March 20, 1962 H. F. GEORGE 3,025,694

LATCHING AND LOCKING MECHANISM

Filed Sept. 19, 1960 4 Sheets-Sheet 1

Fig. 1.

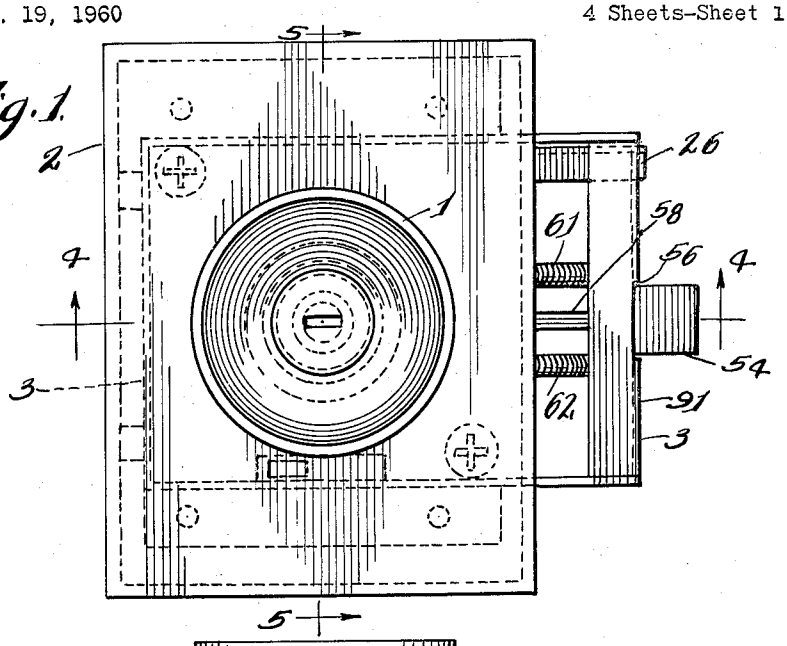
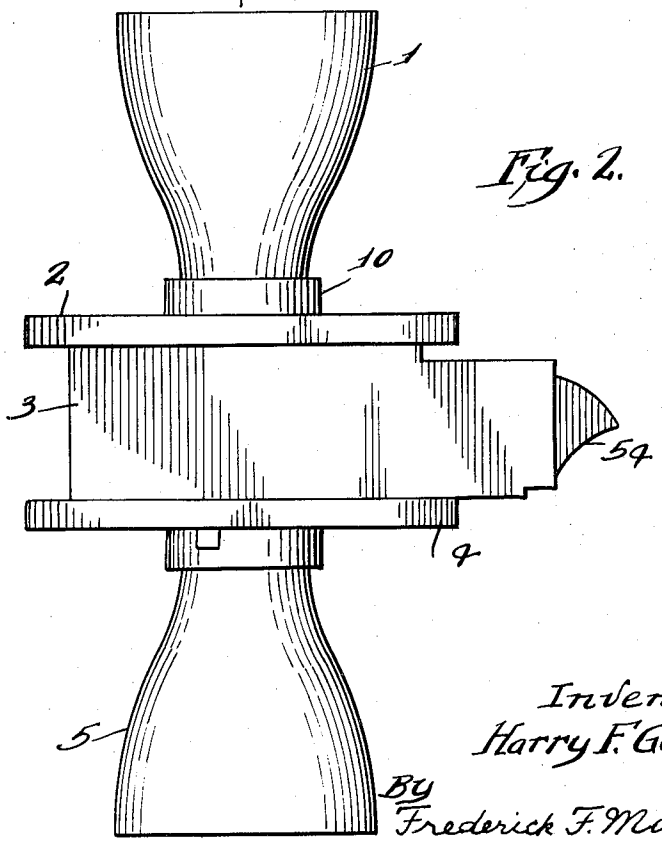


Fig. 2.

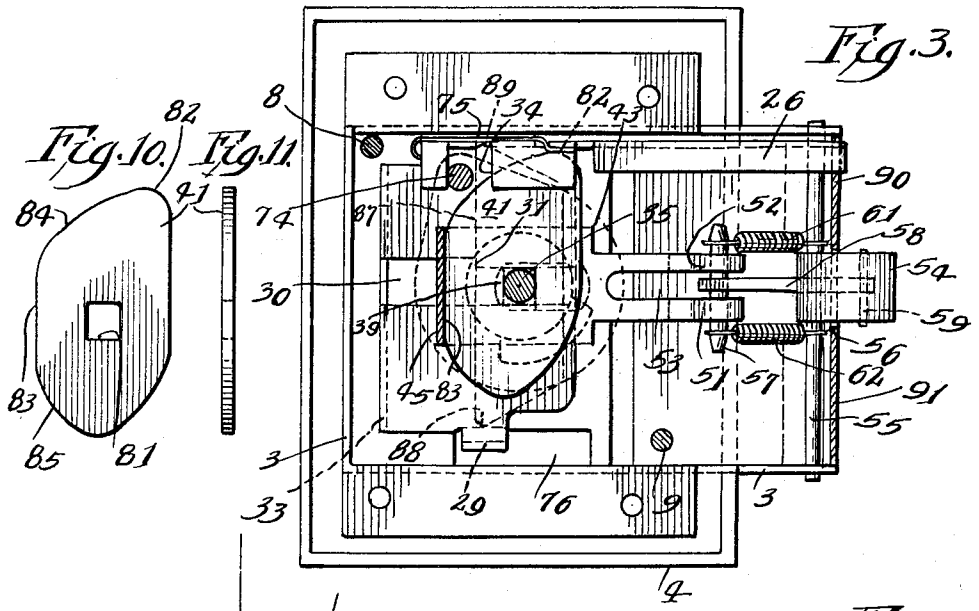


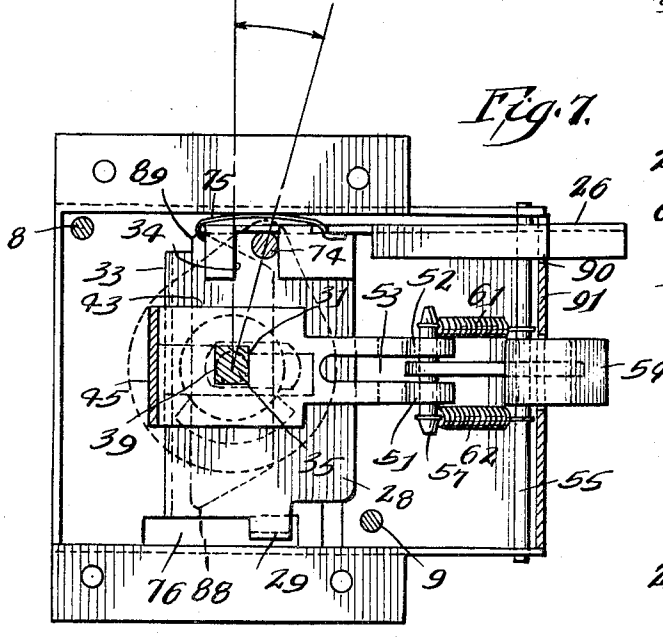
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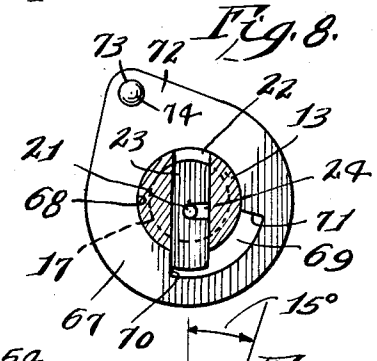
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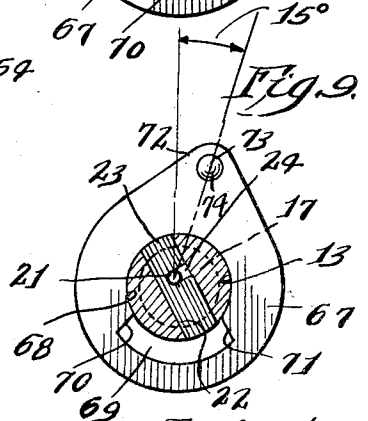
LATCHING AND LOCKING MECHANISM

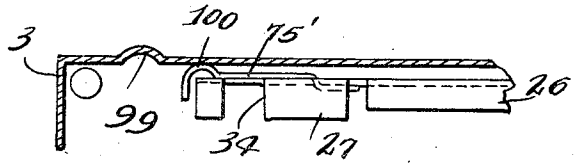
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LATCHING AND LOCKING MECHANISM

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Fig. 4.

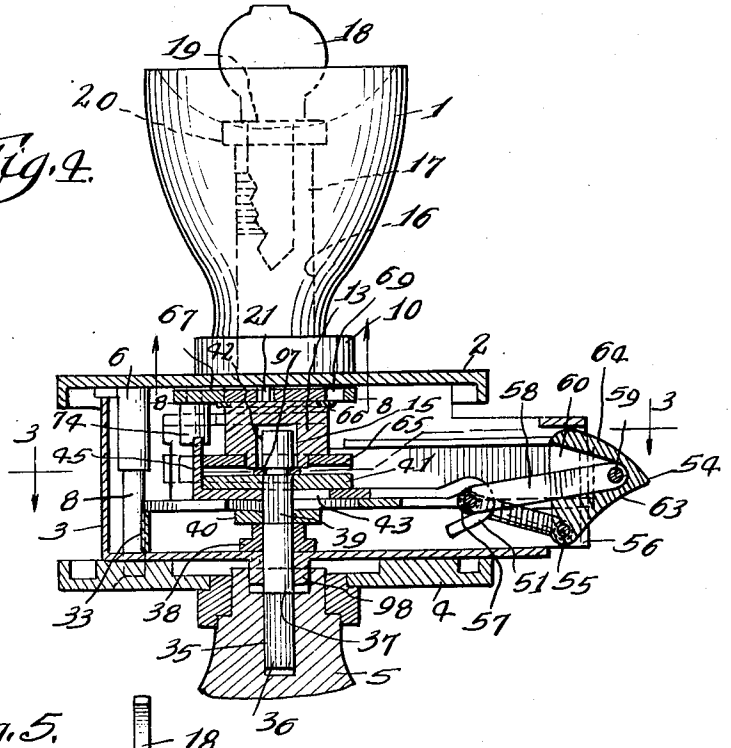


Fig. 5.

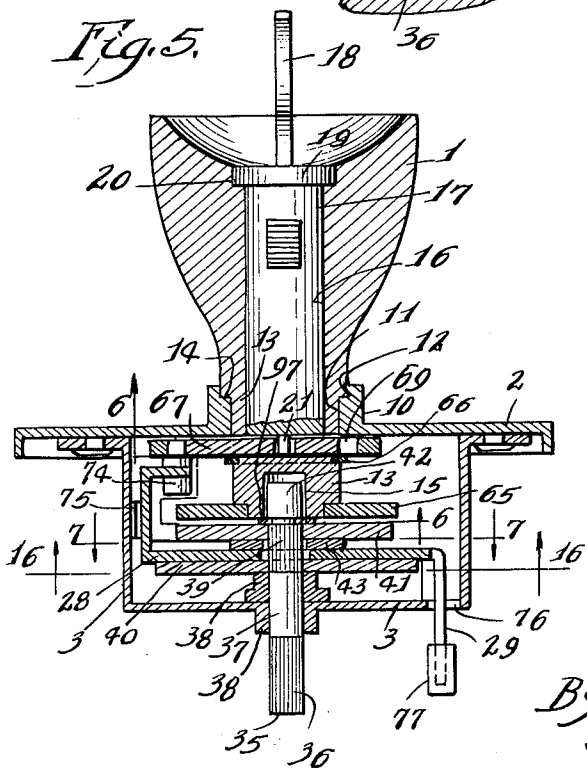
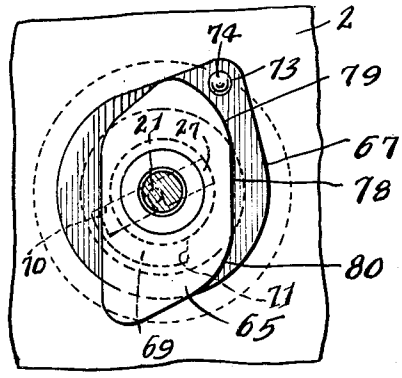


Fig. 6



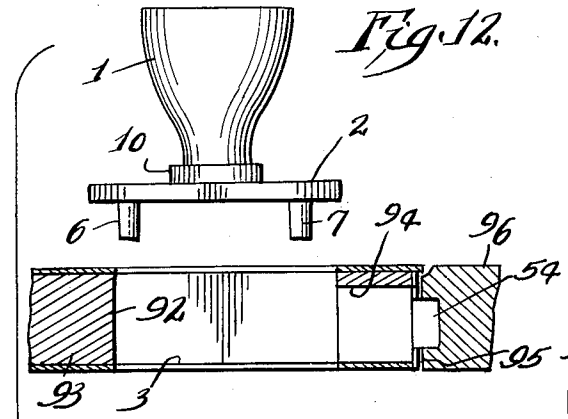
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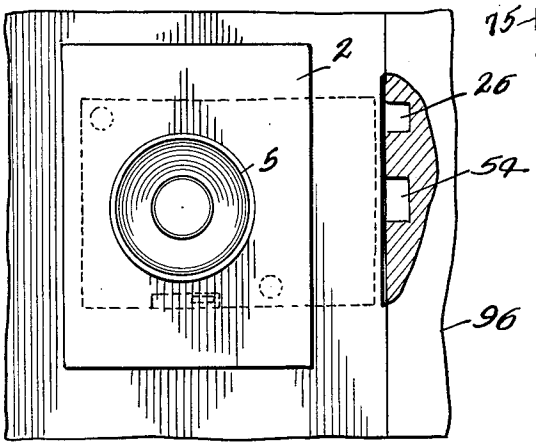
March 20, 1962 H. F. GEORGE 3,025,694

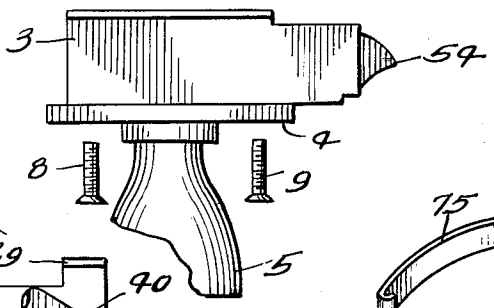
LATCHING AND LOCKING MECHANISM

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Fig. 12.







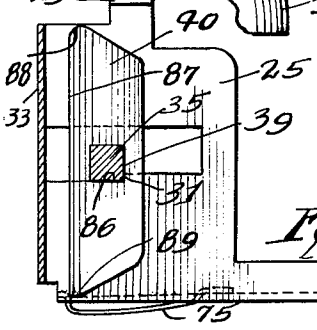


Fig. 13.

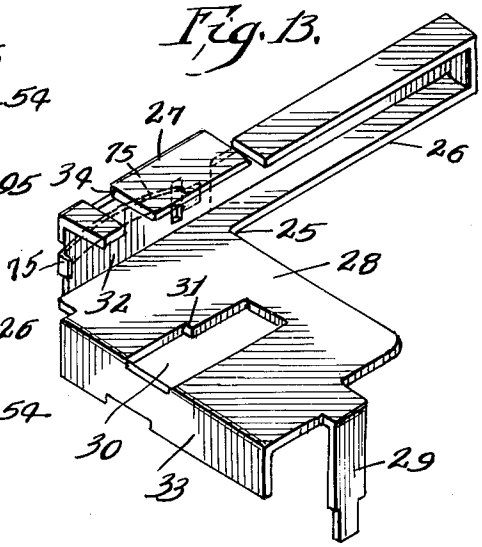


Fig. 14

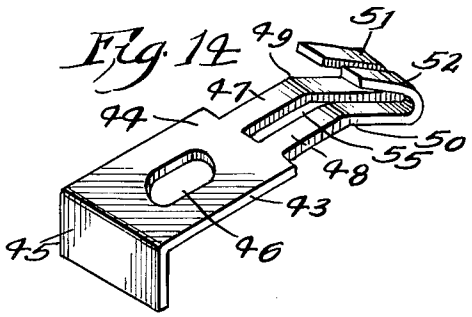


Fig. 15.

Fig. 16.

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United States Patent Office 3,025,694 Patented Mar. 20, 1962

3,025,694

LATCHING AND LOCKING MECHANISM

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Filed Sept. 19, 1960, Ser. No. 56,894
16 Claims. (Cl. 70—107)

This invention relates to improved latching and locking mechanism for doors and similar structures, and is applicable for use in doors made of metal, wood, or other suitable material.

The present invention is an improvement over those of my Patent 3,009,347, granted to me November 21, 1961, and Patent 2,803,957, granted to me August 27, 1957.

In the present days of high labor costs and high prices, it is necessary in the latching and locking mechanism industry, that such mechanism be so constructed as to be economical, as well as efficient in operation, and capable of quick and easy installation in the door or the like. It is also of vital importance to be able to easily and quickly open a locked door from the inside, in case of fire or other emergency, by merely rotating the inner knob or handle in either direction without any confusion of complicated operation, even though the door has been locked by a key from the outside, and the key removed and carried elsewhere.

Among the objects of my invention are: to provide a new and improved latching and locking mechanism; to provide a novel mechanism for locking the door by a key from the outside, or by finger means from the outside; to provide a knob controlled dead-bolt having the desired leverage without strain on the key which might break the key off in the lock; to provide a panic release from the inside of a door that has been locked by a key from the outside, which release may be operated merely by turning the inside knob in either direction; to provide means whereby the relative movements of the latch bolt and the dead-bolt are so timed that a longer travel of the dead-bolt can be used with a smaller travel of the latch bolt; to provide a latching and locking mechanism that can be manufactured as a self-contained unit with no adjustments being necessary during installation in the door; to provide a latching and locking mechanism that is economical to manufacture, easy to install, efficient in operation, is attractive in appearance, sturdy in construction, and smooth and reliable in operation; and such further objects, advantages and capabilities, inherently possessed by my invention, as will later more fully appear.

My invention further resides in the combination, construction and arrangement of parts illustrated in the accompanying drawings, and while I have shown therein a preferred embodiment I wish it understood that the same is susceptible of modification and change without departing from the spirit of the invention.

In the drawings:

FIG. 1 is a side elevation looking toward the outside of my improved latching and locking mechanism.

FIG. 2 is a bottom plan view looking toward the bottom of FIG. 1.

FIG. 3 is a vertical longitudinal section on the line 3—3 of FIG. 4, and showing the dead-bolt retracted, but showing the dead-bolt unit in elevation, and the crank plate in dotted lines.

FIG. 4 is a horizontal longitudinal section on the line 4—4 of FIG. 1, with the outer knob shown in elevation, and the inner knob in section and partly broken away.

FIG. 5 is a vertical transverse section on the line 5—5 of FIG. 1, but omitting the inner knob.

FIG. 6 is a fragmentary detail view looking from the zig zag line 6—6 of FIG. 5, but being reversed in position because of being turned over to show the inside.

FIG. 7 is a vertical longitudinal section on the line 7—7 of FIG. 5, and showing the dead-bolt projected, but showing the latch bolt, the connections of the latch bolt with the pull bar, and the dead-bolt unit, in elevation.

FIG. 8 is a vertical section on the line 8—8 of FIG. 4, showing the actuator crank plate, the outer knob shaft, and the lock bar, in relative position when the dead-bolt is in retracted position.

FIG. 9 is a detail view similar to FIG. 8, but showing the parts when the dead-bolt is in projected position.

FIG. 10 is a face view of one of the cams in my device.

FIG. 11 is an edge view of FIG. 10.

FIG. 12 is an exploded view showing how the outside knob, the inside knob, and the housing of the device, are mounted in the door.

FIG. 13 is a perspective view of the dead-bolt unit.

FIG. 14 is a perspective view of the pull bar for the latch bolt, but in inverted position.

FIG. 15 is a detail perspective view of the leaf spring for normally urging the dead-bolt unit into locked position when the dead-bolt is projected.

FIG. 16 is a section on the line 16—16 of FIG. 5, but omitting the housing.

FIG. 17 is a fragmentary vertical section showing a modified form of the spring for urging the dead-bolt unit to move laterally, and its detent connection with the housing.

In the form illustrated in the drawings, my latching and locking mechanism includes an outer knob 1 rotatably mounted in an outer plate 2, a housing 3, an inner plate 4 in which is rotatably mounted an inner knob 5, the outer and inner plates 2 and 4 being secured together on opposite faces of the door by internally threaded posts 6 and 7 and threaded screws 8 and 9, the housing 3 also being secured by this means between said outer and inner plates. The mechanism contained within the housing 3 for operating the latch bolt and the dead-bolt will be described in detail as this description proceeds.

As seen in FIG. 5, the outer plate 2 is formed with an outstanding integral collar 10 formed with a cylindrical bore 11 having in its outer end a counterbore 12. The outer knob 1 is preferably tapered inwardly and at its inner end is formed with a decreased diameter portion 13 or shaft, which is rotatably mounted in bore 11. At the outer end of the reduced diameter shaft 13 is an outwardly extending annular shoulder 14 which rotatably seats in said counterbore 12. The shaft 13 of the outer knob 1 extends through the collar 10 and outer plate 2 into the interior of housing 3 for a distance approximately one-half the distance between the outer plate 2 and the inner plate 4, it, at its inner end, being formed with a central cylindrical opening 15 extending axially part way thereinto as seen in FIGS. 4 and 5.

The outer knob 1 is formed with an axially extending central cylindrical opening 16 within which is rotatably mounted a tumbler lock shaft 17, the tumbler lock thereof being operated by a key 18 for rotation with relation to the outer knob 1 when desired. The tumbler lock shaft is held against axial movement in knob 1 by a collar 19 mounted in a complemental counterbored annular seat 20. The inner end of the tumbler lock shaft 17 terminates flush with the inner face of the outer plate 2 and has fixed thereto a longitudinally extending eccentrically mounted pin 21. The shaft 13 of the outer knob 1 is formed with a transversely extending opening 22 in which is slidably mounted a lock bar 23 equal in length to the diameter of the shaft 13. The upper face of lock bar 23, as viewed in FIGS. 4 and 5, is approximately in sliding contact with the inner end of tumbler lock shaft 17 and adjacent portions of the inner face of the outer plate 2. Lock bar 23 is provided with a laterally extending slot 24 of a length a little more than half the width of the lock bar and opening out of one edge thereof, as seen in FIGS. 8 and 9.

The eccentric pin 21 is seated in slot 24 so that when the shaft 17 is rotatably moved the lock bar 23 will slide in the transverse opening 22 in the shaft 13 of the outer knob 1, for a purpose later more fully described.

Slidably mounted within the housing 3 for movement toward and from the latch bolt side of the housing, is a dead-bolt unit designated generally at 25 in FIG. 13, and comprising the dead-bolt 26, the operating flange 27, the table portion 28, the manually operable finger 29, and the slot 30 having on one of its side edges a locking shoulder 31 for a purpose later more fully described. The dead-bolt unit table 25 and dead-bolt 26 are preferably integrally formed of sheet metal bent into the described shape by die-stamping machinery. The operating flange 27 is bent at right angles to the web member 32 which in turn is bent at right angles to the table portion 28, flange 27 extending inwardly over said table portion. Table portion 28 is formed at its rear end with a downwardly extending flange 33 of a depth to slidably rest on the bottom of the housing 3 and be pushed rearwardly by one of the cams, as later more fully explained. The upper face of dead-bolt 26 is at a lower level than the upper face of operating flange 27 to properly position the dead-bolt with relation to the housing as well as to better proportion its size. The operating flange 27 is formed adjacent its rear end with a laterally extending slot 34 to movably receive a crank pin for moving the dead-bolt as later more fully explained.

Extending inwardly through the inner plate 4 and the bottom of the housing 3, as viewed in FIG. 4, is a shaft 35 which has a square cross-section at 36 to be inserted into a square hole in the inner knob, a cylindrical portion 37 to be rotatably mounted in the bottom of the housing and the spacer block 38, a square cross-section portion 39 to fixedly receive the inner cam 40 and the intermediate cam 41, and at its innermost end a cylindrical portion 42 to have free rotational movement in the cylindrical axial opening 15 in the inner end of the shaft 13 of the outer knob 1. The slot 30 in the dead-bolt unit table 28 is sufficiently larger than the square portion 39 of shaft 35 to permit rotation of said square portion therein, and the slot to have sliding movement with relation to shaft 35.

In FIG. 14 is a pull bar 43, shown for clarity in upside-down position with relation to its position in FIGS. 4 and 5. Pull bar 43 is formed of sheet metal having a flat face 44 adapted to slidably contact the upper face of the dead-bolt table portion 28 as viewed in FIGS. 4 and 5, and at its rear end is formed with a flange 45 extending at right angles to the flat face 44 in a direction toward the outer plate 2. Pull bar 43 is also formed with a slot 46 of a width sufficiently greater than the square portion 39 of shaft 35 to permit rotation of this square portion therein, and of a length to provide for the necessary latching operation of the mechanism. Extending forwardly from the forward edge of the pull bar and in the same plane therewith are a pair of spaced apart arms 47 and 48 which at points 49 and 50 are bent upwardly, as viewed in FIG. 4, at a slight angle for a short distance and then are curved backwardly to form a pair of laterally spaced apart hooks 51 and 52. This construction results in a longitudinal slot 53 extending the entire distance between said arms and hooks for a purpose later more fully explained.

Latch bolt 54 is pivotally mounted adjacent its lower edge, as viewed in FIG. 4, on rod 55 which at its ends is mounted in the side walls of the housing 3 adjacent the forward end thereof and just within the front wall of the housing. The latch bolt 54 is thus mounted to swing inwardly and outwardly through a complemental opening 56, formed in the front wall of the housing 3. A short rod 57 is positioned in the bights of the two hooks 51 and 52 to extend a short distance beyond each of the outer edges of said hooks, as seen in FIGS. 3 and 7. Fulcrumed on rod 57 is a connecting bar 58 which has edgewise swinging movement in the slot 53, and at its opposite end is fulcrumed to a pin 59 fixed in the latch bolt 54 to

extend across a slot 60 in the latch bolt. This provides articulation between the respective ends of the connecting bar 58 and the latch bolt 54 and the pull bar 43. A pair of coil springs 61 and 62 are each connected at one end to the rod 57 and at the other end to the rod 55, outside of the pair of hooks 51 and 52 and the latch bolt 54, to return the parts to neutral position upon release of turning power on the knobs 1 and 5, to normally place the latch bolt 54 in projected position.

In the form illustrated in the drawings, the door opens outwardly, see FIG. 4, and as the door swings shut the cam surface 63 rides over the complemental edge of an opening in the metal of the door frame, and causes the latch bolt 54 to swing inwardly of the housing until the latch bolt clears the metal of the door frame until the door is closed, at which time the coil springs 61 and 62 cause the latch bolt to normally move to projected position in the opening in the door frame with the surface 64 holding the door latched shut, until one or the other of the inner or outer knobs is turned for unlatching purposes.

Fixed to the inner end of the shaft 13 of the outer knob is a cam 65 which operates independently of the cams on inner shaft 35 when the outer knob is rotated, because of the freewheeling of the cylindrical portion 42 of inner shaft 35 in the hole 15 in the inner end of the outer knob shaft 13. To prevent the shaft 13 from being pulled outwardly of the outer plate 2, said shaft 13 is formed with a circumferential groove within which is mounted a spring ring 66 just inside of the inner face of the actuator crank plate 67. Actuator crank plate 67 is formed with a cylindrical central opening 68 rotatably mounted on the shaft 13 between the inner face of the outer plate 2 and the spring ring 66, see FIGS. 4 and 5. Opening 68 in the actuator crank plate 67 is extended at one side to form an arcuate recess or slot 69 communicating with opening 68 to receive the adjacent end of lock bar 23 when the tumbler lock shaft 17 is rotated under action of the key 18. Rotation of lock shaft 17 will, under action of the eccentric pin 21, slide the lock bar 23 into or out of said arcuate recess or slot 69 as desired. When the end of lock bar 23 is extended into arcuate recess 69, and the shaft 13 is rotated in one direction or the other, an edge of said end of the lock bar 23 will contact either one end wall 70 of the arcuate recess, or the other end wall 71 thereof, depending upon the direction of rotation of the outer knob 1. Continued rotation of the outer knob will consequently cause rotation of the actuator crank plate in one direction or the other as desired.

Actuator crank plate 67 is extended in a diametric direction on one side of its opening 68 at 72, diametrically opposite arcuate slot 69, which extended portion is formed with a hole 73 in which is fixed a crank pin 74 seated in slot 34 of the operating flange 27 of the dead-bolt unit 25. While not limited to these particular dimensions, I have obtained good results by forming the crank pin 74 to be of ¼ inch diameter, and the slot 34 to be ⅜ inch in width.

A leaf spring 75 is mounted on the back of the web member 32 of the dead-bolt unit, which spring is curved at one end to engage around the rear free edge of web member 32, and at the other end is formed with an offset portion to extend through a slot in said web member, said spring being bowed outwardly and positioned between said web member and the adjacent inner face of the housing 3 to normally urge the inner end of the dead-bolt unit toward shaft 35, see FIGS. 3, 5, 7, 13 and 15. The bottom wall of the housing 3 is formed with a slot 76 through which slidably extends the operating finger 29 of the dead-bolt unit 25. Slot 76 is of a length sufficient to permit movement of the operating finger 29 therein the necessary distance for projecting and retracting the dead-bolt 26, and of a width sufficient to give the necessary lateral play therein of the operating finger for compressing the leaf spring 75 to move the shoulder 31 of slot 30 free of the square shaft 39 to enable rearward

movement of the dead-bolt for retraction thereof, see FIG. 7. As seen in FIG. 5, the operating finger 29 is of sufficient length to protrude through the slot 76 a sufficient distance to receive the cap 77 and be available for easy grasping for manual operation of the dead-bolt unit and dead-bolt.

The structure and operation of the three cams 65, 41 and 40 will now be explained. As stated earlier, the cam 65 is fixed to rotate with the outer knob 1. Cam 65 has a straight edge 78 which normally contacts with the adjacent flat inner face of the flange 45 on the pull bar, see FIG. 4, so that rotation of the outer knob in either direction will rotate cam 65 to retract latch bolt 54 fast at first and then more slowly as one or the other curved portions 79—80 comes into contact with the pull bar flange 45, depending upon the direction of rotation of the outer knob. The position of the actuator crank plate 67 in FIGS. 4 and 6 is that which it occupies when the dead-bolt 26 is in retracted position, it being kept in mind that these parts are reversed in FIG. 6 with relation to FIGS. 3 and 7, because of FIG. 6 being turned over from right to left, or vice versa, for looking toward the inside of the outer plate 2.

Intermediate cam 41 is shown in FIGS. 3 and 10 as having a square hole 81 to be snugly fitted over the square portion 39 on shaft 35 so as to rotate with the inner knob 5. Cam 41 is similar in shape and size to cam 65 except that the former is turned over end for end with relation to the latter, so that the extended cam end 82 will be in contact with the inner surface of the web member 32 of the dead-bolt unit 25 when the latter is moved to extend the dead-bolt to projected position with the shoulder 31 having been pushed back of the square portion 39 of shaft 35 by action of the leaf spring 75. It should here be noted that the extended cam end 82 of cam 41 is sufficiently to the right of the center of rotation of shaft 35 to push the web member 32 and the dead-bolt unit 25 upwardly, as viewed in FIG. 3, to free the shoulder 31 from the square portion 39 of the shaft 35, and enable the dead-bolt to be moved rearwardly to retracted position, when the shaft 35 is rotated in a counterclockwise direction as viewed in FIG. 3, by rotation of the inner knob 5.

It is thus seen that the shoulder 31 serves as a releasable locking means to lock the dead-bolt 26 in projected position. As seen in FIGS. 3 and 10, cam 41 is provided on one side with a straight edge 83 which normally contacts with the adjacent flat inner face of the flange 45 on the pull bar, see FIGS. 3 and 4, so that rotation of the inner knob in either direction will rotate cam 41 to retract latch bolt 54 fast at first and then more slowly as one or the other curved portions 84—85 comes into contact with the pull bar flange 45, depending upon the direction of rotation of the inner knob.

Inner cam 40, see FIGS. 4, 5 and 16, is formed with a central square opening 86 of a size to snugly fit over the square portion 39 of shaft 35, so that rotation of the inner knob 5 will correspondingly rotate cam 40 which is positioned immediately adjacent the bottom face of the table portion 28 of the dead-bolt unit 25, as viewed in FIGS. 4, 5 and 13. Cam 40 is formed on its left hand edge, as viewed in FIG. 16, with a straight edge 87 which is longer than the opposite edge to form protruding end noses 88 and 89. When the dead-bolt 26 is in retracted position and the latch bolt 54 is in neutral projected position, the straight edge 87 of cam 40, as seen in FIG. 3, is substantially parallel to the back flange 33 of dead-bolt unit table 28 and some distance away therefrom, but closer thereto when the dead-bolt is in projected position because of the forward movement of the dead-bolt unit. As will be understood, the dead-bolt 26 is longitudinally slidable through a complemental hole 90 formed in the front wall 91 of the housing 3.

As seen in FIG. 12, the housing 3, with its assembled parts, is positioned in a rectangular hole 92 extending through the door 93, with the forward end of the housing being of less thickness than the main portion of the housing, as seen in FIGS. 2 and 4, and extended through an opening 94 of less thickness than the hole 92, so as to bring the front wall 91 of the housing against the metal skin covering on the free edge of the door which has complemental holes to slidably receive the latch bolt and the dead-bolt, so that when the door is closed the latch bolt 54 will enter its hole in the metal covering 95 of the door frame 96, and the dead-bolt 26 may be moved into and out of its hole in said metal covering of the door frame. When the housing and its parts are in position in the door, the outer and inner plates are properly applied to the housing and securely clamped together and to the door by the screws 8 and 9.

In order to maintain the cam 41, the pull bar 43, the dead-bolt table portion 28, the cam 40, and the spacer block 38, properly assembled with relation to each other on shaft 35 within the housing 3, a spring ring 97 is mounted in a circumferential groove in the shaft 35 just above the cam 41 as viewed in FIGS. 4 and 5, and a collar 98 fixed to shaft 35 just outside of the closed wall of the housing. The inner knob 5 with its square opening may be fixed onto the square portion 36 of the shaft 35 in any manner desired for their rotation together.

From the foregoing it is seen that the cam 65 is fixed to the outer knob to always be rotatable therewith in either direction for causing retraction of the latch bolt without rotating the inner shaft 35. Also that cam 41 is fixed to the inner knob to always be rotatable therewith for causing retraction of the latch bolt without rotating the outer knob. In other words the latch bolt may be retracted by either the outer knob or the inner knob, entirely independently each of the other, and without rotation of the other thereof. Also that the dead-bolt 26 can be projected and retracted either from the outside or the inside of the door. This is effected from the inside of the door by manual operation of the finger 29, which when pushed forwardly toward the free edge of the door will push the dead-bolt unit forwardly and project the dead-bolt 26, and when pushed rearwardly will retract the dead-bolt. In this connection it must be kept in mind that when the dead-bolt is fully projected it will be locked in that position by the shoulder 31 engaging behind the corner of the square portion 39 of the shaft 35. However, this can be unlocked from the inside of the door by merely pushing laterally on the operating finger 29 in a direction toward the shaft 35, see FIGS. 3 and 7, which will move the dead-bolt unit in that direction, compress the leaf spring 75, and remove the shoulder 31 from behind the shaft square portion, thus permitting the dead-bolt unit to be moved rearwardly and the dead-bolt retracted.

As seen in FIGS. 3 and 7, the crank pin 74, which is fixed to the crank arm 72 of the actuator crank plate 67 is positioned in the slot 34 in the operating flange 27 of the dead-bolt unit, with a play therein to further assist in unlocking the shoulder 31 from the square portion 39 of the inner shaft 35. When the dead-bolt is in retracted position and the lock bar 23 entirely within the circumferential area of the outer knob shaft 13, the crank pin 74 and the operating flange 27 with its slot 34 will be in the position shown in FIG. 3. At this time the outer knob 1 may be rotated in either direction to retract the latch bolt, for opening the door, without affecting the dead-bolt 26, because the outer knob shaft 13 rotates freely within the actuator crank plate 67 without imparting any movement to the crank arm 72 and crank pin 74.

If, however, it is desired to lock the door from the outside by projecting the dead-bolt 26, this may be done by inserting the key 18 in the tumbler lock shaft 17 in outer knob 1, and rotating it to move the lock bar 23 to carry one of its ends into arcuate slot 69, formed in the actuator crank plate 67, see FIG. 8, at which time the outer knob and its shaft 13 may be rotated in a clockwise direction, as viewed in FIG. 8, which will cause the end of lock

bar 23 which extends into arcuate slot 69 to contact the closed end 70 of slot 69. Continued rotation of the outer knob will cause rotation of the actuator crank plate 67 from the position shown in FIG. 8 to the position shown in FIG. 9, also see FIGS. 3 and 7, which through crank pin 74 will move the dead-bolt into projected position. When the dead-bolt is in projected position the center of the crank pin 74 will have moved through an angle of approximately 15 degrees beyond the vertical center line extending through the center of rotation of the outer knob, as seen in FIG. 9. This will be a sufficient movement to permit the shoulder 31 to drop behind the square portion of the shaft 35 as the dead-bolt reaches its projected position, to lock the dead-bolt against retraction. The key will then be turned back to its neutral position which will withdraw the end of the lock bar from the arcuate slot until it is desired to retract the dead-bolt. The key will be removed and retained by the operator until he wishes to unlock the door. While the 15 degrees referred to gives good results, applicant does not wish to be limited thereto.

When it is desired to unlock the locked door with a key from the outside, the key will be inserted in the tumbler lock shaft in the outer knob and rotated to move the lock bar 23 to again carry one of its ends into arcuate slot 69, and the outer knob will be rotated in a counterclockwise direction as viewed in FIG. 9. The protruded end of the lock bar 23 will thus contact the end 71 of arcuate slot 69, and continued rotation of the outer knob will rotate the actuator crank plate 67 and carry the crank pin 74 from the position shown in FIGS. 9 and 7 to the position shown in FIGS. 8 and 3. During this latter movement the crank pin will, in passing through the vertical centerline extending through the center of rotation of the outer knob shaft 13, see FIG. 9, move the operating flange 27 and the dead-bolt unit 25 upwardly, as viewed in FIG. 7, sufficiently to free the shoulder 31 from the square portion 39 of the shaft 35 and permit continued rotation of the outer knob in the same direction, to move the dead-bolt unit 25 and the dead-bolt 26 to retracted position. During this releasing action of the shoulder 31 from the square shaft, the leaf spring 75 is being compressed by the upward movement, as viewed in FIG. 7, of the crank pin against the web member 32 of the dead-bolt unit, and remains compressed until the dead-bolt is again moved to projected position. This will be understood in FIGS. 3 and 7.

The length of the arcuate slot 69 is such as to permit the return of the cams, knobs, and latch bolt to neutral position after movement of the dead-bolt in either direction, even though the lock bar end is in said arcuate slot at that time. Because of the freewheeling connection between the adjacent ends of the inner knob shaft 35 and the outer knob shaft 13, the inner knob and the outer knob are normally rotatable independently of each other. In other words the door may be unlatched from the outside by rotation of the outer knob in either direction, without rotation of the inner knob, and the door may be unlatched from the inside by rotation of the inner knob in either direction, without rotation of the outer knob. Also the door may be locked and unlocked by a key from the outside, and manually locked and unlocked from the inside by operation of the operating finger 29 even though it has been locked from the outside by a key and the key removed from the lock.

Furthermore, even though the door has been locked by a key from the outside and the key removed from the lock, the door may be unlocked from the inside in a natural manner merely by turning the inside knob in either direction, thus rendering it proof against panic from any emergency. Assuming the door to be locked from the outside by the key and the key removed from the lock, the turning of the inner knob in either direction, will, through rotation of the inner cam 40 and its contact with the back flange 33 of the dead-bolt unit, move the dead-bolt unit rearwardly and retract the dead-bolt. In order to free the shoulder 31 of the dead-bolt unit 25 from the square portion 39 of the shaft 35 at the beginning of this last mentioned rearward movement of the dead-bolt unit, it is pointed out that by rotation of the inner knob and its shaft 35 in a counterclockwise direction as viewed in FIG. 16, the nose 88 of cam 40 will swing against the back flange 33 of the dead-bolt unit 25 in such direction that the friction between these parts will set up such a downward component of force, as viewed in FIG. 16, as to free the shoulder 31 from the square portion 39 of the shaft, which action is facilitated by the direction of rotation of said square portion 39 being such as to further assist in such freeing operation.

Immediately upon release of shoulder 31 from the square portion of the shaft, the cam 40 will continue to rotate and push the dead-bolt unit rearwardly to its innermost position at which time the dead-bolt will be fully retracted. Release of the turning force on the inner knob, will, through the tension in coil springs 61 and 62, return the parts to neutral position.

Rotation of the inner knob in the opposite direction, to wit in a clockwise direction as viewed in FIG. 16, which would be a counterclockwise direction in FIGS. 3 and 7, would first release the shoulder 31 from behind the square portion 39 of the shaft 35 by the extended cam end 82 of the cam 41 pushing the web member 32 and the dead-bolt unit 25 upwardly as viewed in FIG. 3, and upon continuation of said rotation the nose 89 of cam 40 would swing against the back flange 33 of the dead-bolt unit 25, and carry same rearwardly to retract the dead-bolt.

It is thus seen that the door can be unlocked from the inside merely by turning the inside knob in either direction, even though the door has been locked by a key from the outside and the key removed from the lock, thus enabling quick escape from the inside of the door, even under panic conditions and with a locked door.

As seen in FIG. 17, the spring 75', which corresponds to spring 75, may be provided with detent means to prevent any accidental jarring or movement of the dead-bolt outwardly away from fully retracted position, as might happen during travel of mobile houses or trailers, or other more or less rough usage, etc. This detent means comprises an outwardly pressed cavity 99 formed in the wall of the housing at a suitable location adjacent the inner end of the operating flange 27 when the dead-bolt is in retracted position, and a similarly outward bowed portion 100 formed on the end of the spring 75' to snap into the cavity 99 when the dead-bolt reaches its fully retracted position. When it is desired to again project the dead-bolt, rotation of the outer knob after operation of the key, or application of a forwardly directed force on the operating finger 29, will cause the bowed portion 100 of the spring 75' to move out of the cavity 99 due to the resiliency of the spring and the curved surfaces of the contacting parts. In other respects the operation of spring 75' is the same as spring 75.

Having described my invention I claim:

1. A latching and locking mechanism, comprising, an outer knob having an inwardly extending shaft, an inner knob having a shaft extending toward said outer knob shaft and axially therewith, said outer knob shaft and inner knob shaft being rotatable independently of each other, a latch bolt movably mounted with relation to said knob shafts, means connected between said outer knob shaft and the latch bolt for moving the latch bolt to unlatched position upon rotation of the outer knob and its shaft independently of rotation of the inner knob and its shaft, means connected between said inner knob shaft and the latch bolt for moving the latch bolt to unlatched position upon rotation of the inner knob and its shaft independently of rotation of the outer knob and its shaft, a dead-bolt unit slidable with relation to said shafts, an actuator crank plate loosely mounted on the outer knob shaft, and means for selectively connecting the actuator crank plate for

rotation with the outer knob shaft for movement of the dead-bolt unit, or be free therefrom.

2. A latching and locking mechanism as claimed in claim 1, in which the inner end of the outer knob shaft is formed with a cylindrical axial bore, and the adjacent end of the inner knob shaft is formed with a cylindrical portion rotatably mounted in said bore for independent rotation therein, a flange on said dead-bolt unit, and a cam fixed to rotate with the inner knob shaft to engage said flange for retracting the dead-bolt unit upon rotation of the inner knob shaft.

3. A latching and locking mechanism, comprising, an outer knob having an inwardly extending shaft, an inner knob having a shaft extending toward said outer knob shaft and axial therewith, a latch bolt movably mounted with relation to said knob shafts, a pull bar connected to said latch bolt, a flange on the pull bar, a cam fixed to the inner end of the outer knob shaft and positioned close to said flange, a cam fixed to the inner knob shaft and positioned close to said flange, said two shafts being independently rotatable with relation to each other, whereby the latch bolt may be moved to unlatched position by rotation of either of said knobs independently of rotation of the other knob, a dead-bolt unit slidable with relation to said shafts, means selectively connecting the outer knob shaft and the dead-bolt unit for projecting and retracting said unit by rotation of the outer knob shaft, and a further cam fixed to the inner knob shaft for retracting the dead-bolt unit by rotation of the inner knob shaft.

4. A latching and locking mechanism as claimed in claim 3, in which said pull bar is formed with a slot slidable over the inner knob shaft to enable its longitudinal movement thereon to unlatched position upon rotation of either of said first two mentioned cams, spring means connected to said pull bar to return the pull bar and latch bar to latched position upon release of turning force to the respective knob, said dead-bolt unit being movable both longitudinally and laterally and having a slot formed with a shoulder for catching back of the inner knob shaft when the dead-bolt unit is fully projected, and means for moving said unit laterally to release said shoulder from back of the inner knob shaft by rotation of either the outer or inner shaft.

5. A latching and locking mechanism, comprising, an outer knob having an inwardly extending shaft, an inner knob having a shaft extending toward said outer knob shaft and axial therewith, a slidable dead-bolt unit having a dead-bolt fixed to move therewith, said two knob shafts being rotatable independently of each other, said dead-bolt unit having an upstanding web member, said web member having an operating flange formed with a slot, an actuator crank plate mounted on said outer knob shaft for loose rotation with relation thereto, means for selectively connecting the actuator crank plate to the outer knob shaft for rotation therewith when the outer knob shaft is rotated, and a crank pin fixed to said crank plate and positioned in said slot, whereby when the crank plate is rotatable with the outer knob shaft rotation of the outer knob will move the dead-bolt longitudinally into and out of projected position for locking and unlocking purposes, depending on the direction of rotation of the outer knob.

6. A latching and locking mechanism as claimed in claim 5, in which said means comprises said actuator crank plate being formed with an arcuate slot, said outer knob shaft being provided with a slidable lock bar, and the outer knob shaft being provided with a key-operated lock shaft and key, whereby rotation of said key in the lock shaft will move the lock bar into the arcuate slot for causing the actuator crank plate to be rotatable with the outer knob shaft for causing movement of said crank pin and dead-bolt unit.

7. A latching and locking mechanism, comprising, a housing, a dead-bolt unit longitudinally slidably mounted in said housing, an outer knob having an inwardly extending shaft, an inner knob having a shaft extending toward said outer knob shaft in axial alinement therewith but disconnected therefrom, a dead-bolt fixed to said dead-bolt unit, an actuator crank plate on said outer knob shaft, means connecting said actuator crank plate with said dead-bolt unit for longitudinaly moving the latter from rotation of the outer knob to carry the dead-bolt to projected position, a cam fixed to said inner knob shaft to move the dead-bolt unit and dead-bolt longitudinally of the housing to retracted position upon rotation of the inner knob independently of the outer knob and actuator crank plate, said housing having a slot in one face, and said dead-bolt unit having fixed thereto a finger which passes through the housing slot for operation of the dead-bolt unit and dead-bolt independently of the knob shafts.

8. A latching and locking mechanism as claimed in claim 7, including a latch bolt, a pull bar connected to said latch bolt and having a flange, said pull bar being slidable against one face of the dead-bolt unit, a second cam fixed to rotate with the inner knob shaft and contacting said flange and said dead-bolt unit, means locking the dead-bolt in projected position when said projected position is reached, said second cam releasing said locking means before operation of the first mentioned cam.

9. A latching and locking mechanism, comprising, an outer knob having an inwardly extending shaft, an inner knob having a shaft extending toward said outer knob shaft in axial alinement therewith but disconnected therefrom, a slidable dead-bolt unit having a dead-bolt fixed thereto, said dead-bolt unit having a slot slidable over said inner knob shaft and having a shoulder on one side edge, the inner knob shaft having a square cross-section portion in said slot, a latch bolt, a pull bar connected to said latch bolt and having a slot slidable over said square cross-section portion, a flange on said pull bar, a first cam fixed on said square cross-section portion to rotate therewith, said first cam contacting said flange and a projection on the dead-bolt unit, a flange on the rear edge of the dead-bolt unit, a second cam on the square cross-section portion adapted for contact with said dead-bolt unit flange, an actuator crank plate on the outer knob shaft, means connecting the actuator crank plate with the dead-bolt unit for movement of the dead-bolt unit and dead-bolt upon rotation of the outer knob shaft, and a key-operated lock in the outer knob shaft for connecting the actuator crank plate for rotation with the outer knob shaft and disconnecting it therefrom, whereby when the dead-bolt is projected by rotation of the outer knob shaft the shoulder on the edge of the dead-bolt unit slot will catch behind said square cross-section of the inner knob shaft to normally prevent retraction of the dead-bolt, but such retraction is made possible by rotation of the inner knob by the first cam moving the dead-bolt unit laterally to free said shoulder from the square portion of hte shaft, and the second cam retracting the dead-bolt unit and dead-bolt.

10. A latching and locking mechanism, comprising, a housing, a dead-bolt unit slidable in said housing, an outer knob having an inwardly extending shaft, an inner knob having a shaft extending toward said outer knob shaft in axial alinement therewith but disconnected therefrom, a dead-bolt fixed to said dead-bolt unit, said dead-bolt unit having a web member and an operating flange formed with a slot, an actuator crank plate rotatably mounted on the outer knob shaft, means for selectively connecting said actuator crank plate for rotation with the other knob shaft, or be free thereof, a crank pin fixed to said crank plate and positioned in said slot for sliding the dead-bolt unit longitudinally upon rotation of the outer knob to carry said dead-bolt to projected position, spring-pressed locking means for locking the dead-bolt in projected position, said crank pin being forwardly past dead-center with relation to the dead-bolt unit when said projected position is reached upon rotation of the outer knob in one direction, said crank pin pushing laterally against said web member to move the dead-bolt unit laterally and unlock said locking means as the crank pin is passing rearwardly past

dead-center in its return stroke upon rotation of the outer knob in the opposite direction.

11. A latching and locking mechanism as claimed in claim 10, in which said spring pressed locking means for locking the dead-bolt in projected position comprises a square cross-section portion on the inner knob shaft, and a shoulder on the dead-bolt unit seating back of said square cross-section portion, which shoulder is released from the square portion when the dead-bolt unit is moved laterally by said crank pin.

12. A latching and locking mechanism, comprising, a housing, an outer knob having an inwardly extending shaft, an inner knob having a shaft extending in axial aliement toward said outer knob shaft, said shafts being independently rotatable with relation to each other, a latch bolt pivotally mounted in a housing wall, a pull bar connected to said latch bolt, means on the inner knob shaft for moving the pull bar and latch bolt, means on the outer knob shaft for moving the pull bar and latch bolt, a dead-bolt unit and a dead-bolt slidable in said housing, key operated means in the outer knob shaft for moving the dead-bolt unit to move the dead-bolt to projected position, spring means for locking the dead-bolt in projected position, and means for unlocking the dead-bolt and moving it to retracted position either by rotation of the outer knob or by rotation of the inner knob.

13. A latching and locking mechanism, comprising, an outer knob having an inwardly extending shaft, an inner knob having a shaft extending toward said outer knob shaft in axial alinement therewith but disconnected therefrom, a latch bolt, a pull bar connected to said latch bolt, a cam fixed to said outer knob shaft for moving said pull bar and latch bolt, a cam fixed to the inner knob shaft for moving said pull bar and latch bolt, a dead-bolt unit slidable with relation to said shafts, a further cam fixed to said inner knob shaft for moving said dead-bolt unit in a retracting direction, and means for selectively connecting the outer knob shaft to the dead-bolt unit for movement of said unit forwardly and rearwardly, whereby said latch bolt and dead-bolt unit may be independently operated for retraction by either the outside knob or the inside knob without rotating the other.

14. A latching and locking mechanism as claimed in claim 13, in which said means includes a key-operated lock, a slidable lock bar, a crank plate, and a crank pin in driving connection with the dead-bolt unit.

15. A latching and locking mechanism, comprising, an outer knob having an inwardly extending shaft, an inner knob having a shaft extending in axial alinement toward said outer knob shaft, said shafts being independently rotatable with relation to each other, a latch bolt, an actuator crank plate on said outer knob shaft, a dead-bolt unit longitudinally slidable at right angles to said shafts, means including said actuator crank plate on said outer knob shaft for moving the dead-bolt unit upon rotation of the outer knob shaft, means on said outer knob shaft for moving the latch bolt upon rotation of the outer knob shaft, means on said inner knob shaft for moving the latch bolt upon rotation of the inner knob shaft, and means on the inner knob shaft for moving the dead-bolt unit to retracted position upon rotation of the inner knob shaft, said two mentioned means on the outer knob shaft being operable without any rotation of the inner knob shaft, and said two mentioned means on the inner knob shaft being operable without any rotation of the outer knob shaft.

16. A latching and locking mechanism as claimed in claim 15, in which the dead-bolt unit is provided with a flange on each of its two opposite faces, said actuator crank plate being connected with one of said flanges, and said means on the inner knob shaft for moving the dead-bolt unit being engageable with the other of said flanges.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,025,694 March 20, 1962

Harry F. George

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the heading to the printed specification, line 3, for "Harry F. George, 919 N. Michigan Ave., Park Ridge, Ill." read -- Harry F. George, Park Ridge, Ill., (919 N. Michigan Ave., Chicago 11, Ill.) --; column 1, line 30, for "outside", second occurrence, read -- inside --.

Signed and sealed this 10th day of July 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents