to shift the position of the disc **85** rotatably until the short legs fall adjacent depressions **106**. At this point the short legs will be urged into the bottoms of the depressions by pressure of the spring **90** against the disc **89** and from the disc **89** to the disc **85**, thus urging the disc **85** toward the short legs. This adjustment is advantageous in prohibiting climbing of the short legs which might be effected by a jerky manipulation of the handle, thereby inadvertently unlocking the lock from the exterior.

To release the blocking mechanism which is the relationship of the parts blocking rotation of the spindle **34** and hence retraction of the latch bolt **56**, the knob **16**, as viewed in Figure 8, is rotated counter-clockwise a distance sufficient to shift the long legs **93** from the right end of the arcuate recesses to the left end. Rotation throughout this distance slides the short legs out of the depressions **106**, the legs riding up on the sloping walls of the depressions, until the short legs **96** again fall into a position of alignment with the rectangular recesses **97** and **98**, respectively, of the discs **85** and **89**. The discs as viewed in Figures 6, 7 and 8 will then be urged from right to left to positions wherein the short legs again reengage both discs, interlocking all three discs together. During this same movement the ears **100** of disc **89** are shifted out of engagement with the apertures **101**, thus freeing the square shaft **34** from its blocked or locked position. Consequently, inasmuch as there is no blocking of rotation of the latch mechanism, the latch mechanism can again be withdrawn by operation of the outer operating assembly.

Inasmuch as there is nothing other than the spring **90** tending to urge, as viewed in Figures 6, 7 and 8, the square spindle **34** endwise from left to right into a position of engagement with the latch mechanism, all that is necessary to release the latch mechanism for manipulation by the outer operating assembly is to shift the spindle **34** endwise from right to left the same as in the embodiment of the invention described in connection with Figures 1 through 5, inclusive. Consequently, the identical structure, as described in Figure 2, facilitating release by the wire **81**, can be employed in connection with the form of the lock illustrated in Figures 6, 7 and 8.

Either form of the invention may be constructed so as to be unlocked from the exterior by means of key actuation instead of some other instrument such as the wire **81** described in connection with Figure 2. Key actuation is illustrated by a structure disclosed in Figures 9, 10, 11 and 12. As there illustrated, an inner knob assembly **120** is designed to be pulled away from the door in order to unlock the device and to be pushed toward the door in order to lock the device. In Figures 9 and 10 the inner knob assembly is shown in locked position.

The inner knob assembly includes a shank **121** having a reduced portion **122** rotatably mounted in a bushing **123**. On the reduced portion **122** are the cooperating discs **85**, **89** and **92** as described in connection with Figures 6, 7 and 8, these being shown cooperable with the dished plate **102**. These parts operate as previously described in connection with Figures 6, 7 and 8.

In this form of the invention an outer knob assembly **130** is provided with a shank **131** which is non-rotatably secured to a hollow square shaft **132**. The shaft **132** fits in a square aperture in the bushing **59** for manipulation of the latch in the same manner as heretofore described. The square shaft **132** fits into the square hole in the disc **89**.

Since the inner knob assembly must be free to rotate throughout the arc necessary for latching the device by manipulation of the inner knob assembly, means must be provided to permit a corresponding amount of lost motion between the inner knob assembly and a solid square rod **133** which as shown is operated through a tumbler lock **134** by a key **135**. Parts of the lost motion mechanism are illustrated in the exploded view of Figure 12.

To provide a receptacle for the lost motion mechanism the shank **121** has a recess **134'** therein at the rim of which are flanged portions **135'** consisting of identical arcuate parts. A passage **136** extends through the reduced portion **122** to freely accommodate the hollow square shaft **132**. Within the recess is a washer **137** having a central aperture **138** which is substantially larger than the rod **133** permitting it to turn freely in the aperture. Next to the washer **137** is a square washer **139** having corners **140** which are adapted to fit into cut-out portions **141** in the walls of the recess **134'**, thereby preventing the square washer from turning when in place.

Extending outwardly relative to the door are ears **142** on the square washer which are designed to be received within arcuate recesses **143** in a disc **144**. The location of the ears **142** in the arcuate recesses **143** is clearly shown in Figure 10. It will also be noted that the disc **144** has a central square recess **145** which snugly accommodates the square rod **133** to the end that the disc **144** turns with the solid square rod.

To hold all of the parts of the lost motion mechanism in place a large washer **146** is provided having slots **147** adapted to receive the flanges **135'**. When all of the parts are properly positioned, the outside edges of the flanges **135'** may be swedged over the face of the washer **146** as illustrated in Figure 10. The washer **146** has a central hole **148** comparable in diameter to the hole **138**, there being also a hole **149** in the square washer so that the solid square rod **133** turns freely within all of these parts.

In operation let it be assumed that the door has been locked by means of pushing the inner knob assembly **120** toward the door and rotating it through the distance permitted by the cooperating discs **85**, **89** and **92**. This adjustment locks the disc **89** in engagement with the dished plate **102** and because the square shaft **132** is non-rotatably received in the disc **89**, the square shaft **132** cannot rotate. Hence the outer knob assembly **130** which carries the square shaft cannot rotate and the door is barred against opening from the outside.

The door can then be unlatched by rotating the inner knob assembly **120**, and can also be opened by use of the key **135**. When the key is used, it rotates the connected square rod **133** which extends through the center of the hollow square shaft **132**. Rotation of the rod **133** immediately rotates the disc **144** and the inner knob assembly **120** since the ears **142** have already been moved to the ends of the respective slots **143** by initial rotation of the inner knob assembly **120**. The slots **143** provide necessary lost motion inasmuch as the square washer could not be rotated against the set position of the key.

Accordingly, the inner knob assembly is caused to rotate by key actuation a distance permitted by lost motion in the cooperating discs **85**, **89** and **92**, until they are in a position wherein the lock is released. The action of the discs is the same as is achieved by manually rotating the inner knob assembly **120** through the same distance. It will be noted that opening or unlocking the lock by

means of the key in the assembly illustrated in Figures 9, 10, 11 and 12 differs from release of the lock by the means illustrated in Figure 2 in that the means of Figure 2 does no more than disengage the square shaft 34 from blocking rotation of the bushing 59, thereby permitting the outer knob assembly to open the latch. As soon as the wire 81 is withdrawn, the square shaft 31 again returns to block rotation of the latch and should the door be slammed it will again lock itself unless in the meantime the inner knob assembly 13, as illustrated in Figure 2, is rotated so as to release the locking mechanism.

After unlocking by means of the key 135, the key is ordinarily returned to its initial position, which movement again shifts the disc 144 the length of the arcuate slots 143 so that the lost motion mechanism is reset to initial position. This will permit rotation of the inner knob assembly by a corresponding distance in order to lock the lock set from the inside without disturbing the key mechanism.

In the construction of Figures 9 and 10 provision has been made for suitable inclusion of a relatively heavy coil spring 150 by providing a spring keeper or hollow cap 151 adapted to fit into a central aperture 152 of the dished plate 102.

Continuous spindle lock outer knob assembly

In still another form of the invention illustrated in Figures 13 through 27 inclusive details are shown of a lock which locks when the inner knob is thrust inward.

In order to facilitate an understanding of the environment in which the novel inner knob assembly is disposed, as well as to illustrate the novel combination of outer and inner knob assemblies in this form of the invention, the essential features of the outer knob assembly will be again described in connection with Figures 13 through 27.

The outer knob assembly comprises an outer shank 160 which is formed with a cylindrical section 161 and a conical section 162 having a shoulder 163 therebetween.

The outer end of the shank 160 is formed with a shoulder 164 and a boss 165, which said boss 165 is formed with a pair of diametrically disposed transverse flat grooves 166, the purpose of which will be explained later.

A knob shell 167 is formed with a flanged opening on the inner end thereof, the flange 168 being adapted to enclose the boss 165, and is securely held in place by a washer 169. The washer 169 is formed with a pair of diametrically opposite inwardly directed ears 170 adapted to fit in the flat grooves of the boss 165, as above described. That portion of the boss 165 which extends outwardly through the washer 169 is peened or swedged over to securely hold the washer and the shell 167 in position. The shell 167 is also formed with an outer circular aperture 171.

A knob filler 172 is disposed through the opening 171 and abuts against the inner surface of the shell 167. A knob insert 173 formed originally with inwardly extending cylindrical side walls 174 is forced inwardly against the knob filler 172 so that the knob filler 172 acts as a swedging or expanding tool to expand the inner edges of the side wall 174 to securely lock the knob insert 173 in place.

The outer shank 160 is also formed with an axial bore 175 adapted to receive an internally threaded cap 176, and is broached as at 177 to receive a non-circular, preferably a square shank filler 178.

The inner end of the shank 160 is formed with a pair of oppositely disposed semi-circular bosses 179 (see Figure 15) spaced apart to form a pair of oppositely disposed grooves 179'. A washer 180 is disposed over the semi-circular bosses 179 and held securely in place by means of a snap ring 181.

The washer 180 is formed with inwardly directed oppositely disposed ears 182 adapted to fit in the grooves 179' and to act as stops to prevent the shank filler 178 from coming out of the bore 179.

A rose insert 183 having attached to it two internally threaded binding posts 184 is mounted on a cylindrical rose bushing 185 which abuts against a flange 186 of a rose 187 and is held in place by the outer edges 188 of rose 187, being crimped over the outer edges 189 of rose insert 183. Shank 160 rotatably engages with cylindrical rose bushing 185, rose flange or shoulder 186 abutting against shank shoulder 163, and shank 160 is retained in engagement with cylindrical rose bushing 185 by means of washer 180 fitting over the end of shank 160 and against rose insert 183, said washer 180 being retained in position by the snap ring 181, as above mentioned, the snap ring being seated in an annular groove in the end of shank 160.

As will be seen from Figure 13, the washer 180 has a major diameter greater than the diameter of the aperture in the rose insert 183 so that when the washer 180 is secured in place by the snap ring 181 the entire outer assembly is secured in one unit.

A lost motion device, the parts of which are illustrated in Figure 26, comprises a circular slotted washer 190 and a square tabbed washer 191. The washer 190 is formed with a square hole 192 and arcuate slots 193. The square washer 191 is formed with a circular hole 194 having a diameter larger than the diagonal of the square hole 192 and is provided with oppositely disposed tabs 195.

The two washers are assembled contiguously with the tabs 195 reposing in the slots 193, in which slots the tabs are afforded rotational play. When the tabs engage either end of the slots the rotational play is interrupted and simultaneous movement of both washers then occurs.

The square hole 192 engages a square spindle 196, hereinafter described, and the circular hole 194 is large enough to clear the spindle. These washers in their assembled relationship are disposed inside the bore 179 of the shank 160 between the inner end of the cap 176 and the outer end of the shank filler 178, the circular washer 190 being in contact with the cap and the square washer 191 being in contact with the shank filler. Reversal of position of the two washers 190 and 191 can be employed with equal effectiveness, and other suitable forms of lost motion mechanism can be employed.

The general purpose of this delayed action mechanism, as will more fully appear later, is to permit partial rotation of a key in a cylinder lock 197 (later described) to actuate that lock prior to rotation of the shank 160. Further rotation of the key in the same direction will cause rotation of the shank 160 by reason of the fact that when the play of the tabs 195 in the slots 193 is taken up, the washer 190 which is rotated by the spindle 196 will impart rotation to the square washer 191, and the squared corners of the washer 191 engage against the broached portion 177 of the shank bore 175.

The lost motion mechanism in the outer knob assembly is not essential to operation of the lock but does furnish a desirable improved function therein in that continued rotation of the key after actuation of the cylinder lock 197 will retract the latch bolt without the necessity of grasping the knob to rotate it.

The filler 172 is formed with a longitudinal bore 198 adapted to receive the cylinder lock 197 which is formed with a reduced threaded end 199 adapted to cooperate with the cap 176. The cap 176 has a larger diameter than the bore 198 so that it will abut against the inner end of the filler 172 to assist in retaining the lock 197 in the knob assembly. The cap 176 and the threaded section 199 also provide convenient means for adjusting the tolerance between the lock 197 and its housing which has been identified as the knob filler 172.

A ball seat 200 is formed in the outside surface of the

lock 197. The filler 172 is formed with a transverse bore 201 adapted to receive a spring loaded ball 202 which cooperates with the seat 200. The purpose of such an arrangement is so that the user of the door lock assembly can readily position the cylinder lock 197 for easy key extraction.

The square shank filler 178 is formed with an axial, non-circular (square) hole 203 adapted to receive a corresponding non-circular (square) tubular spindle 204. The tubular spindle 204 is formed with outwardly flared shoulders 205 so that it cannot be pulled away from the filler 178.

The non-circular (square) spindle 196 (previously identified) extends through the square tubular spindle 204 and is rotatable within and independently of the spindle 204. The spindle 196 is much longer than the spindle 204 and is formed with an inner flattened and widened end 206 adapted to register with a transverse slot 207 (Figure 13) in the end of the cylinder lock 197 so that rotation of the cylinder lock 197 rotates the spindle 196.

A compression spring 208 bears at one end against the inner wall of cap 176 and at its other end against the shoulder 209 (Figure 27) of the widened end of the spindle 196 to hold said spindle in the cylinder lock 197.

The arrangement of spindle 196, cap 176, spring 208 and lock 197 contributes ease of assembly and adjustment of the lock, as well as simplified convenience in substituting or removing the lock for repair.

In assembling the spring is slipped on the spindle 196 with its small end against the shoulder 209 of the spindle. The spindle is then inserted through the cap. The hole 210 through which the spindle passes is square to accommodate the spindle with a sliding but relatively non-rotating fit. The flattened end 206 of the spindle is inserted in the slot 207 of the cylinder lock. This slot is preferably formed in a cross with actually two slots at a 90° angle intersecting in the center so that the flattened end of the spindle may engage in either one of the slots.

The spindle is rotated while being held back to compress the spring and keep the end 206 out of the lock, screwing the cap onto the lock tight, then it is backed off to assure freedom of rotation of the cap and lock, and the end 206 is allowed to enter the selected slot.

To remove the cylinder lock, the spindle is pulled free of the same, the spindle is rotated to unscrew the cap from the lock, and the lock can then be withdrawn. Obviously, as shown, the cavity in the cap must be made long enough to afford space for the function described.

When it is desired to mount the assembly on a door 211, a hole 212 is bored into the door through the end thereof and intersects a hole 213 running perpendicularly through the door. A suitable latch assembly, designated generally 214, is inserted through the hole 212 and extends into the hole 213. The binding posts 184 are disposed through suitable openings in the latch assembly 214, and a binding plate 215 is secured against the opposite side of the door by means of bolts 216'.

The tubular spindle 204 passes through the latch assembly 214 and engages therewith in any conventional manner (not illustrated) to retract or permit advancement of the latching element.

A similar outer knob assembly is shown and described in U. S. Patent No. 2,484,961 except that the lost motion mechanism (Figure 26) was not illustrated in the prior patent.

Inner knob assembly

The inner knob assembly comprises an inner shank, designated generally 216, which is formed with a cylindrical section 217 and an outwardly tapered section 217' having a shoulder 218 therebetween.

The outer end of the shank 216 is formed with a shoulder 219 and a pair of semi-circular bosses 220 spaced apart to form a groove 221 therebetween. The shank 216 is formed with a longitudinal bore 222.

An inner knob shell 223 is formed with a flange 224 which fits between the shank shoulder 219 and an annular portion 225 of a washer 226, the washer being fixedly secured in its relation to the shell and shank by arcuate segments 227 of the shank upset over the washer. The flange 224 is formed with flat sides 228 adapted to cooperate with corresponding flat sides 229 on the bosses 220 to prevent relative rotation between the shell 223 and the shank 216. Diametrical spiders 230 of the washer 226 fit into the grooves 221 to interlock the washer with the shank 216 and the knob shell 223. A cap 231 is secured by press fit into the shell 223.

The shank 216 is formed with a counterbore 232 adapted to receive a cooperating lost motion mechanism 233. This mechanism comprises parts identical to those illustrated in Figure 26 and described in connection with the outer knob assembly. The same reference numerals will be applied to the lost motion mechanism here. Thus, a circular washer 190 having a squared center hole 192 slidably but non-rotatably receiving the spindle 196 is free to rotate in the counterbore. The square washer 191 is disposed in the same counterbore with the tabs 195 engaged in the arcuate slots 48. The squared corners of the washer 191 non-rotatably engage in a complementary broached bore 234 of the shank 216. The washer 226 retains the washer 191 in its operative relationship with the washer 190. There is thus provided a slight lost motion in rotation between the shank-and-shell and the spindle 196. Other suitable forms of lost motion mechanism may be employed to accomplish the same result.

On the cylindrical portion 217 of the shank 216 are diametrically disposed axial grooves 235 which terminate in circumferential grooves 236 formed at approximately 90° to the axial grooves.

Mounted on a reducer inner end portion 237 of the shank 216 is a locking washer 238 rotatably held against a shoulder 239 of the shank cylindrical portion 217 by a snap ring 240. The washer 238 has radially and axially inwardly extending legs 241 which are retained in slots 242 formed in a bushing 243.

The bushing 243 is disposed in the tapered portion 244 of an inner rose 245 and is rotatable therein. This bushing 243 has a reduced cylindrical portion 246 on which a ring 247 is disposed. The ring 247 has inwardly extending stops 248 which also ride in the slots 242. The ring 247 is lodged between a rose insert 268 and a shoulder 249 on the bushing 243, and held in place by the cooperation of such parts. The rose 245 and rose insert 268 may be rigidly connected as a sub-assembly with the binding plate 215 as is shown in Figure 13 where machine screws 250 are employed.

The cylindrical portion 217 of the shank 216 slidably and rotatably engages a bore 251 of the bushing 243. At the inner end of the bore 251 is disposed a washer 252. This washer 252 has outwardly extending ears 253 which key into slots 254 of the bushing 243, these slots 254 being radially offset from the slots 242. A square hole 255 is provided for slidable but non-rotational engagement with the tubular spindle 204. The washer 252 is held within the bore 251 by a snap ring 256. Between the washer 252 and the locking washer 238 is disposed a compression spring 257. This compression spring 257 tends to force the shank 216 to the right and outwardly of the bore 251, therefore tending to bring the legs 241 of the locking washer 238 out of a locked engagement with the binding plate 215 next discussed.

The binding plate 215 is formed with complementary slots 258 which receive the legs 241 of locking washer 238 when the shank 216 and the locking washer 238 together have been pushed into locking position, thus preventing tubular spindle 204 from turning, by coordination of the parts described in the paragraph immediately above.

Operation

To lock the door the inner knob shell 223 is pushed inwardly from the position shown in Figures 13 and 17

to the position illustrated in Figure 21, whereupon the cylindrical portion 217 of the shank 216 slides inwardly in the bore 251 with the stops 248 of the ring 247 remaining stationary as the walls of grooves 235 of the shank slide by. With the parts in the position shown in Figure 21, the legs 241 of the locking washer 238 engage in the slots 258 of the binding plate 215 against the axial resistance of spring 257. The inner knob shell is then slightly rotated, as permitted by the delayed action mechanism 233 (washers 190 and 191, etc.) and the rotatable relationship between shank 216 and locking washer 238. See Figure 23. More specifically, the rotation of the knob and shank assembly will rotate square washer 191, the tabs 195 of which ride in the arcuate slots of the washer 190, and the circumferential grooves 236 of the shank 216 will be rotated into engagement with the stops 248 of the ring 247.

Manual relinquishment of the knob and shank assembly at this time will then leave the circumferential grooves in engagement with the stops 248, thus securing the parts in a locked position with the spring 257 exerting pressure through the agencies of the washer 238 and shank portion 217 against the stops 248.

To summarize the locking position of the parts, the movement of the inner shell and shank from extended (outward) to retracted (inward) position brings the locking washer 238 into non-rotatable relationship with the fixed binding plate 215. Inasmuch as the locking washer is always in non-rotatable, but slidable, relationship with the bushing 243, and the washer 252 is also always in non-rotatable relationship with the bushing 243, the washer 252 is held against rotation, and consequently, also, the tubular spindle 204 is held against rotation and the latch 214 cannot be withdrawn. The ring 247 being at all times restrained against axial movement and against rotational movement relative to the bushing 243, enables the minor rotational movement of the shank 216 to bring the circumferential grooves 236 thereof into axially restraining engagement with the stops 248 of the ring 247, holding the parts in the locking position.

The bushing 243 plays an important part in the device. It rotates within the rose 245 and rose insert 268 and at the same time houses spring 257 and retains ring 247, slidably houses locking washer 238 during locked or unlocked position, slidably houses shank 216 during extended (unlocked) positioning of said shank 216, rotatably houses shank 216 during inward (locked) positioning of said shank 216 and turns the latch actuating tubular spindle 204 through the medium of washer 252.

The door lock may be unlocked either by a key from the outside or by rotating the inner knob.

When the cylinder lock assembly 198 is rotated by a key in a direction counter to the turn given the inner knob when locking, the spindle 196 is rotated, and washer 190 in the inner knob assembly, by virtue of its square hole 192 engaging the spindle 196, is rotated. The washer 190 rotates the washer 191 and this in turn rotates the shank 216. The circumferential slots 236 are thus disengaged from the stops 248, and the axial grooves 235 come into alignment with these stops. Spring 257 then ejects the shank, at which time the washer 238 and its tabs 241 will be withdrawn from locking engagement with the slots 258 of binding plate 215.

The same unlocking action is accomplished by turning the inner knob assembly counter-clockwise or opposite from the retaining motion.

When the locking washer 238 is disengaged from the binding plate 215, the hollow spindle 204 may be rotated to operate the door latch mechanism 214.

From the outside, by key, the small, longer spindle 196 can be then rotated, and this rotation will be communicated through the delayed action washers 190 and 191 in the outer knob assembly and the broached bore of the shank 160 to the hollow spindle 204.

If, instead of using the key for the purpose last described, the outer knob is turned after the lock is unlocked, the rotation is imparted through the shank 160 and the filler 178 to the hollow spindle 204 without utilizing the delayed action washers 190 and 191.

When in the extended (unlocked) position, rotation of the inner knob through the shank 216 results in rotation of the ring 247 as the stops 248 are in the axial grooves 235 of the shank as well as in the slots 242 of the bushing 243. Therefore, bushing 243 will be rotated, which in turn rotates washer 252 as the ears 253 are in the slots 254, the various parts then being rotationally keyed together. The washer 252 by reason of the broached hole 255 engaging the hollow spindle 204 will rotate the latter.

In Figure 28 is shown a binding plate 260 and a locking washer 261 which can be used in place of and which perform the same functions as the binding plate 215 and locking washer 238, respectively.

Except for attaching dimples, the binding plate 260 is flat instead of being formed with a depressed contour and is provided with slots 262 having inwardly struck plane ledges 263.

The locking washer 261 has the same form as the locking washer 238 except that the axial extensions of the legs 241 are omitted. In this case, the legs 264 terminate at their radial extremities 265.

During the locking phase of operation, the locking washer 261 is thrust toward the binding plate 260, and the legs 264 enter the slots 262 and engage the ledges 263, thus preventing the locking washer from rotating so long as it is held in the engaging position.

This modified form of binding plate and locking washer combination offers the advantage of simplicity and, from the standpoint of manufacturing, is preferable to the form first shown and described. One is equivalent to the other.

In its essential aspects the device for the purposes of illustration of the invention and not by way of limitation comprises an outer knob assembly retained in position by a binding plate 215 which also serves as a rotational restraining means for the inner knob assembly when in a locked position and as an attachment means for the inner knob assembly. Inner and outer knob assemblies are operatively associated with a tubular spindle 204.

The inner knob assembly in the extended position is free to rotate the tubular spindle which extends from the inner knob assembly through a latch unit into the outer knob assembly. In the retracted or inward position, members of the inner knob assembly mechanism engage with mating provisions in the binding plate preventing rotation of the hollow spindle. The inner knob assembly may be retained in the retracted or locking position by a slight rotation of the knob and shank subassembly which only is free to rotate independently of the hollow spindle when the inner knob assembly is in this innermost position. The effect of this slight rotational movement of knob and shank sub-assembly is to retain the inner knob assembly in locked position and to resist any rotation or impact forces which would tend to dislodge the locked parts.

There has thus been described a relatively simple privacy lock set featuring a series of independent discs in such relationship one with respect to another that by interconnecting them the lock is adjusted in one position and by disconnecting certain of the relationships the lock is adjusted to another position, locked or unlocked depending upon the initial construction and arrangement of the discs. The parts have herein been described as discs chiefly because as such they may be made of relatively small size and circumference to the end that they may be compacted neatly within a very small housing and hence encourage an inexpensive construction and convenient installation. Locking and unlocking of the lock set are accomplished by manipulation of the inner knob. It is more or less natural to

push or pull upon the knob if that movement is permitted and the natural tendency is to rotate the knob. Thus persons relatively unacquainted with its mechanism can readily learn its operation. Moreover, after being locked, the natural tendency of a person opening a door is to turn the knob and in the construction herein disclosed turning the knob is the motion which in fact unlocks the lock device. At the same time accidental lock-out is avoided by providing enabling means through the outer knob assembly for opening the door under special circumstances. Moreover, the device is well suited to doors of different thickness. For example, in the case of Figure 1 the spindle 34 will assume its own position subject to shifting to operative position by means of the spring 90. Hence the lock will make its own adjustment depending upon the width of the door and the inner and outer operating parts may be assembled together in the door merely by drawing up sufficiently on the bolts.

While I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A door lock comprising a latch bolt, a stationary portion, an outer operating device and an inner operating device operatively engaging said latch bolt, said inner operating device having axial movement to respective extended and retracted axial positions, either of said devices being operable to actuate the latch bolt when the inner operating device is in one axial position, a blocking mechanism operatively associated with the inner operating device adapted upon movement of the inner operating device when in said other position to block the outer operating device against latch bolt actuation and to retain said inner operating device in said other axial position, said blocking mechanism being releasable upon further rotation of the inner operating device, said blocking mechanism comprising coaxial members and interlocking elements on said members, said members in one position of rotation when the inner operating device is in said one axial position forming an engagement between the operating devices, said members in another position of rotation forming a disengaged relationship between the operating devices and an engagement between the outer operating device and the stationary portion of the lock.

2. A door lock comprising a latch bolt, a stationary portion, an outer operating device and an inner operating device operatively engaging said latch bolt, said inner operating device having axial movement to respective extended and retracted axial positions, either of said devices being operable to actuate the latch bolt when the inner operating device is in one axial position, a blocking mechanism operatively associated with the inner operating device adapted upon movement of the inner operating device when in the other axial position to block the outer operating device against latch bolt actuation and to retain said inner operating device in said other axial position, said blocking mechanism comprising coaxial members having elements thereon adapted to have interlocked relationship when the inner operating device is in said one axial position wherein the inner and outer operating devices are non-rotatably attached to each other and in latch actuating engagement, said elements having a mutually released relationship upon rotation of the inner operating device when the inner operating device is in said other axial position wherein the inner operating device is disengaged from latch actuation and one of said members is releasably engaged in non-rotatable relationship with the outer operating device and the stationary portion of the lock, said elements being disengaged from the stationary portion and re-engaged one with another upon further rotation of the inner operating device.

3. A door lock comprising a latch bolt, a stationary portion, an outer operating device and an inner operating device operatively engaging said latch bolt, said inner operating device having axial movement to respective extended and retracted axial positions, either of said devices being operable to actuate the latch bolt when the inner operating device is in one axial position, a blocking mechanism operatively associated with the inner operating device and adapted upon movement of the inner operating device when in said other axial position to block the outer operating device against latch bolt actuation and to retain said inner operating device in said other axial position, said blocking mechanism comprising a plurality of coaxial discs having rotation-inhibiting engagement in one axially shifted position and being released from said engagement in another axially shifted position.

4. A door lock comprising a latch bolt, a stationary portion, an outer operating device and an inner operating device operatively engaging said latch bolt, said inner operating device having axial movement to respective extended and retracted axial positions, either of said devices being operable to actuate the latch bolt when the inner operating device is in one axial position, a blocking mechanism operatively associated with the inner operating device and adapted upon movement of the inner operating device to said other axial position to block the outer operating device against latch bolt actuation and upon rotation of said inner operating device while in said other axial position to maintain said blocking relationship, said blocking mechanism comprising a plurality of coaxial discs, one of said discs being attached to the inner operating device, another of said discs being non-rotatably attached to the outer operating device, a third disc operatively associated with the other two discs, these three discs having one adjustment wherein when the inner operating device is in said one axial position all discs are locked together and another adjustment wherein when the inner operating device is in said other axial position the inner operating device disc is rotatably disconnected from the outer operating device disc, the outer operating device being then interlocked with the stationary portion of the lock.

5. A door lock comprising a latch bolt, a stationary portion, an outer operating device and an inner operating device operatively engaging said latch bolt, said inner operating device having axial movement to respective extended and retracted axial positions, either of said devices being operable to actuate the latch bolt when the inner operating device is in one axial position, a blocking mechanism operatively associated with the inner operating device adapted upon movement of the inner operating device when in said other position to block the outer operating device against latch bolt actuation and to retain said inner operating device in said other axial position, said blocking mechanism being releasable upon further rotation of the inner operating device, said blocking mechanism comprising coaxial members and interlocking elements on said members, said members in one position of rotation when the inner operating device is in said one axial position forming an engagement between the operating devices, said members in another position of rotation forming a disengaged relationship between the operating devices and an engagement between the outer operating device and the blocking mechanism, and means extending axially between the outer operating device and the blocking mechanism enabling unblocking of the outer operating device for latch operation.

6. A door lock comprising a latch bolt, a stationary portion, an outer operating device and an inner operating device operatively engaging said latch bolt, said in-

ner operating device having axial movement to respective extended and retracted axial positions, either of said devices being operable to actuate the latch bolt when the inner operating device is in one axial position, a blocking mechanism operatively associated with the inner operating device and adapted upon movement of the inner operating device when in said other axial position to block the outer operating device against latch bolt actuation and to retain said inner operating device in said other axial position, said blocking mechanism comprising a plurality of coaxial discs having one relationship when the inner operating device is in said one axial position wherein one of said discs is in engagement with said inner operating device, another of said discs is in non-rotatable engagement with the outer operating device and another of said discs is adapted to have a non-rotatable engagement with said first two discs wherein both operating devices are operatively connected to the latch bolt, said second and last identified disc being interlocked to the stationary portion of the lock when the inner operating device is in said other axial position wherein said outer operating device is blocked from latch bolt actuation, said blocking being releasable by further rotation of the inner operating device, and means extending axially between the outer operating device and the blocking mechanism enabling unblocking of the outer operating device for latch bolt operation.

7. A door lock comprising inner and outer operating assemblies, the inner operating assembly being axially movable to extended and retracted positions. means associated with said operating assemblies adapted to actuate a latch bolt upon rotation of either of said operating assemblies, means associated with said inner operating assembly adapted to block latch bolt actuating rotation of the outer operating assembly when said inner operating assembly is in one of the positions and to free said outer operating assembly for latch bolt actuating rotation when said inner operating assembly is in another position, catch means comprising relatively rotatable members mounted on the side of the door lock adjacent the inner operating assembly and operatively associated with said inner operating assembly, one of said rotatable members being operable by rotative motion of said inner operating assembly, said catch means being adapted when in engagement to releasably hold said inner operating assembly in the position which blocks the latch bolt actuating rotation of the outer operating assembly, and means within said outer operating assembly enabling unblocking of said outer operating assembly and thus free said outer operating assembly for latch bolt actuating rotation.

8. A door lock comprising inner and outer operating assemblies, the inner operating assembly being axially movable to extended and retracted positions, means associated with said operating assemblies adapted to actuate a latch bolt upon rotation of either of said operating assemblies, means associated with said inner operating assembly adapted to block latch bolt actuating rotation of the outer operating assembly when said inner operating assembly is in one of the positions and to free said outer operating assembly for latch bolt actuating rotation when said inner operating assembly is in another position, catch means within said inner operating assembly operable by rotative motion of said inner operating assembly adapted to releasably hold said inner operating assembly in the position which blocks the latch bolt actuating rotation of the outer operating assembly, yieldable means adapted to urge said inner operating assembly into said other position wherein the outer operating assembly is freed for latch bolt actuating rotation, and means within said outer operating assembly enabling unblocking of said outer operating assembly and thus free said outer operating assembly for latch bolt actuating rotation.

9. A door lock comprising inner and outer knob assemblies, the inner knob assembly being axially movable to extended and retracted positions, means associated with said knob assemblies adapted to actuate a latch bolt upon rotation of either of said knob assemblies, means associated with said inner knob assembly adapted to block latch bolt actuating rotation of either knob assembly upon retracted positioning of said inner knob assembly and to free said assemblies for latch bolt actuating rotation upon extended positioning of said inner knob assembly, catch means within said inner knob assembly operable by rotative motion of said inner knob assembly and adapted to releasably hold said inner knob assembly in retracted position, yieldable means adapted to urge said inner knob assembly into extended position when the catch means are released, a rotatable key actuatable lock associated with said outer knob assembly, and means interconnecting said rotatable lock and said catch means adapted to communicate key rotation of said rotatable lock to said catch means to release the same and free said inner knob assembly for movement to said extended position where both said knob assemblies are free for latch bolt actuating rotation.

10. A door lock comprising inner and outer knob assemblies, the inner knob assembly being axially movable to extended and retracted positions, means associated with said knob assemblies adapted to actuate a latch bolt upon major rotation of either of said knob assemblies, means associated with said inner knob assembly adapted to block major rotation of either knob assembly upon retracted positioning of said inner knob assembly and to free said knob assemblies for major rotation upon extended positioning of said inner knob assembly, catch means within said inner knob assembly adapted to releasably hold said inner knob assembly in retracted position, said catch means comprising mutually engageable stop elements adapted to be engaged or disengaged by relative longitudinal and minor relative rotative movement, the longitudinal movement occurring by axial movement of said inner knob assembly, and means for imparting said minor rotative movement, yieldable means adapted to urge said inner knob assembly into extended position when the catch means are released, a rotatable key actuatable lock associated with said outer knob assembly, and means interconnecting said rotatable lock and said catch menas adapted to communicate key rotation of said rotatable lock to said catch means to release the same and free said inner knob assembly for movement to said extended position where both said knob assemblies are free for major rotation.

11. A door lock comprising inner and outer knob assemblies, the inner knob assembly being axially movable to extended and retracted positions, means associated with said knob assemblies adapted to actuate a latch bolt upon major rotation of either of said knob assemblies, means associated with said inner knob assembly adapted to block major rotation of either knob assembly upon retracted positioning of said inner knob assembly and to free said knob assemblies for major rotation upon extended positioning of said inner knob assembly, catch means within said inner knob assembly adapted to releasably hold said inner knob assembly in retracted position, said catch means comprising mutually engageable stop elements adapted to be engaged or disengaged by relative longitudinal and minor relative rotative movement, the longitudinal movement occurring by axial movement of said inner knob assembly, and lost motion mechanism operatively associated with said stop elements to enable or impart said minor rotative movement, yieldable means adapted to urge said inner knob assembly into extended position when the catch means are released, a rotatable key actuatable lock associated with said outer knob assembly, and means interconnecting said rotatable lock and said catch means adapted to communicate key rotation of said rotatable lock to said catch means to release the same and free said inner knob as-

sembly for movement to said extended position where both knob assemblies are free for major rotation.

12. A door lock comprising inner and outer knob assemblies, the inner knob assembly being axially movable to extended and retracted positions, means associated with said knob assemblies adapted to actuate a latch bolt upon rotation of either of said knob assemblies, means associated with said inner knob assembly adapted to block latch bolt actuating rotation of either knob assembly upon and during retracted positioning of said inner knob assembly and to free said knob assemblies for latch bolt actuating rotation upon extended positioning of said inner knob assembly, catch means within said inner knob assembly operable by rotative motion of said inner knob assembly and adapted to releasably hold said inner knob assembly in retracted position, yieldable means adapted to urge said inner knob assembly into extended position when the catch means are released, a rotatable key actuatable lock associated with said outer knob assembly, and a spindle interconnecting said rotatable lock and said catch means adapted to communicate key rotation of said rotatable lock to said catch means to release the same and free said inner knob assembly for movement to said extended position where both said knob assemblies are free for latch bolt actuating rotation.

13. A door lock comprising inner and outer operating assemblies, the inner operating assembly being axially movable to extended and retracted positions, means associated with said knob assemblies adapted to actuate a latch bolt upon rotation of either of said operating assemblies, means associated with said inner knob assembly adapted to block latch bolt actuating rotation of the outer operating assembly when said inner operating assembly is in one position and to free said operating assemblies for latch bolt actuating rotation when said inner operating assembly is in another position, said last named means including a stationary plate having a stop thereon, and a member adapted to engage with or disengage from said stop, catch means within said inner operating assembly adapted to releasably hold said inner operating assembly in the position which blocks the outer operating assembly against latch bolt actuating rotation, yieldable means adapted to urge said inner operating assembly into unlocked position when the catch means are released, a rotatable key actuatable lock associated with said outer operating assembly, and means interconnecting said rotatable lock and said catch means adapted to communicate key rotation of said rotatable lock to said catch means to release the same and thus free said inner operating assembly for movement to the position wherein the outer operating assembly will be free for latch bolt actuating rotation.

14. A door lock comprising inner and outer operating assemblies, an intermediate plate adapted to abut against the inside of a door in which the lock is installed, means extending through the door adapted to secure the outer operating assembly to the plate, and means attaching the inner operating assembly to said plate, the inner operating assembly being axially movable to extended and retracted positions, means associated with said operating assemblies adapted to actuate a latch bolt upon major rotation of either of said knob assemblies, means associated with said inner operating assembly adapted to block major rotation of outer operating assembly when said inner operating assembly is in one position and to free said operating assemblies for a major rotation when said inner operating assembly is in another position, catch means within said inner operating assembly adapted to releasably hold said inner operating assembly in the position which blocks latch bolt actuating rotation of the outer operating assembly, said catch means comprising mutually engageable stop elements adapted to be engaged or disengaged by relative axial and minor relative rotative movement of said inner operating assembly, and means to enable or impart said minor rotative movement,

yieldable means adapted to urge said inner operating assembly into said other position when the catch means are released, a rotatable key actuatable lock associated with said outer operating assembly, and means interconnecting said rotatable lock and said catch means adapted to communicate key rotation of said rotatable lock to said catch means to release the same and thus free said inner operating assembly for movement to said other position.

15. A door lock comprising inner and outer operating assemblies, a fixed plate intermediate said assemblies, the inner operating assembly being axially movable to extended and retracted positions, means associated with said operating assemblies adapted to actuate a latch bolt upon rotation of either of said operating assemblies, said means including a tubular spindle, means associated with said inner operating assembly adapted to block latch bolt actuating rotation of the outer operating assembly when the inner operating assembly is in one position and to free said operating assemblies for latch bolt actuating rotation when the inner operating assembly is in another position, said last named means including a stop on said fixed plate, and a rotatable member having a complementary stop adapted to engage with or disengage from the stop on said fixed plate, catch means within said inner operating assembly adapted to releasably hold said inner operating assembly in one position, yieldable means adapted to urge said inner operating assembly into the other position, a rotatable key actuatable lock associated with said outer operating assembly, and a second spindle longer than and passing through said tubular spindle interconnecting said rotatable lock and said catch means adapted to communicate key rotation of said rotatable lock to said catch means to release the same and free said inner operating assembly for movement to said other position where both said operating assemblies are free for latch bolt actuating rotation.

16. A door lock comprising inner and outer operating assemblies, the inner operating assembly being axially movable to extended and retracted positions, means associated with said operating assemblies adapted to actuate a latch bolt upon major rotation of either of said operating assemblies, means associated with said inner operating assembly and adapted to block latch bolt actuating rotation of the outer operating assembly when said inner operating assembly is in one of the positions and to free said operating assemblies for major rotation when said inner operating assembly is in another of the positions, said inner operating assembly having a minor rotative movement, catch means within said inner operating assembly adapted to releasably hold said inner operating assembly in said one of the positions, said catch means comprising mutually engageable stop elements adapted to be engaged and disengaged by said axial and said minor rotative movement of the inner operating assembly, and means within said outer operating assembly enabling the unblocking of said outer operating assembly and thus free said outer operating assembly for latch bolt actuating rotation.

17. A door lock comprising inner and outer operating assemblies, the inner operating assembly being axially movable to extended and retracted positions, means associated with said operating assemblies adapted to actuate a latch bolt upon major rotation of either of said operating assemblies, means associated with said inner operating assembly adapted to block latch bolt actuating rotation of the outer operating assembly when said inner operating assembly is in one of the positions and to free said operating assemblies for major rotation when said inner operating assembly is in another of the positions, said inner operating assembly having a minor rotative movement, catch means within said inner operating assembly adapted to releasably hold said inner operating assembly in said one of the positions, said catch means comprising mutually engageable stop elements adapted

to be engaged and disengaged by said axial and said minor relative rotative movement of the inner operating assembly, lost motion mechanism operatively associated with said stop elements to enable said minor rotative movement of said inner operating assembly, and means within said outer operating assembly enabling the unblocking of said outer operating assembly and thus free said outer operating assembly for latch bolt actuating rotation.

18. A door lock comprising inner and outer operating assemblies, the inner operating assembly being axially movable to extended and retracted positions, means associated with said operating assemblies adapted to actuate a latch bolt upon major rotation of either of said operating assemblies, means associated with said inner operating assembly adapted to block latch bolt actuating rotation of the outer operating assembly when said inner operating assembly is in one of the positions and to free said operating assemblies for major rotation when said inner operating assembly is in another of the positions, said inner operating assembly having a minor rotative movement, catch means within said inner operating assembly adapted to releasably hold said inner operating assembly in said one of the positions, said catch means comprising mutually engageable stop elements adapted to be engaged and disengaged by said axial and said minor relative rotative movement of the inner operating assembly, lost motion mechanism operatively associated with said stop elements to enable or impart said minor rotative movement of said inner operating assembly, yieldable means between the inner operating assembly and a stationary portion of the device adapted to urge said inner operating assembly into the position which frees the outer operating assembly for latch bolt actuating rotation, and means within said outer operating assembly enabling the unblocking of said outer operating assembly and thus free said outer operating assembly for latch bolt actuating rotation.

19. A door lock comprising inner and outer operating assemblies, the inner operating assembly being axially movable to extended and retracted positions, means associated with said operating assemblies adapted to actuate a latch bolt upon rotation of either of said operating assemblies, means associated with said inner operating assembly adapted to block latch bolt actuating rotation of the outer operating assembly when said inner operating assembly is in one of the positions and to free said outer operating assembly for latch bolt actuating rotation when said inner operating assembly is in another position, catch means within said inner operating assembly operable by rotative motion of said inner operating assembly adapted to releasably hold said inner operating assembly in the position which blocks the latch bolt actuating rotation of the outer operating assembly, yieldable means adapted to urge said inner operating assembly into said other position wherein the outer operating assembly is freed for latch bolt actuating rotation, means within said outer operating assembly enabling the unblocking of the outer operating assembly and thus free said outer operating assembly for latch bolt actuating rotation, said last-mentioned means including a rotatable key actuatable lock associated with said operating assembly and a spindle interconnecting said actuatable lock and said catch means adapted to communicate key rotation of said rotatable lock to said catch means to release the same and thus free said inner operating assembly for movement to the position where the outer operating assembly will be free for latch bolt actuating rotation.

20. In a door lock which includes an outer operating device and an inner operating device, either being operable to actuate a latch bolt when in unlocked condition and the outer operating device being non-operable to actuate the latch bolt when in locked condition, the inner operating device having a shank axially movable to one position for establishing unlocked condition and to another position for establishing locked condition, a spindle engaging said latch bolt, a stationary fixed plate intermediate the outer operating device and the inner operating device and having a stop thereon, said spindle including a locking washer provided with an element adapted to engage said stop whereby the spindle is locked against rotation, and means adapted to rotationally interlock said spindle and said shank absolutely when the shank is in said one position but adapted to free said shank for non-latch bolt actuating rotation at which time the locking washer engages the stop when the shank is in said other position.

21. In a door lock which includes a latch bolt, an outer operating device and an inner operating device, either being operable to actuate the latch bolt when in unlocked condition and the outer operating device being non-operable to actuate the latch bolt when in locked condition, the inner operating device being axially movable to one position for establishing unlocked condition and to another position for establishing locked condition, a spindle engaging said latch bolt, a stationary fixed plate intermediate the outer operating device and the inner operating device and having a stop thereon, said inner operating device including a shank and a locking washer provided with an element adapted to engage said stop, a rotatable but axially stationary member having a means for rotationally interlocking said locking washer, shank and spindle when the shank is in said one position but maintaining freedom of said shank for non-latch actuating rotation while in said other position, and yieldable means urging said shank toward said one position and means within said outer operating device to unlock same.

22. A door lock comprising inner and outer knob assemblies, the inner knob assembly being axially movable to extended and retracted positions, means associated with said knob assemblies adapted to actuate a latch bolt upon major rotation of either of said knob assemblies, means associated with said inner knob assembly adapted to block rotation of the outer knob assembly and major rotation of the inner knob assembly upon retracted positioning of said inner knob assembly and to free said knob assemblies for major rotation upon extended positioning of said inner knob assembly, catch means within said inner knob assembly adapted to releasably hold said inner knob assembly in retracted position, said catch means comprising a longitudinally fixed member provided with a stop, and a cooperating slidable and rotatable member having an axial groove merging into a transverse groove, the two members being positioned so that longitudinal movement of the last named member toward the fixed member will bring the transverse groove into alignment with the stop and a minor rotational movement of the slidable and rotatable member will engage the stop in the transverse groove and block withdrawal of the slidable and rotatable member from the stop except by counter rotation of said last named member, yieldable means adapted to urge said inner knob assembly into extended position when the catch means are released, a rotatable key actuatable lock associated with said outer knob assembly, and means interconnecting said rotatable lock and said catch means adapted to communicate key rotation of said rotatable lock to said catch means to release the same and free said inner knob assembly for movement to said extended position where it is free to rotate.

23. A door lock comprising inner and outer knob assemblies, the inner knob assembly being axially movable to extended and retracted positions, means associated with said knob assemblies adapted to actuate a latch bolt upon major rotation of either of said knob assemblies, means associated with said inner knob assembly adapted to block rotation of the outer knob assembly and major rotation of the inner knob assembly upon retracted posi-

tioning of said inner knob assembly and to free said assemblies for major rotation upon extended positioning of said inner knob assembly, catch means within said inner knob assembly adapted to releasably hold said inner knob assembly in retracted position, said catch means comprising a longitudinally fixed member provided with a stop, and a cooperating slidable and rotatable member having an axial groove merging into a transverse groove, the two members being positioned so that longitudinal movement of the last named member toward the fixed member will bring the transverse groove into alignment with the stop and a minor rotational movement of the slidable and rotatable member will engage the stop in the transverse groove and block withdrawal of the slidable and rotatable member from the stop except by counter rotation of said last named member, and lost motion mechanism operatively associated with said fixed member and said slidable and rotatable member to enable or impart to the last named member said minor rotational movement, yieldable means adapted to urge said inner knob assembly into extended position when the catch means are released, a rotatable key actuatable lock associated with said outer knob assembly, and means interconnecting said rotatable lock and said catch means adapted to communicate key rotation of said rotatable lock to said catch means to release the same and free said inner knob assembly for movement to said extended position where it is free to rotate.

24. In a door lock comprising inner and outer knob assemblies coupled with a door latch bolt actuatable by rotation of either knob assembly and in which there is a rotatable key actuatable lock associated with the outer knob assembly, and in which there is a tubular spindle common to both assemblies which when held against rotation blocks the outer knob from being rotated and thereby the latch bolt from being actuated and which when rotated is effective to actuate the latch bolt, the improvement which comprises: an inner knob and shank unit axially retractable and extensible and rotatable, means holding the tubular spindle against rotation when said unit is in retracted position, and releasable catch means adapted to hold said unit in retracted position, said catch means comprising a fixed stop ring provided with a stop, a groove in the knob and shank unit presenting a transverse shoulder engageable with the stop when the unit is moved to retracted position and slightly rotated, a lost motion mechanism retained within said inner knob and shank unit, a second spindle longer than and passing through the tubular spindle interconnecting said rotatable lock and said lost motion mechanism enabling the slight rotation of said knob and shank unit by slight rotation of the inner knob assembly to engage the stop and shoulder while the spindles remain stationary, said delayed action mechanism comprising a first washer, and a complementary washer non-rotatably contained within the knob and shank unit, said washers being provided with parts interengageable for rotation of one by the other after slight loss of motion.

25. A door lock comprising inner and outer knob assemblies, a fixed plate intermediate said assemblies, the inner knob assembly being axially movable to extended and retracted positions, means associated with said knob assemblies adapted to actuate a latch bolt upon rotation of either of said knob assemblies, said means including a tubular spindle, means associated with said inner knob assembly adapted to block latch bolt actuating rotation of either knob assembly upon retracted positioning of said inner knob assembly and to free said knob assemblies for latch bolt actuating rotation upon extended positioning of said inner knob assembly, said last named means including a stop on said fixed plate, a locking washer provided with an element adapted to engage said stop, a bushing having a slot receiving said element for rotationally interlocking said locking washer and bushing, means rotationally interlocking said bushing and said tubular spindle, a knob shank, and catch means adapted to rotationally interlock said bushing and said knob shank absolutely when the shank is in extended position but adapted to free said knob shank for non-latch actuating rotation within said bushing when the shank is in retracted position, said catch means being also adapted to releasably hold said inner knob assembly in retracted position, yieldable means adapted to urge said inner knob assembly into extended position when the catch means are released, a rotatable key actuatable lock associated with said outer knob assembly, a second spindle longer than and passing through said tubular spindle interconnecting said rotatable lock and said catch means adapted to communicate key rotation of said rotatable lock to said catch means to release the same and free said inner knob assembly for movement to said extended position where both said knob assemblies are free for latch actuating rotation.

26. A door lock comprising inner and outer knob assemblies, a fixed plate intermediate said assemblies, the inner knob assembly being axially movable to extended and retracted positions, means associated with said knob assemblies adapted to actuate a latch bolt upon rotation of either of said knob assemblies, said means including a tubular spindle, means associated with said inner knob assembly adapted to block latch bolt actuating rotation of either knob assembly upon retracted positioning of said inner knob assembly and to free said knob assemblies for latch bolt actuating rotation upon extended positioning of said inner knob assembly, said last named means including a stationary fixed plate having a stop thereon, a locking washer provided with an element adapted to engage said stop, a bushing having a slot receiving said element for rotationally interlocking said locking washer and bushing, means rotationally interlocking said bushing and said tubular spindle, a knob shank, and catch means adapted to rotationally interlock said bushing and said knob shank absolutely when the shank is in extended position but adapted to free said knob shank for non-latch bolt actuating rotation within said bushing when the shank is in retracted position, said last named means comprising a ring with a radial stop engaged in said bushing slot, an axial slot in the shank aligned with the said slot in the bushing and having an angular offset, the said ring stop engaging in the axial portion of the shank slot when the shank is in extended position and engaging with limited rotational play in the said offset when the shank is in retracted position, said catch means being also adapted to releasably hold said inner knob assembly in retracted position, yieldable means adapted to urge said inner knob assembly into extended position when the catch means are released, a rotatable key actuatable lock associated with said outer knob assembly, a second spindle longer than and passing through said tubular spindle interconnecting said rotatable lock and said catch means adapted to communicate key rotation of said rotatable lock to said catch means to release the same and free said inner knob assembly for movement to said extended position where both said knob assemblies are free for latch bolt actuating rotation.

27. In a door lock which includes an outer operating device and an inner knob assembly, either being operable to actuate a latch bolt when in unlocked condition and the other operating device being non-operable to actuate the latch bolt when in locked condition, the inner knob assembly being axially movable to extended position for establishing unlocked condition and to retracted position for establishing locked condition, a tubular spindle engaging said latch bolt, a stationary fixed plate intermediate the outer operating device and the inner knob assembly and having a stop thereon, said inner knob assembly including a locking washer provided with an element adapted to engage said stop, a rotatable sleeve bushing having a slot receiving said element for rota-

tionally interlocking said locking washer and bushing, means rotationally interlocking said bushing and said tubular spindle, an inner knob shank, and means adapted to rotationally interlock said bushing and said knob shank absolutely when the shank is in extended position but adapted to free said knob shank for non-latch actuating rotation within said bushing when the shank is in retracted position, said last named means comprising a ring with a radial stop engaged in said bushing slot, an axial slot in the shank aligned with the said slot in the bushing and having an angular offset, the said ring stop engaging in the axial portion of the shank slot when the shank is in extended position and engageable with limited rotational play in the said offset when the shank is in retracted position.

28. In a door lock which includes an outer operating device and an inner operating device, either being operable to actuate a latch bolt when in unlocked condition and the outer operating device being non-operable to actuate the latch bolt when in locked condition, the inner knob assembly being axially movable to one position for establishing unlocked condition and to another position for establishing locked condition, a spindle engaging said latch bolt, a stationary fixed plate intermediate the outer operating device and the inner operating device and having a stop thereon, said inner operating device including a locking washer provided with an element adapted to engage said stop, a rotatable sleeve bushing having a slot receiving said element for rotationally interlocking said locking washer and bushing, means rotationally interlocking said spindle comprising a washer mounted on said spindle in non-rotational relation thereto and provided with an extending ear, ear engaging means on said bushing, a shank, and means adapted to rotationally interlock said bushing and said shank absolutely when the shank is in said one position but adapted to free said shank for non-latch actuating rotation within said bushing when the shank is in said other position, said last named means comprising a ring with a radial stop engaged in said bushing slot, an axial slot in the shank aligned with the said slot in the bushing and having an angular offset, the said ring stop engaging in the axial portion of the shank slot when the shank is in said one position and engageable with limited rotational play in the said offset when the shank is in said other position.

29. In a door lock which includes an outer operating device and an inner operating device, either being operable to actuate a latch bolt when in unlocked condition and the outer operating device being non-operable to actuate the latch bolt when in locked condition, the inner operating device being axially movable to one position for establishing unlocked condition and to another position for establishing locked condition, a spindle engaging said latch bolt, a stationary fixed plate intermediate the outer operating device and the inner operating device and having a stop thereon, said inner operating device including a locking washer provided with an element adapted to engage said stop, a rotatable sleeve bushing having a slot receiving said element for rotationally interlocking said locking washer and bushing, means rotationally interlocking said bushing and said spindle, a shank, said shank being rotatably and slidably supported in said bushing, means adapted to rotationally interlock said bushing and said shank absolutely when the shank is in said one position but adapted to free said shank for non-latch actuating rotation within said bushing when the shank is in said other position, said last named means comprising a ring with a radial stop engaged in said bushing slot, an axial slot in the shank aligned with the said slot in the bushing and having an angular offset, the said ring stop engaging in the axial portion of the shank slot when the shank is in said one position and engageable with limited rotational play in the said offset when the shank is in said other position, and yieldable means housed in said bushing urging said knob shank toward said one position.

30. In a door lock which includes an outer operating device and an inner operating device, either being operable to actuate a latch bolt when in unlocked condition and the outer operating device being non-operable to actuate the latch bolt when in locked condition, the inner operating device being axially movable to one position for establishing unlocked condition and to another position for establishing locked condition, a spindle engaging said latch bolt, a stationary fixed plate intermediate said outer operating device and inner operating device and having a stop thereon, said inner operating device including a locking washer provided with an element adapted to non-rotatably engage said stop, means operatively associated with said locking washer to block rotation of said spindle when said locking washer element is engaged with the stop on said fixed plate, a shank unit forming part of said inner operating device, said inner operating device including means adapted for mounting on a door and providing a rotatable and slidable support for said shank unit, said locking washer being rotatably supported on a portion of said shank unit whereby said inner shank unit can be rotated for non-latch bolt actuating movement when the locking washer is non-rotatably engaged with the fixed plate.

31. In a door lock which includes an outer operating device and an inner knob assembly, either being operable to actuate a latch bolt when in unlocked condition and the outer operating device being non-operable to actuate the latch bolt when in locked condition, the inner knob assembly being axially movable to extended position for establishing unlocked condition and to retracted position for establishing locked condition, a tubular spindle engaging said latch bolt, a stationary fixed plate intermediate the outer operating device and the inner knob assembly and having a stop thereon, said inner knob assembly including a locking washer provided with an element adapted to engage said stop, a rotatable but axially stationary bushing having a slot receiving said element for rotationally interlocking said locking washer and bushing, means rotationally interlocking said bushing and said tubular spindle, an inner knob shank, said knob shank being rotatably and slidably supported in said bushing, means adapted to rotationally interlock said bushing, said stationary fixed plate and said locking washer when the knob shank is in the retracted position but maintaining freedom of said knob shank for non-latch actuating rotation while in said retracted position, and yieldable means housing said bushing urging said knob shank toward extended position.

32. In a door lock which includes a latch bolt, an outer operating device and an inner operating device, either being operable to actuate the latch bolt when in unlocked condition and the outer operating device being non-operable to actuate the latch bolt when in locked condition, the improvement which comprises: a shank unit axially retractable and extensible and rotatable, a spindle engaging said latch, a stationary fixed plate intermediate said outer operating device and inner operating device and having a stop thereon, said inner operating device including a locking washer provided with an element adapted to non-rotatably engage said stop, means operatively associated with said locking washer to block rotation of said spindle when said locking washer element is engaged with the stop on said fixed plate, a shank unit rotatably and slidably supported within said inner operating device, said locking washer being rotatably supported on a portion of said shank unit whereby said shank unit can be rotated for non-latch bolt actuating movement when the locking washer is non-rotatably engaged with the fixed plate.

33. In a door lock which includes an outer operating device and an inner knob assembly, either being operable to actuate a latch bolt when in unlocked condition and the outer operating device being non-operable to actuate the latch bolt when in locked condition, the inner knob as-

sembly being axially movable to extended position for establishing unlocked condition and to retracted position for establishing locked condition, a tubular spindle engaging said latch bolt, a stationary fixed plate intermediate the outer operating device and the inner knob assembly and having a stop thereon, said inner knob assembly including a locking washer provided with an element adapted to engage said stop, a rotatable but axially stationary bushing having a slot receiving said element for rotationally interlocking said locking washer and bushing, means rotationally interlocking said bushing and said tubular spindle, an inner knob shank, said knob shank being rotatably and slidably supported in said bushing, means adapted to rotationally interlock said bushing and said knob shank absolutely when the shank is in extended position and with lost motion when the shank is in retracted position, and yieldable means housed in said bushing urging said knob shank toward extended position.

34. A door lock comprising inner and outer operating assemblies, the inner operating assembly being axially movable to extended and retracted positions, means associated with said operating assemblies adapted to actuate a latch bolt upon major rotation of either of said operating assemblies, means associated with said inner operating assembly adapted to block latch bolt actuating rotation of the outer operating assembly when said inner operating assembly is in one of the positions and to free said operating assemblies for major rotation and related latch bolt actuating rotation when said inner operating assembly is in another of the positions, catch means within said inner operating assembly adapted to releasably hold said inner operating assembly in the position which blocks latch bolt actuating rotation of the outer operating assembly, said catch means comprising a longitudinally fixed member provided with a longitudinally fixed surface and a cooperating rotatable member provided with a transverse surface, the two last identified members being positioned so that longitudinal movement of the rotating member toward the fixed member will bring the transverse surface into alignment with the longitudinally fixed surface and a minor rotational movement of the rotatable member will engage the said two surfaces and block withdrawal of the rotatable member from the longitudinally fixed member except by rotation of said rotatable member to a free position, yieldable means adapted to urge said inner operating assembly into the position which frees the outer operating assembly for latch bolt actuating rotation, and means within said outer operating assembly enabling the unblocking of said outer operating assembly and thus free said outer operating assembly for latch bolt actuating rotation.

35. A door lock comprising inner and outer operating assemblies, the inner operating assembly being axially movable to extended and retracted positions, means associated with said operating assemblies adapted to actuate a latch bolt upon major rotation of either of said operating assemblies, means associated with said inner operating assembly adapted to block latch bolt actuating rotation of the outer operating assembly when said inner operating assembly is in one of the positions and to free said operating assemblies for major rotation and related latch bolt actuating rotation when said inner operating assembly is in another of the positions, catch means within said inner operating assembly adapted to releasably hold said inner operating assembly in the position which blocks latch bolt actuating rotation of the outer operating assembly, said catch means comprising a longitudinally fixed member provided with a longitudinally fixed surface and a cooperating rotatable member provided with a transverse surface, the two last identified members being positioned so that longitudinal movement of the rotating member toward the fixed member will bring the transverse surface into alignment with the longitudinally fixed surface and a minor rotational movement of the rotatable member will engage the said two surfaces and block withdrawal of the rotatable member from the longitudinally fixed member except by rotation of said rotatable member to a free position, and a lost motion mechanism operatively associated with said fixed member and said rotatable member to enable or impart said minor rotational movement to the rotatable member, yieldable means adapted to urge said inner operating assembly into the position which frees the outer operating assembly for latch bolt actuating rotation, and means within said outer operating assembly enabling the unblocking of said outer operating assembly and thus free said outer operating assembly for latch bolt actuating rotation.

36. In a door lock comprising inner and outer operating assemblies coupled with a door latch bolt actuatable by rotation of either operating assembly and in which there is a rotatable key actuatable lock associated with the outer operating assembly, and in which there is a tubular spindle common to both assemblies which when held against rotation blocks the outer operating assembly from being rotated and thereby the latch bolt from being actuated and which when rotated is effective to actuate the latch bolt, the improvement which comprises: a shank unit axially on the inner operating assembly retractable and extensible and rotatable, means holding the tubular spindle against rotation when said unit is in retracted position, and releasable catch means adapted to hold said unit in retracted position, said catch means comprising a longitudinally fixed member provided with a longitudinally fixed surface and a cooperating rotatable member provided with a transverse surface engageable with the longitudinally fixed transverse surface when the rotatable member is moved toward the fixed member and slightly rotated, a lost motion mechanism retained within said inner operating assembly, a second spindle longer than and passing through the tubular spindle interconnecting said rotatable lock and said lost motion mechanism enabling the slight rotation of said inner operating assembly to engage the transverse surfaces while the spindles remain stationary, said delayed action mechanism comprising a first washer, and a complementary washer nonrotatably contained within the inner operating assembly, said washers being provided with parts interengageable for rotation of one by the other after slight loss of motion.

37. A door lock comprising inner and outer operating assemblies, a fixed plate intermediate said assemblies, the inner operating assembly being axially movable to extended and retracted positions, means associated with said operating assemblies adapted to actuate a latch bolt upon rotation of either of said operating assemblies, said means including a tubular spindle, means associated with said inner operating assembly adapted to block latch bolt actuating rotation of the outer operating assembly when the inner operating assembly is in one position and to free said operating assemblies for latch bolt actuating rotation when the inner operating assembly is in another position, said last named means including a stop on said fixed plate, a locking washer provided with a stop element adapted to engage said stop, means adapted to rotationally join together said locking washer and tubular spindle when the stop element on the locking washer is engaged with the stop on the fixed plate, and catch means adapted to rotationally join the tubular spindle to the inner operating assembly or to disengage the inner operating assembly from the tubular spindle, said catch means being also adapted to releasably hold said inner operating assembly in position which blocks latch bolt actuating rotation by the outer operating assembly, yieldable means adapted to urge said inner operating assembly into the position which faces the outer operating assembly for latch bolt actuating rotation when the catch means are released, a rotatable key actuatable lock associated with said

outer operating assembly, a second spindle longer than and passing through said tubular spindle interconnecting said rotatable lock and said catch means adapted to communicate key rotation of said rotatable lock to said catch means to release the same and free said inner operating assembly for movement to said position where both said operating assemblies are free for latch bolt actuating rotation.

References Cited in the file of this patent

UNITED STATES PATENTS

1,804,482	Reif	May 12, 1931
1,940,018	Rymer	Dec. 19, 1933
2,185,863	Miller	Jan. 2, 1940
2,482,926	Milligan	Sept. 27, 1949
2,484,961	Russell	Oct. 18, 1949