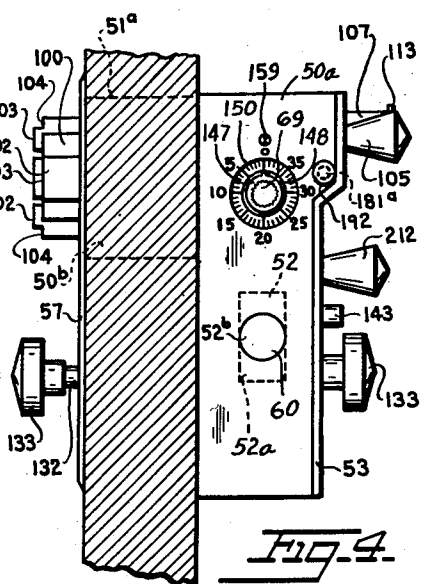
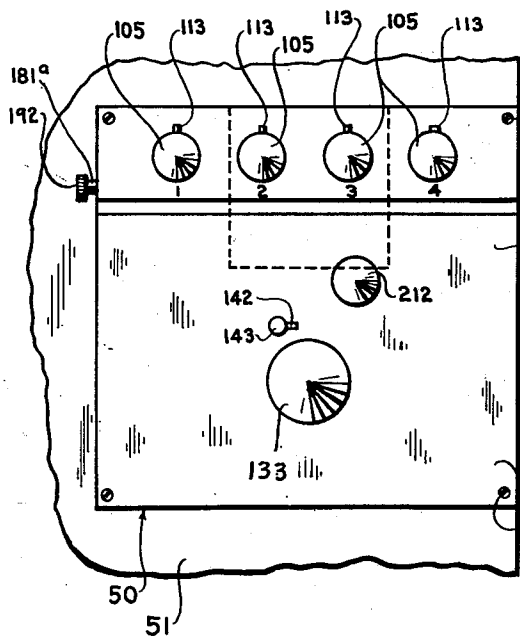
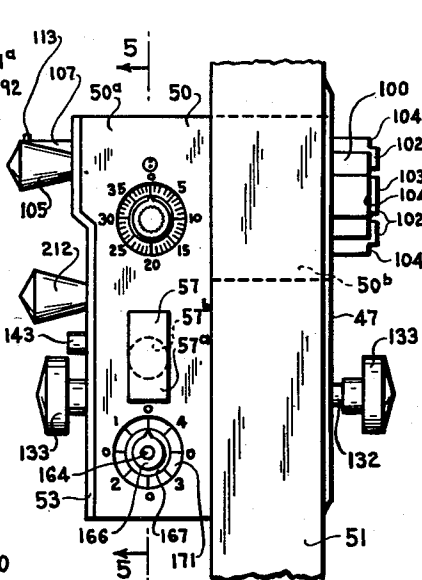
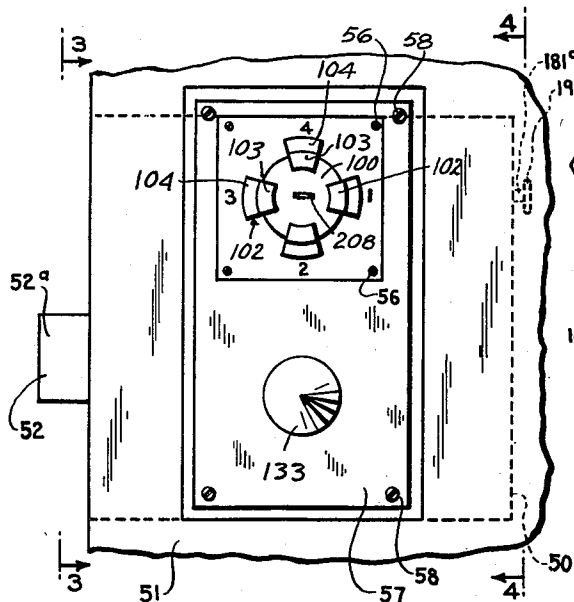


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COMBINATION OR KEY OPERABLE DOOR LOCK

8 Sheets-Sheet 1



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2,580,830

COMBINATION OR KEY OPERABLE DOOR LOCK

Filed Nov. 12, 1948

8 Sheets-Sheet 2

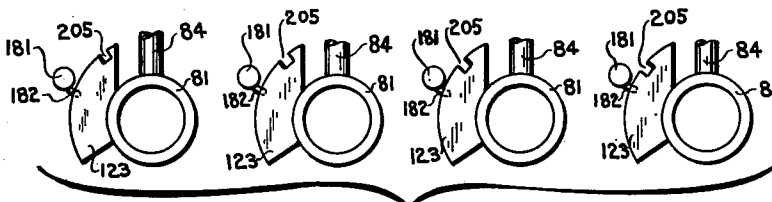
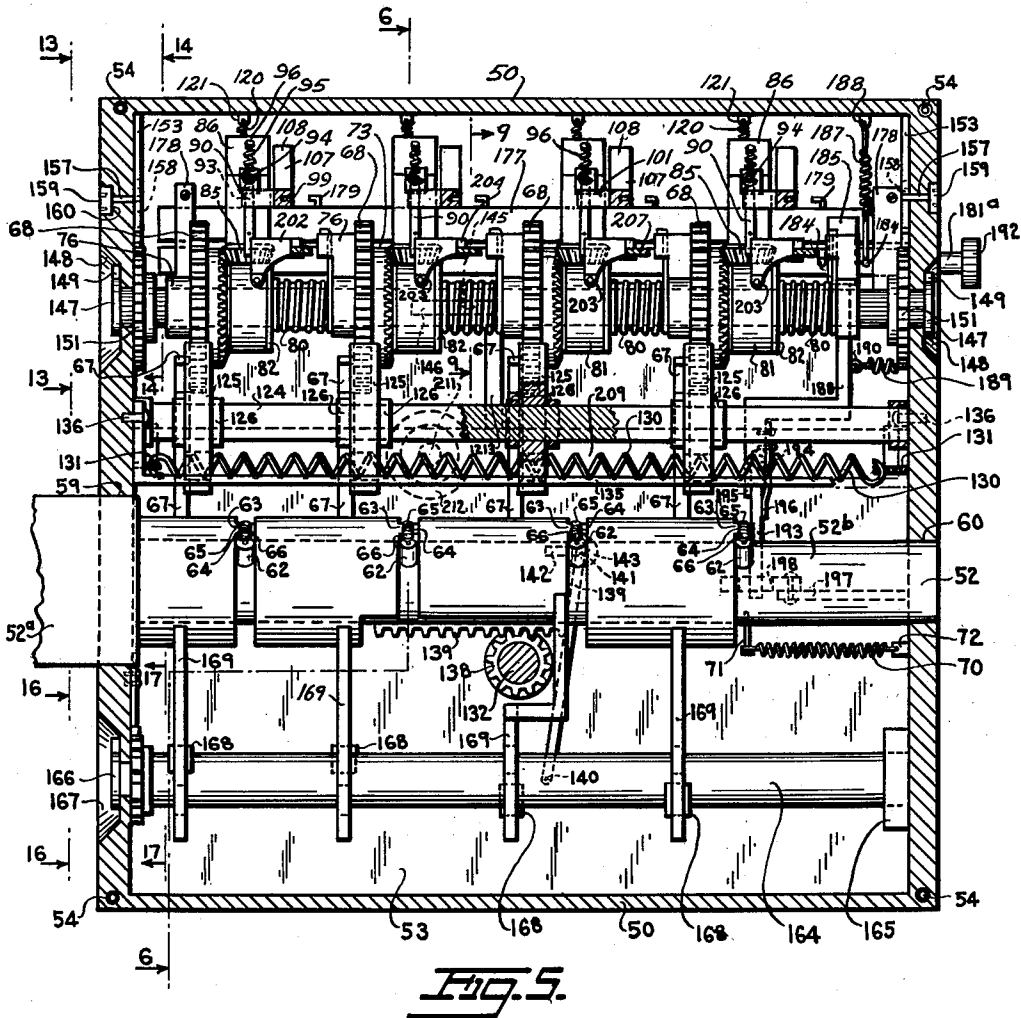


Fig. 19.

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2,580,830

8 Sheets-Sheet 3

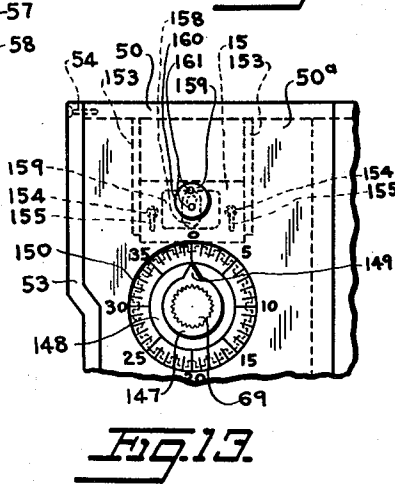


FIG. 15.

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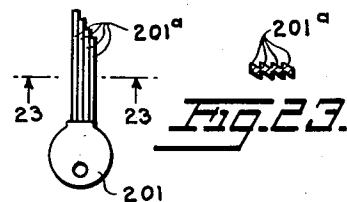
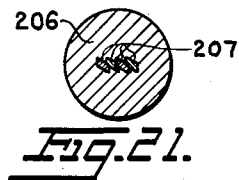
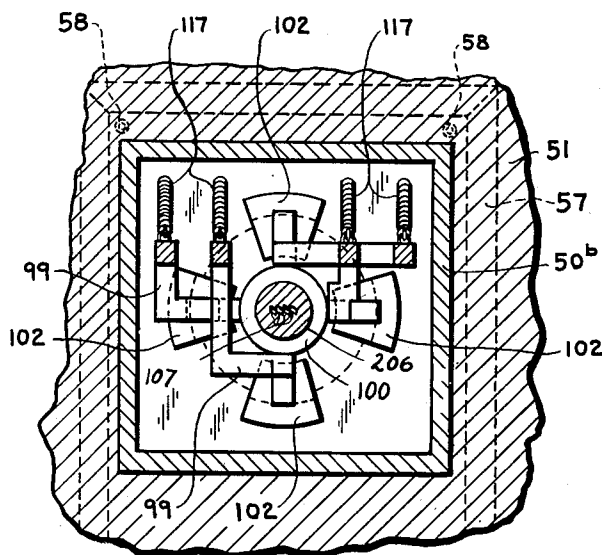
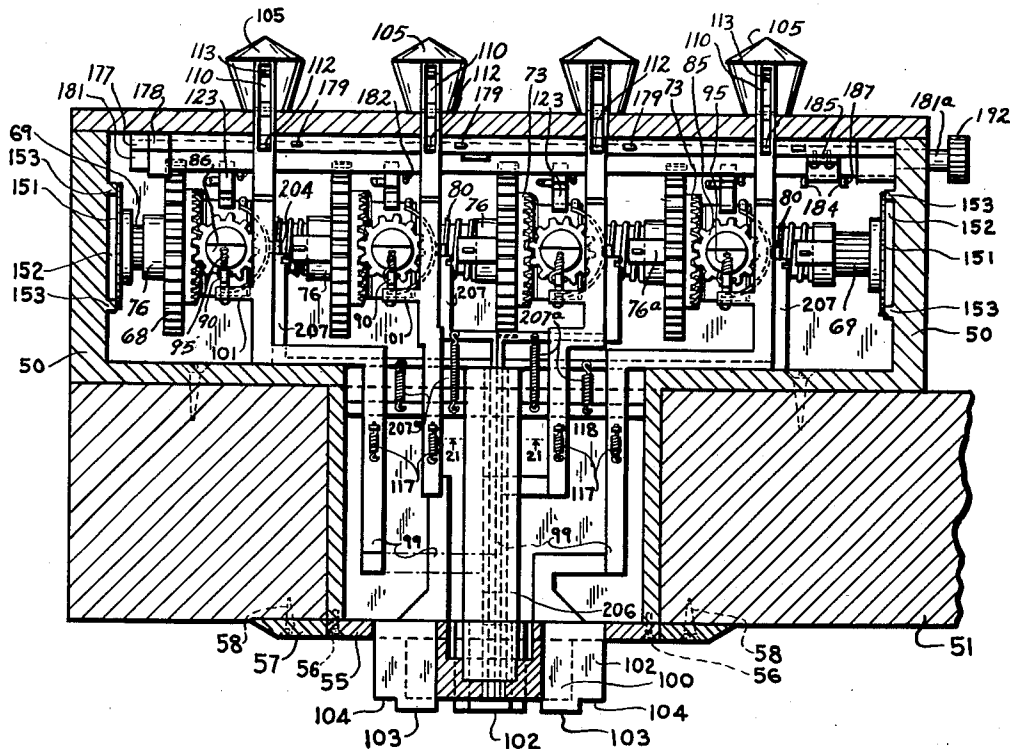
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8 Sheets-Sheet 4



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Filed Nov. 12, 1948

8 Sheets-Sheet 5

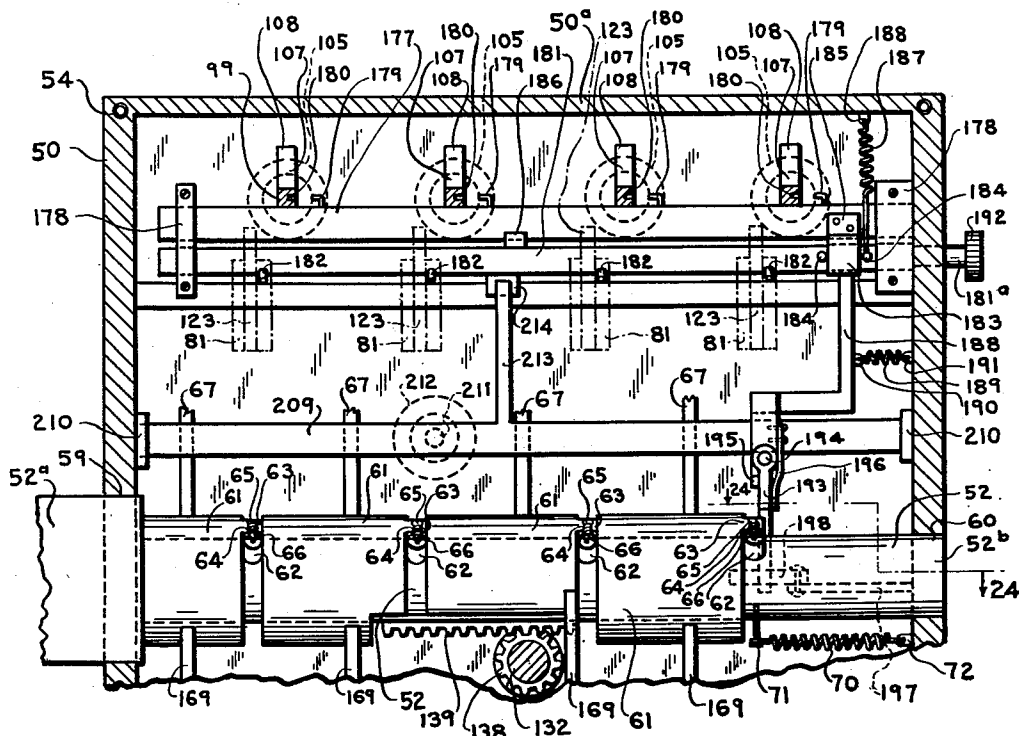


Fig. 23

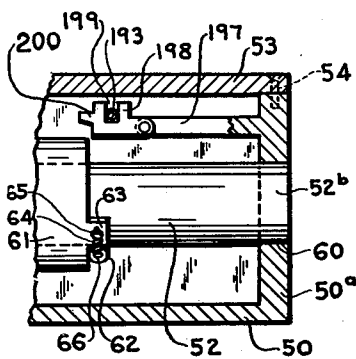


Fig. 24

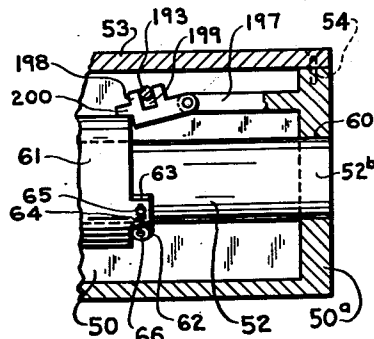


Fig. 25

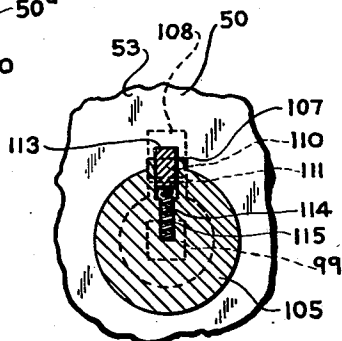


Fig. 26

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COMBINATION OR KEY OPERABLE DOOR LOCK

Filed Nov. 12, 1948

8 Sheets-Sheet 6

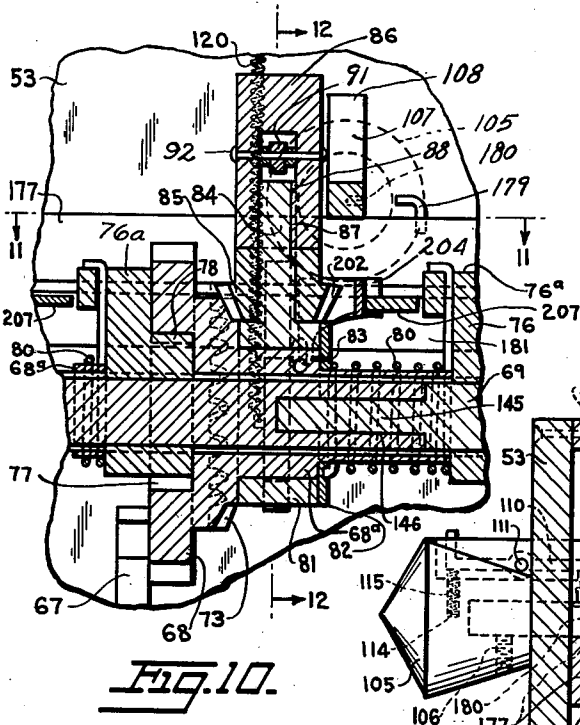


FIG. 10.

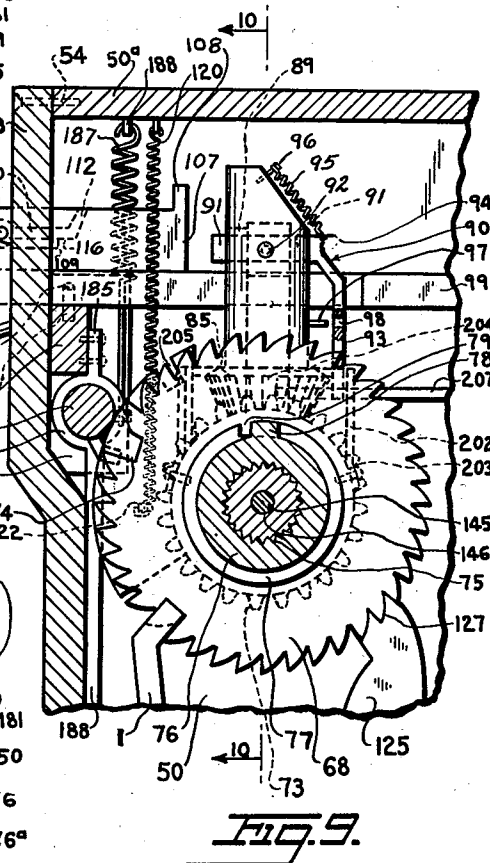


FIG. 9.

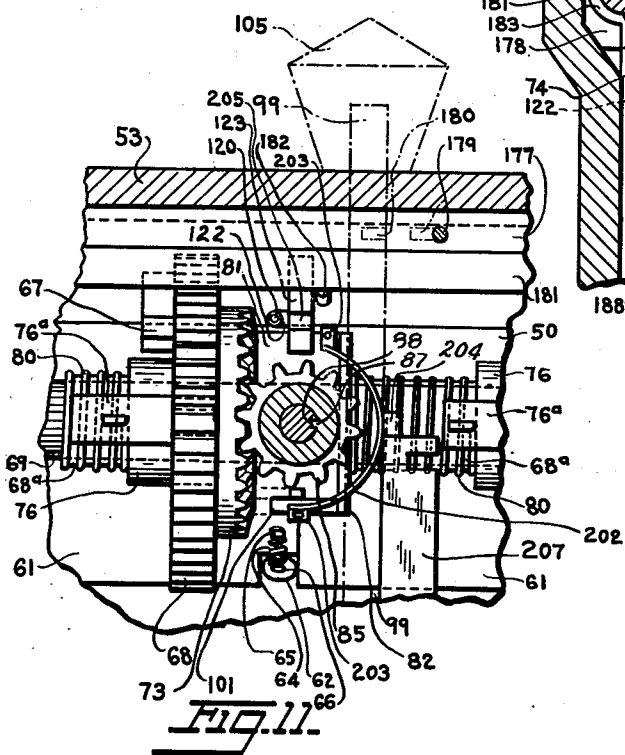


FIG. 11.

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COMBINATION OR KEY OPERABLE DOOR LOCK

Filed Nov. 12, 1948

8 Sheets-Sheet 7

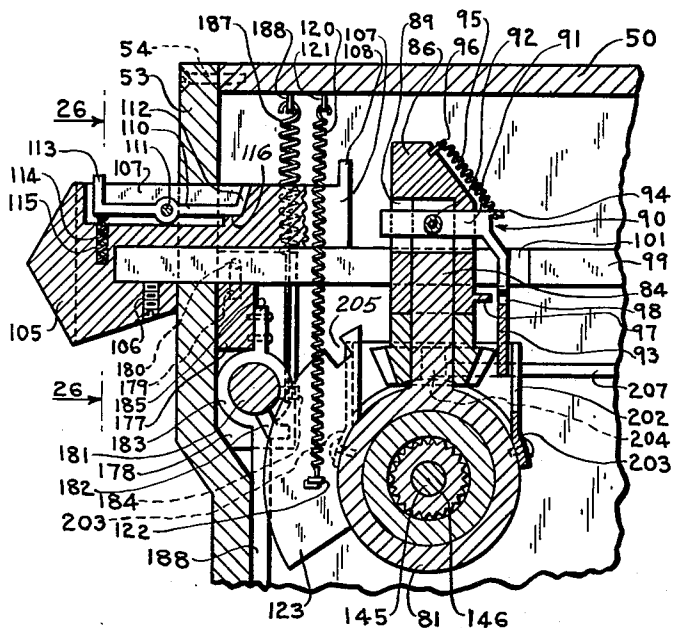


Fig. 12.

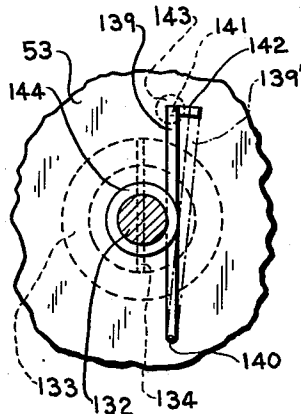


Fig. 18.

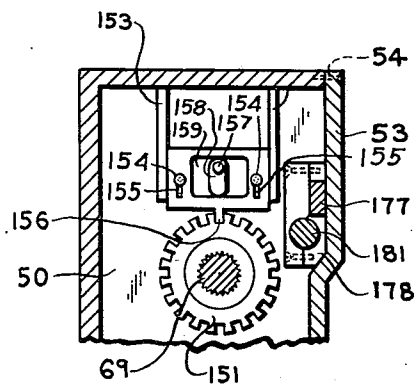


Fig. 14.

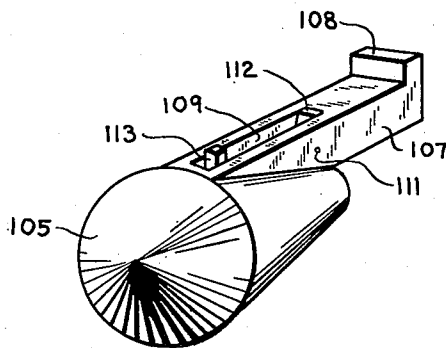


Fig. 27.

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COMBINATION OR KEY OPERABLE DOOR LOCK

Filed Nov. 12, 1948

8 Sheets-Sheet 8

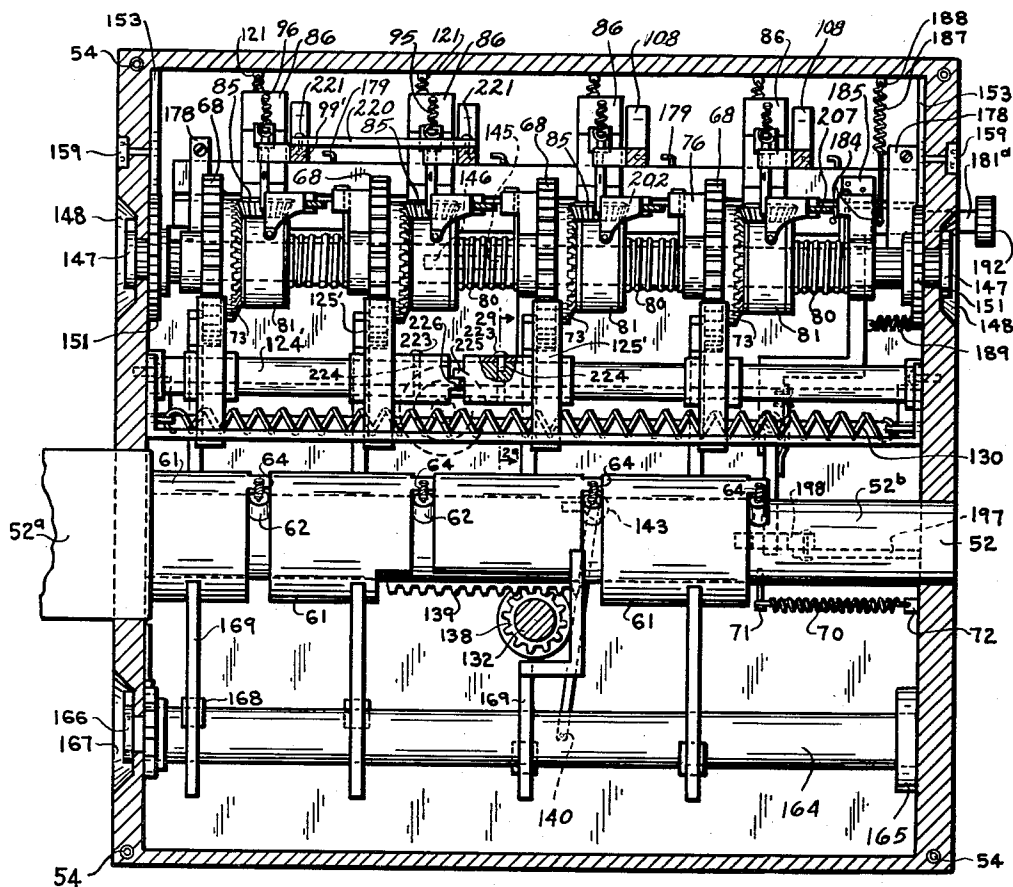


Fig. 28.

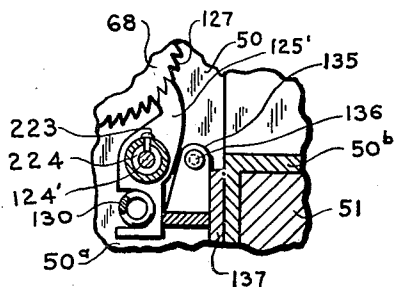


Fig. 29.

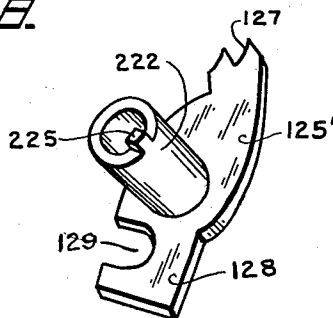


Fig. 30.

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UNITED STATES PATENT OFFICE

2,580,830

COMBINATION OR KEY OPERABLE DOOR
LOCK

Stephen Pelle, New York, N. Y.

Application November 12, 1948, Serial No. 59,650

18 Claims. (Cl. 70—156)

1

2

This invention relates to new and useful improvements in a lock.

More specifically, the present invention relates to a new and improved lock characterized by the fact that the bolt thereof may be selectively secured in a locking position by one of two mechanisms, one of which is operable to open the lock by manipulation of push buttons in accordance with a predetermined combination and the other of which is operable to open the lock by means of an insertable key.

A further object of the present invention proposes so arranging the push button mechanism that the push buttons thereof may be manipulated from either side of the lock body, and more particularly the door to which the lock is attached, in a manner to permit the push button mechanism to be used for opening the lock from either side of the door.

Still another object of the present invention proposes so arranging the key mechanism that it terminates in a key hole opening on the outer side of the lock body and more particularly on the outer side of the door to which the lock is attached, in a manner so that the mere insertion of a key of novel design into the key hole opening will release the bolt of the lock.

Another object of the present invention proposes providing the lock with a plurality of rotatively mounted ratchet wheels each having a corresponding push button and arranged to be rotated through a predetermined portion of a complete revolution by its corresponding push button in a manner to move the ratchet wheels to a position in which the bolt of the lock will be freed.

Still further, the present invention proposes so constructing the push buttons that they may be used for rotating their respective ratchet wheels through a distance equal to one tooth of the ratchet wheel or five teeth of the ratchet wheel for each manipulation of the push buttons.

Still another object of the present invention proposes the provision of a separate resiliently biased dog for holding each of the ratchet wheels in their rotated positions with a means controlled by axial movement of the door knob rod for moving the dogs to positions in which the ratchet wheels will be freed to be returned to their starting positions by self-contained resilient means.

Still further, the present invention proposes the provision of an emergency device arranged in a manner to permit the bolt to be quickly released from the inside of the door regardless of whether the door is locked by the push button

mechanism or the key mechanism in times of emergency, such as fires and the like.

In accordance with a modification of the present invention it is proposed to connect certain of the push buttons in a manner so that movement of either of the connected push buttons will cause the connected pair to move in unison to rotate their respective ratchet wheels.

The present invention also proposes a novel combination arrangement for the modification referred to in the preceding paragraph whereby manipulation of the connected push buttons will move their ratchet wheels in a direction to free the bolt and manipulation of an adjacent independent push button to move its ratchet wheel in a direction to free the bolt, will automatically release the ratchet wheel of the adjacent push button of the connected pair in a manner to free that ratchet wheel to be returned to its starting position so that upon further manipulation of the connected push buttons the respective ratchet wheels will again be moved in unison but in staggered positions with relation to each other.

It is a further object of the present invention to construct a new and novel lock which is simple and durable, which is positive and foolproof in operation and which may be manufactured and sold at a reasonable cost.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

Fig. 1 is an outside elevational view of a portion of a door provided with a lock in accordance with the present invention.

Fig. 2 is a view similar to Fig. 1, but illustrating the lock viewed from the inside of the door.

Fig. 3 is an end elevational view looking in the direction of the line 3—3 on Fig. 1.

Fig. 4 is a vertical sectional view of a portion of the door taken on the line 4—4 of Fig. 1 and looking at the opposite end of the lock from that seen in Fig. 3.

Fig. 5 is an enlarged vertical sectional view taken substantially on the line 5—5 of Fig. 3.

Fig. 6 is a vertical sectional view taken substantially on the line 6—6 of Fig. 5.

Fig. 7 is a horizontal sectional view taken substantially on the line 7—7 of Fig. 6.

Fig. 8 is a partial vertical sectional view taken substantially on the line 8—8 of Fig. 6.

Fig. 9 is an enlarged partial vertical sectional view taken substantially on the line 9—9 of Fig. 5.

Fig. 10 is a partial vertical sectional view taken substantially on the line 10—10 of Fig. 9.

Fig. 11 is a partial horizontal sectional view taken substantially on the line 11—11 of Fig. 10.

Fig. 12 is a partial vertical sectional view taken substantially on the line 12—12 of Fig. 10.

Fig. 13 is a partial end elevational view looking in the direction of the line 13—13 on Fig. 5.

Fig. 14 is a partial vertical sectional view taken substantially on the line 14—14 of Fig. 5.

Fig. 15 is a perspective view of the operating tool, per se.

Fig. 16 is a partial end elevational view looking in the direction of the line 16—16 on Fig. 5.

Fig. 17 is a partial vertical sectional view taken substantially on the line 17—17 of Fig. 5.

Fig. 18 is a partial vertical sectional view taken substantially on the line 18—18 of Fig. 6.

Fig. 19 is a diagrammatic view of the four ring members and their respective latch members.

Fig. 20 is a partial vertical sectional view taken substantially on the line 20—20 of Fig. 6.

Fig. 21 is an enlarged vertical sectional view of a portion of the key mechanism taken on the line 21—21 of Fig. 7.

Fig. 22 is a plan view of the key, per se.

Fig. 23 is an enlarged sectional view taken on the line 23—23 of Fig. 22.

Fig. 24 is a partial horizontal sectional view taken substantially on the line 24—24 of Fig. 8.

Fig. 25 is a view similar to Fig. 24, but illustrating a different position of the parts.

Fig. 26 is a vertical sectional view of one of the internal push buttons, per se, taken on the line 26—26 of Fig. 12.

Fig. 27 is a perspective view of one of the internal push buttons, per se.

Fig. 28 is a view similar to Fig. 5, but illustrating the lock constructed in accordance with a modification of the present invention.

Fig. 29 is a partial vertical sectional view taken on the line 29—29 of Fig. 28.

Fig. 30 is a perspective view of one of the dogs, per se, used in the form of the invention illustrated in Fig. 28.

The lock, in accordance with the first form of the invention shown in Figs. 1 to 27, includes a casing 50 shown on the drawings attached to a portion of a door 51. The casing 50 slidably supports a bolt 52 for movement in a direction laterally thereof. The bolt 52, as in conventionally constructed locks is arranged to cooperate with a complementary keeper (not shown) mounted on the door jamb (not shown) for locking the door 51 in a closed position, as is generally known in the art. Further details regarding the keeper will not be given in this specification, as such details form no part of this invention, it being deemed sufficient to say that any keeper which will receive the projected end of the bolt 52 is adequate for purposes of the present invention.

The casing 50 includes a main rectangular portion 50a and an integral smaller square portion 50b. The main rectangular portion 50a extends along the inside face of the door 51 and the smaller square portion 50b is projected through a complementary opening 51a formed in the door 51. The portions 50a and 50b of the casing 50 are open from end to end, and the main rectangular portion 50a is closed by a plate 53 secured in position by four screws 54. Likewise, the end of

the portion 50b is closed by a plate 55 held in position by four screws 56. Mounted on the outside of the door 51 and surrounding the plate 55, there is a further finishing plate 57 held in position by four wood screws 58 screwed into the surface of the door 51.

The bolt 52 comprises a portion 52a rectangular in cross-section and an integral portion 52b which is circular in cross-section. The rectangular portion 52a of the bolt 52 is slidably extended through a complementary opening 59 in the side wall of the casing 50 adjacent the vertical edge of the door 51 for engagement with the keeper (not shown), previously referred to. The free end of the circular portion 52b of the bolt 52 is freely slidably extended through a complementary circular opening 60 formed in the opposite side wall of the casing 50.

Rotatively mounted on the circular portion 52b of the bolt 52, there are four sleeves 61. The side of the sleeve 61 adjacent the rectangular portion 52a of the bolt 52 abuts the rectangular portion 52a and pins 62 are disposed between the adjacent edges of adjacent sleeves and against the end of the sleeve at the end of the bolt 52 opposite the rectangular portion 52a. The pins 62 are fixedly extended diametrically through the circular portion 52b of the bolt 52 and act to prevent axial movement of the sleeves 61 on the circular portion 52b while leaving the sleeves free for rotative movement. Each of the sleeves 61 is formed with a laterally projecting lug 63 normally in abutment with the adjacent end of the respective pin 62 for limiting rotative movement of the sleeves 61 to one direction only.

Resilient means is provided for retaining the sleeves 61 in positions in which their lugs 63 will be in abutment with the ends of their respective pins 62. This resilient means comprises a contraction spring 64, see Fig. 6, for each of the sleeves 61. Each spring 64 has one end attached to a pin 65 extending from the lug 63 of its respective sleeve 61 and its other end attached to a second pin 66 extending from the end of the respective pin 62. The springs 64 thus act to retain the sleeves 61 in a rotative position in which their lugs 63 abut the adjacent ends of the pins 62.

Extending substantially vertically upwards from each of the sleeves 61 there is a finger 67. These fingers abut the sides of ratchet wheels 68 mounted on a shaft 69 mounted between the side walls of the rectangular portion 50a of the casing 50. When the ends of the fingers 67 abut the ratchet wheels 68 they retain the bolt 52 in a position in which the rectangular portion 52a of the bolt 52 is extended from the side of the casing 50 in locking position, as shown in Figs. 1, 2 and 5, against the action of a resilient means which exerts a force tending to draw the bolt 52 into a position retracted into the casing 50. This resilient means comprises a contraction spring 70 having one end attached to a pin 71 projecting from the circular 52b of the bolt 52 and its other end attached to a lug 72 mounted on an adjacent side wall of the casing 50.

As illustrated in Fig. 5, there is a finger 67 for each of the ratchet wheels 68, making four fingers 67 and four ratchet wheels 68. Each of the ratchet wheels 68 is alike in construction and each includes a tubular portion 68a rotatively engaging the shaft 69. The peripheries of the ratchet wheels are formed with the usual ratchet teeth and the sides thereof adjacent the tubular portions 68a are formed with circular groups of

teeth 73. More particularly, the periphery of each of the ratchet wheels 68 is formed with 39 ratchet teeth and a cutout portion 74, see Figs. 6 and 9, of a width to permit the end of the respective finger 67 to pass therethrough, when the ratchet wheels 68 have been rotated to a position in which the cutout portions 74 are aligned with the free upper ends of the fingers 67. This frees the bolt 52, as will become clear as this specification proceeds, for movement in a direction to withdraw the rectangular portion 52^a into the casing 50.

The periphery of the shaft 69 is formed with a plurality of serrations 75, preferably twenty in number; however, the shaft should be formed with forty longitudinal serrations corresponding to the number of ratchet teeth on the periphery of the ratchet wheels 68. Stops 76 are engaged on the shaft 69, between adjacent ratchet wheels 68 and at each end of the group of four ratchet wheels. These stops 76 are formed with internal serrations complementary to the serrations 75 of the shaft 69 for retaining the stops against rotative motion on the shaft 69. These stops 76 are engaged upon the shaft 69 with a force fit, so that they will be retained against longitudinal movement on the shaft. Each stop 76 has its end adjacent the side of one of the ratchet wheels 68 namely, the side opposed to the side formed with the tubular portion 68^a, extended into a recess 77 formed in the side of the ratchet wheel 68. Within the recesses 77, the stops 76 are formed with projecting lugs 78 engaged by lugs 79 projected radially into the recess 77 from the ratchet wheels 68, see Figs. 6 and 9. This engagement of the lugs 78 and 79 limits rotation of the ratchet wheels 68 to one direction only, and adjustment of the stops 76 on the shaft 69 changes the combination of the lock by varying the spacing of the cutout portions 74 and the free upper ends of the fingers 67, thus effecting the number of ratchet teeth the ratchet wheels 68 must be advanced in order to align the cutout portions 74 with the free upper ends of the fingers 67.

Rotative means is provided for retaining the ratchet wheels 68 in a position in which the lugs 78 and 79 will be in facial engagement and the cutout portions 74 will be spaced from the free upper ends of the fingers 67 securing the bolt 52 in its extended door locking position. This resilient means comprises a coil spring 80 wound about the tubular portion 68^a of each of the ratchet wheels 68 and having one end attached to the respective ratchet wheel 68 and its other end projected through an opening in an overhanging portion 78^a of the adjacent stop 76. This connects the other ends of the coil springs 80 to the stops 76 and as the ratchet wheels 68 are rotatively mounted on the shaft 69 and the stops 76 are fixedly mounted thereon against rotative motion, by reason of their interengagement with the serrations 75 on the periphery of the shaft 69, the coil springs 80 exert a force tending to retain the lugs 78 and 79 in facial contact.

Push button means is provided for advancing the ratchet wheels 68 a desired number of ratchet teeth in accordance with a predetermined combination for aligning the cutout portions 74 of the ratchet wheels 68 with the free upper ends of the fingers 67 to free the bolt 52 to be retracted into the casing 50 by the spring 70.

This push button means is characterized by a ring 81 rotatively retained upon the tubular portion 68^a of each of the ratchet wheels 68 by means of a circular flat member 82 held in position by

several removable bolts 83, see Fig. 10. It is the circular flat member 82 which is also formed with an opening into which the adjacent end of the coil spring 80, of each of the ratchet wheels 68, extends for anchoring the adjacent end to the ratchet wheel 68. A rod-like member 84 extends vertically upwards from each of the rings 81 and a spur gear 85 is rotatively engaged upon each of the rod-like members 84 and each spur gear 85 meshes with the teeth 73 formed on the side of the adjacent ratchet wheel 68. When the rings 81 are turned, the spur gears 85 merely rotate upon their respective rod-like members 84 and their teeth merely idle over the teeth 73 of the ratchet wheels 68. On the other hand, when the spur gears 85 are locked against rotation, which will become clear as this specification proceeds, and the rings 81 are rotated, the teeth of the spur gears 85 will no longer ride over the teeth 73 of the ratchet wheels, but the spur gears 85 will be locked to the teeth 73 of the ratchet wheels 68 causing the ratchet wheels to be turned away from the lugs 78 of the stops 76 and against the action of the coil springs 80.

A cap 86 is engaged over the top end of each of the rod-like members 84 above the spur gears 85 and each cap is retained against rotation by means of an internal key 87 which engages a complementary keyway 88 formed on the side of the respective rod-like member 84. Each cap 86 above the top end of the respective rod-like member 84 is formed with a tubular passageway 89, see Figs. 9, 10 and 12, extended from side to side thereof. A latch member 90 has a horizontal portion 91 extended through the passageway 89 and pivotally supported on a pin 92 extended across the passageway 89. The latch members 90 further include depending portions 93 which in pivoted position of the latch members 90, are adapted to have their lower ends engage between adjacent teeth of the spur gears 85 and retain the spur gears against rotation upon the rod-like members 84 as previously referred to.

Each of the latch members 90 at the junction of the horizontal portions 91 with the depending portions 93 is formed with a projecting stud 94. A contraction spring 95 has one end attached to the stud 94 of the respective latch member 90 and its other end attached to a pin 96 mounted on the top portion of the respective cap 86 for retaining the latch members 90 in a position in which the lower ends of their depending portions 93 will be disengaged from the teeth of the spur gears 85.

A stem 97 extends from the side of each of the caps 86 and is adapted to enter an elongated opening 98 formed in the depending portion 93 of the respective latch member 90 for retaining the latch members 90 against possible sidewise play in their pivoted positions.

There is a push button rod 99 for each of the ratchet wheels 68—four push button rods in all. These push button rods 99 are extended through the casing 50 and have their ends slidably projected through the plates 53 and 55. The plate 55 is formed with a centrally located tubular boss 100 and the adjacent ends of the push button rods 99 are shaped so that those ends project from the plate 55 arranged in a circular group about the tubular boss, see Fig. 1.

Intermediate of their ends, each of the push button rods 99 is formed with a laterally extending projection 101 engaging the side of the respective latch member 90. Thus, when the push button rods 99 are moved in a direction to move

the projections 101 against the latch members 90, the projections 101 will first pivot the latch members 90 against the action of the springs 95 to engage the lower ends of the depending portions 93 of the latch members between the teeth of the spur gears 85 and secure the spur gears 85 against rotation, so that continued movement will turn the rings 81 and the ratchet wheels 68 about the shaft 69.

The ends of the push button rods 99 grouped about the tubular boss 100 are formed with projecting push buttons 102. Each of the push buttons 102 has a high part 103 adapted to be aligned with the outer end of the tubular boss 100 and a low part 104 adapted to be aligned with the face of the plate 55 about the tubular boss 100. If the operator's finger is applied to the high part 103 and the push button 102 pushed inward until the finger strikes the outer end of the tubular boss 100, the push button rod 99 will be advanced to move the corresponding ratchet wheel 68 away from the lug 78, a distance equal to one ratchet tooth. On the other hand, if the operator's finger is applied to the low part 104 of the push button 102 and the button pushed inward until the finger abuts the face of the plate 55, the push button rod 99 will be advanced to move the corresponding ratchet wheel 68 away from the lug 78, a distance equal to five ratchet teeth.

The ends of the push button rods 99 extended through the plate 53, are arranged in a horizontal row, as shown in Fig. 2. These ends project through the plate 53 and are provided with pull buttons 105 for opening the door 51 from the inside. Each of these pull buttons 105 is alike in construction and is securely attached to its respective push button rod 99 by means of a set screw 106, see Figs. 9 and 12.

As in the case of the push buttons 102, the pull buttons 105 are likewise provided with means for controlling movement of the push button rods 99 to advance the respective ratchet wheels one tooth or five teeth, as desired. In the case of the pull buttons 105, this control means includes a portion 107 integrally formed with each of the pull buttons 105 and extended through the plate 53 and along the top face of the respective push button rod 99. The inner end of each of the portions 107 is formed with an upstanding flange 108 which, when the pull button is completely pulled out, is adapted to strike the inside face of the plate 53 and limit movement of the push button rod 99 to a distance to advance the respective ratchet wheel 68 a distance equal to five teeth.

The top of each of the pull buttons 105 is formed with a recess 109, see Figs. 12, 26 and 27, and a lever 110 is disposed in the recess 109 and pivotally supported intermediate of its ends by a pin 111 extended across the recess 109. The inner end of each of the levers 110 is formed with a stop 112 having its top end flush with the top face of the portion 107 of the pull button 105, so as not to interfere with outward pulling of the pull button to advance the ratchet wheels 68 five teeth. The outer ends of the levers 110 are formed with projecting finger portions 113 which are arranged to be manually depressed for purposes of extending the free ends of the stops 112 above the top face of the portion 107 of the pull buttons 105 to strike the inside face of the plate 53 and limit outward pulling of the pull buttons 105 to a distance to advance the respective ratchet wheels 68 one tooth.

An expansion coil spring 114 is disposed within

an opening 115 which extends downwards from the base of the recess 109 of each of the pull buttons 105. These expansion coil springs 114 operate between the base of the openings 115 and the bottom face of the finger portion end of the levers 110 for retaining the stops retracted into the recess 109 and the stop ends of the levers 110 seated against shoulders 116 formed within the recesses 109.

Resilient means is provided for retaining the push button rods 99 in a retracted position in which the pull buttons 105 will be in facial contact with the outside face of the plate 53 and the lateral projections 101 will be engaging the sides of the depending portions 93 of the latch members 90, as shown in Figs. 6, 7 and 12. This resilient means comprises a contraction spring 117 for each of the push button rods 99, within the square portion 50^b of the casing 50 and operating between a lug 118 extending from the top face of the respective push button rod 99 and a complementary lug 119 mounted on the inside face of the plate 55.

A further resilient means is also provided for retaining the rings 81 in a rotative position, relative to their respective ratchet wheels 68, in which the latch members 90 will bear against the sides of the lateral projections 101 of the push button rods 99. This resilient means comprises a contraction spring 120 for each of the rings 81 operating between a depending lug 121 on the top wall of the casing 50 and a lug 122 extending from the side of a flange 123 which projects radially from the side of the respective ring 81, see Fig. 12.

It is appreciated of course that the spring 95 exerts a force greater than the spring 120, so that the spring 95 is capable of overcoming the force exerted by the spring 120 retaining the latch members 90 in pivoted position relative to their respective caps 86 in which the free lower ends of the depending portions will be disengaged from the teeth of the respective spur gears 85 when the latch members 90 engage the lateral projections 101 in the retracted positions of the push button rods 99, as shown in Figs. 9 and 12. Likewise, the coil springs 80 which hold the ratchet wheels 68 in a position in which their lugs 79 bear against the lugs 78 of the stops 76 exert a greater pressure than the springs 95, so that when the push button rods 99 are pushed to rotate the ratchet wheels 68, the latch members 90 will be pivoted to their operative positions before the ratchet wheels 68 start to turn against the action of their respective coil springs 80. The engagement of the lugs 78 and 70 prevent the coil springs 80 from overcoming the force of the springs 95 in the idle position of the ratchet wheel 68 and pivot the latch members 90 to a position in which the lower end of the depending portions 91 will be engaged with the teeth of the spur gears 85 in the position of the parts shown in Fig. 9.

Releasable means is provided for holding the ratchet wheels 68 in rotative positions against the action of their coil springs 80. This releasable holding means comprises a rod 124 extended between the sides of the casing 50 and dogs 125 rotative on the rod 124—there being one dog 125 for each of the ratchet wheels 68. The dogs 125 are retained in aligned positions with their respective ratchet wheels 68 between pairs of collars 126 fixedly mounted on the rod 124. The collars 126 leave the dogs 125 free to rotate. The upper ends of the dogs 125 are formed with teeth 127 engageable with the teeth of the respec-

tive ratchet wheels 68 and the teeth are arranged to permit free rotation of the ratchet wheels 68 in one direction while limiting their rotation in the reverse direction.

Each of the dogs 125 has a depending tail portion 128, see Fig. 6, having a recessed portion 129, see Figs. 6 and 30. A contraction spring 130 has its ends attached to lugs 131 extending from the end walls of the casing 50. The spring 130 extends through all of the recessed portions 129 of the dogs 125 and retains the dogs 125 in a rotative position in which the teeth 127 on their top ends will be engaged with the teeth of the ratchet wheels 68.

Means is provided for simultaneously pivoting all of the dogs 125 against the action of their holding spring 130 to disengage the teeth 127 of the dogs 125 from the peripheral ratchet teeth of the ratchet wheels 68 freeing the ratchet wheels to be returned to their starting position by the coil springs 80. This means comprises a door knob rod 132 extended through aligned openings formed in the plate 53, the rear wall of the casing 50, the door 51 and the finishing plate 57, see Fig. 6. The extended portions of door knob rod 132 are provided with the usual door knobs 133 secured in place by removable pins 134, see Fig. 6, having a forced fit in the door knobs 133 and the adjacent ends of the door knob rod 132. In the normal position of the door knob rod 132, shown in Fig. 6, the door knob 133 at the end of the door knob rod 132 adjacent the finishing plate 57 is spaced slightly from the adjacent face of the finishing plate 57 to have a slight longitudinal movement in addition to the usual rotative movement. Thus, from the outside of the door 51, the door knob rod 132 may be pushed longitudinally inwards until the door knob strikes the face of the finishing plate 57.

A U-shaped bracket 135 has the ends of its vertical arms pivotally attached to the side walls of the casing 50 by means of rivets 136 permitting pivotal movement of the bracket 135. The intermediate arm of the U-shaped bracket 135 extends horizontally along the depending tail portions 128 of the dogs 125. More particularly, the intermediate arm of the U-shaped bracket 135 engages the sides of the tail portions 128 opposed to the side formed with the recessed portions 129 within which the spring 130 is engaged. A fan-shaped member 137, see Fig. 6, extends substantially vertically from the door knob rod 132 and bears against the side of the intermediate arm of the U-shaped bracket 135 in all turned positions of the door knob rod 132, and when the door knob rod 132 is slid longitudinally, the fan-shaped member 137 pivots the U-shaped bracket 135 which in turn pivots all of the dogs 125 against the action of the spring 130 to disengage the teeth 127 of the dogs 125 from the peripheral ratchet teeth of the ratchet wheels 68 freeing the ratchet wheels to be turned back by their coil springs 80.

The door knob rod 132 also carries a gear 138, see Figs. 5 and 6, which is in mesh with rack teeth 139 formed on a portion of the circular part 52^b of the bolt 52. Thus, the door knob rod 132 may be rotated to extend the rectangular portion 52^a of the bolt 52 from the side of the casing 50 against the retaining action of the spring 70. The rack teeth 139 are exposed at the bottom of the bolt 52 by cut away portions of certain of the sleeves 61 and the gear 138 is of a length to mesh with the rack teeth 139 in all lon-

gitudinal shifted positions of the door knob rod 132. The sleeves 61 which are cut away, are only cut away to a degree to allow free rotative movement of those sleeves on the circular portion 52^b of the bolt 52 without interference from the rack teeth 139.

A lever 139 is pivotally mounted at its lower end by means of a pin 140 on the inside face of the plate 53 adjacent the side of the door knob rod 132. The top end of the lever 139 is provided with a laterally extending stem 141 frictionally extended through an arcuate slot 142 formed in the plate 53. The outer end of the stem 141 is provided with a knob 143 which is adapted to be manually gripped for pivoting the lever 139 in one direction or the other. The arcuate slot 142 is arranged concentric with the pin 140 which pivotally supports the bottom end of the lever 139. The door knob rod 132 is formed with a circular flange 144 behind which the lever 139 is engageable in one of its pivoted positions, the full line position shown in Fig. 18, for retaining the door knob rod 132 against longitudinal movement. When the lever 139 is pivoted to the dot and dash line shown at 139' in Fig. 18, the lever is disengaged from behind the circular flange 144 and the door knob rod 132 is free to be moved longitudinally.

The shaft 69 is formed of separate sections arranged in end alignment and the adjacent ends of the sections are connected for rotative movement relative to each other. This means comprises a reduced portion 145 formed on one of the sections of the shaft 69 and engaging a complementary opening 146 formed in the other of the sections. Each of the sections of the shaft 69 carries two ratchet wheels 68 and related parts, and if desired a partition could be formed within the casing 50 for assisting in supporting the rotatively interconnected ends of the sections of the shaft 69.

The outer ends of the sections of the shaft 69 are provided with small knobs 147 fixedly mounted on those outer ends and located within shallow recesses 148 formed in the side walls of the casing 50, see Figs. 3, 4, 5 and 13. The knobs 147 are formed with projecting pointers 149 arranged to register with scales 150 formed on the side walls of the casing 50. By turning the knobs 147 the sections of the shaft 69 will be rotated relative to each other to turn the stops 76 and more particularly, the lugs 78 of those stops relative to the fixed upper ends of the fingers 67. As the coil springs 80 retain the ratchet wheels 68 in a rotative position in which their lugs 79 will bear against the lugs 78 of the stops 76, it is appreciated that movement of the stops 76 will cause a corresponding change in the position of the ratchet wheels 68 to adjust the position of their cutout portions 74 with relation to the fixed upper ends of the fingers 67. The net result is a change in the combination required to effect the proper rotation of the ratchet wheels 68 of either of shaft sections to align the cutout portions 74 of the ratchet wheels 68 with the fingers 67. The net change is recorded on the scale 150 and the change is either added or subtracted from the combination of the two respective ratchet wheels 68 depending upon the direction in which the sections of the shaft 69 are rotated.

Means is provided for releasably retaining the sections of the shaft 69 in desired relative rotative positions with relation to each other. This releasably retaining means comprises a gear

151 mounted on the end of each of the sections of the shaft 69 in facial contact with the inside faces of the side walls of the casing 50. Each of the gears 151 has teeth corresponding in number to the number of serrations 75 formed on the shaft 69. A flat plate 152 is positioned for vertical movement relative to each of the gears 151, between a pair of guide flanges 153 formed on the side walls of the casing 50. Headed pins 154 extend from each of the side walls of the casing and pass through elongated slots 155 formed in the plates 152 for retaining the plates 152 in position between the guide flanges 153. The bottom edge of each plate 152 is formed with a single depending tooth 156, see Fig. 14, engaged between adjacent teeth of the gears 151 to hold the gears and in turn the sections of the shaft 69 against rotation.

A small stud shaft 157 is turnably extended through each side wall of the casing 50 and is formed at its inner end with a cam 158. The cams 158 are disposed within complementary cam openings 159 formed in the plates 152. When the cams 158 are in the position shown in Fig. 14, they retain the plates 152 in a position in which the single tooth 156 of each of the plates will be in its operative position between adjacent teeth of the respective gear 151.

The outer ends of the stud shafts 157 are provided with heads 159, see Figs. 5 and 13, located within recesses 160 formed in the outer faces of the side walls of the casing 50. Each head 159 is formed with spaced openings 161 adapted to be engaged by complementary spaced pins 162 formed on a turning tool 163, see Fig. 15. When the pins 162 of the turning tool 163 are engaged with the openings 161 of either of the heads 159, that head may be rotated through 180 degrees to similarly rotate the respective cam 158 and lift the respective plate 152 and disengage its tooth 156 from the teeth of the respective gear 151 freeing the gear and in turn the section of the shaft 69 upon which the gear is mounted for rotation by turning the respective knob 147. To relock the sections of the shaft 69 against further rotation when the desired adjustment has been made, the heads 159 are rotated again through 180 degrees back to their starting positions to turn the cams 158 and lower the plates 152 and reengage their teeth 156 with the teeth of the respective gears 151.

Means is provided for selectively rendering any of the fingers 67 and related ratchet wheels 68 and related parts inoperative for bolt locking purposes, when desired. This is particularly important if any of the ratchet wheels 68 should become jammed or inoperative for any reason, as it permits the jammed ratchet wheel to be rendered inoperative without effecting the operation of the remaining ratchet wheels 68 or the operation of the lock.

This means is characterized by a shaft 164, see Figs. 5 and 6, extended between the side walls of the casing 50. One end of the shaft 164 is rotatively supported in a bearing 165 on the inside of the adjacent side wall of the casing 50, below the opening 60 through which the end of the circular portion 52^b of the bolt 52 slidably extends. The opposite end of the shaft 164 is rotatively extended through the opposite side wall of the casing 50, see Figs. 5, 16 and 17, and is provided with a small knob 166 located within a shallow recess 167 formed in the adjacent side wall of the casing 50.

Within the casing 50, the shaft 164 is formed

with four longitudinally spaced triangular projections 168 staggered about the periphery of the shaft 164 at 90 degrees from each other. These triangular projections 168 are arranged to engage depending arms 169 which extend from each of the sleeves 61 in spaced positions corresponding to the longitudinal spacing of the triangular projections 168 on the shaft 164.

The small knob 166 is provided with a single projecting pointer 170 adapted to register with a scale 171, see Figs. 3 and 16, for indicating the rotative positions of the shaft 164. The scale 171 has the numbers "1" to "4" alternately arranged with four zeros. In the normal position, the pointer 170 is aligned with one of the zeros, as shown in Figs. 3 and 16, to indicate that none of the fingers 67 and respective ratchet wheels 68 is inoperative for bolt locking purposes. In the event one of the ratchet wheels 68 becomes inoperative for some reason, and for the sake of illustration let us assume it is the ratchet wheel controlled by the push button 102 or pull button 105 identified by the numerals "3" in Figs. 1 and 2, the small knob 166 is then turned until its pointer 170 registers with the numeral "3" on the scale 171. This rotates the shaft 164 and turns the triangular projection 168 beneath the number "3" ratchet wheel into a position to bear against the side of the depending arm 169 of the number "3" ratchet wheel rotating the corresponding sleeve 61 against the action of its respective spring 64 and moves the free end of the respective finger 67 clear of the periphery of the number "3" ratchet wheel 68 rendering that finger 67 and related ratchet wheel 68 inoperative for bolt locking purposes.

A flexible leaf spring 172, see Figs. 5 and 17, is fixedly mounted on the inside face of the side wall of the casing 50 by several pins 173. The bottom end of the leaf spring 172 is free and formed with a knob 174 which is adapted to snap into and out of any one of eight cutouts 175 formed evenly about the periphery of a flange 176 fixedly mounted on the shaft 164. Thus, the knob 174 when engaged with the cutouts 175 is adapted to hold the shaft 164 in any one of eight rotative positions corresponding to the four operative positions of the triangular projections 168 and the four inoperative positions of those triangular projections 168.

The present invention also includes a novel key mechanism for locking and unlocking the bolt 52 of the lock, and it is pointed out that the operation of this key mechanism is dependent upon rendering the push button mechanism inoperative for bolt locking and unlocking purposes. This means that in order to use the key mechanism for locking the bolt 52, the push button mechanism must be operated in accordance with the predetermined combination, as will become clear as this specification proceeds, for turning the ratchet wheels 68 to the positions in which the cutout portions 74 are aligned with the free ends of the fingers 67 so that the bolt 52 is free to move laterally of the casing 50 with the free ends of the fingers 67 passing through the cutouts 74. Also, the lever 139 must be pivoted to the full line position behind the circular flange 144 on the door knob rod 132 so that the rod cannot be moved longitudinally to disengage the dogs 125 from their engaged positions with the peripheral teeth of the ratchet wheels 68 freeing the ratchet wheels 68 to be returned, by the coil springs 80, to their starting positions in which

their cutout portions 74 are disaligned with the free top ends of the fingers 67.

The key mechanism includes a bar 177, see Fig. 8, slidably mounted on the inside face of the plate 53 by several spaced brackets 178. The top edge of the bar 177 rides back and forth beneath the bottom edges of the push button rods 99 and is formed with several hooks 179. There is one hook 179 for each of the push button rods 99 and the free ends of these hooks, in lateral shifted position of the bar 177, are adapted to engage into small openings 180 formed in the sides of the respective push button rods 99. When the hooks 179 are engaged within these openings 180, they secure the push button rods 99 against possible longitudinal movement for causing the rotation of the ratchet wheels 68, as previously described, to disalign the cutout portions 74 of the ratchet wheels from the free upper ends of the fingers 67. Normally, when the key mechanism is not in operation the hooks 179 are disengaged from the openings 180 leaving the push button rods 99 free to be moved longitudinally for opening the lock when the same is locked by the push button mechanism.

Below the bar 177, there is a second bar 181 which is round in cross-section and also slidably and rotatively supported by the bearings 178. This second bar 181 is formed with spaced depending fingers 182 extended along the sides of the flanges 123 of the rings 81.

Adjacent one end, the circular bar 181 has a ring 183 rotatively engaged thereabout and held against longitudinal movement by a pair of pins 184 extending from the side of the circular bar 181. The top of the ring 183 is formed with an upwardly extending flange 185 riveted to the bar 177 for securing the bars 177 and 181 together for simultaneous longitudinal movement. A stop 186 extends upwards from the circular bar 181 and bears against the bar 177 for limiting rotation of the circular bar 181 in one direction. A contraction spring 187 operates between one of the pins 184 of the circular rod 181 and a lug 188 mounted on the top wall of the casing 50 for retaining the circular bar 181 in a rotation position in which the stop 186 bears against the bar 177 and in which the fingers 182 will be in their proper extended position with relation to the flanges 123 of the rings 81.

An arm 188 is extended downward from the ring 183 and a contraction spring 189 operates between a lug 190 extending from that arm 188 and a second lug 191 mounted on the side wall of the casing 50 for urging the bars 177 and 181 into the longitudinal inoperative position shown in Fig. 8.

One end of the circular bar 181 is formed with a reduced extended portion 181^a rotatively and slidably extended through the side wall of the casing 50. The outer end of the reduced portion 181^a is provided with a knurled knob 192 which is adapted to be manually gripped for first rotating the circular bar 181 against the action of the spring 187 to move the fingers 182 clear of the periphery of the flanges 123 so that the bars 177 and 181 may then be moved longitudinally, by pushing in on the knob 192, to engage the hooks 179 into the openings in the sides of the push button rods 99 and to locate the fingers 182 operatively on the other side of the flanges 123. Upon completion of longitudinal movement, the knob 192 is freed for rotative movement while still holding the same pushed inwards, allowing the spring 187 to rotate the circular bar 181 back

until the stop 186 strikes the bar 177 locating the fingers 182 on the opposite side of the flanges 123. The knob 192 is then released, but the spring 189 is then inoperative for drawing the bars 177 and 181 back to their starting position because of the engagement of the fingers 182 on the opposite sides of the flange 123 from that shown in Fig. 8.

The lower end of the arm 188 carries a depending finger 193 which is pivotally attached at its top end to the lower end of the arm 188 by means of a pivot pin 194. The arm 188 is further formed with a stop 195 which engages one side of the depending finger 193 and a leaf spring 196 having one end secured to the side of the arm 188 has its free end bearing against the opposite side of the finger 193 holding the finger 193 in a normal pivoted position aligned with the arm 188 and bearing against the stop 195.

A bracket 197 extends from the side wall of the casing 50 and pivotally supports a keeper 198. The keeper 198 is formed with a slot 199 in which the lower end of the finger 193 extends and the keeper 198 is further formed with a keeper notch 200 which is adapted to engage behind the end of the adjacent endmost sleeve 61, as shown in Fig. 25, for locking the bolt 52 in a position in which the rectangular portion 52^a will be operatively extended from the opening 59 in the side wall of the casing 50. Movement of the bars 177 and 181 longitudinally against the action of the spring 189 merely pivots the finger 193 relative to the arm 188 and loads the leaf spring 196 to pivot the finger 193 back to its starting position and pivot the keeper 198 from the inoperative position shown in Fig. 24 to the operative position shown in Fig. 25. The keeper 198 is freed to be moved to the operative position by the leaf spring 196 through the medium of the finger 193 only after the door knob rod 132 has been turned to turn the gear 138 and extend the bolt 52 into a position in which its rectangular portion 52^a is extended from the opening 59. This movement of the bolt 52 also moves the sleeves 61 moving the endmost sleeve 61 clear of the side of the keeper 198 so the keeper may pivot to cause the end of the sleeve 61 to be engaged within the keeper notch 200 holding the bolt 52 in its extended position against the pull of the spring 70.

Means operative by insertion of a key 201 from the outside of the door 51, is provided for moving the keeper 198 clear of the sleeve 61 with which it is engaged for freeing the bolt 52 to be retracted into the casing 50 by the spring 70 for purposes of unlocking the door. This key operated means comprises a half collar 202 secured to each of the rings 81 by rivet secured lugs 203. The half collars 202 extend about the spur gears 85 and related parts and having projections 204 extending from the sides thereof, see Figs. 10 and 11. Each of the flanges 123 is formed with a slot 205 and the slot 205 of each adjacent flange 123 is spaced further away from its respective finger 182, as shown in the diagrammatic view, Fig. 19. A tubular cylinder 206 extends into the square portion 50^b of the casing 50 from the tubular boss 100 and slidably supports a plurality of plungers 207, one for each of the half collars 202. The plungers 207 have their free ends disposed adjacent the projections 204 of the half collars 202 and are retained in retracted positions within the cylinder 206 by springs 207^a. The key 201 has staggered portions 201^a angularly offset and the key hole opening 208 in the tubular boss 100

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leading to the interior of the cylinder 206, has similar offset portions so as to receive the offset portions 201^a of the key 201. Within the cylinder 206 the ends of the plungers 207 are all flush and the mere act of inserting the key 201 will extend the plungers 207 the proper amount to rotate the rings 81 relative to the ratchet wheels 68 through the medium of the half collars 202 to align the slots 205 of all of the flanges 123 with their respective fingers 182 freeing the bars 177 and 181 to be drawn back by the spring 189. Simultaneously, the keeper 198 will be pivoted clear of the end of the sleeve 61 freeing the bolt 52 to be retracted into the casing 50 by the spring 70.

Movement of the rings 81 to align the slots 205 of the flanges 123 with the fingers 182, did not rotate the ratchet wheels 68 because the spur gears 85 were not locked against rotation by the latch members 90 and so the spur gears 85 merely idled over the teeth 73 of the ratchet wheels 68, while those ratchet wheels remained perfectly stationary. To free the bolt 52 from the inside of the door 51, when locked by the key mechanism, it is merely necessary to manually rotate the knob 192 against the action of the spring 187 to move the fingers 182 beyond the periphery of the flanges 123 freeing the bars 177 and 181 to be drawn back by the spring 189.

Means is provided for quickly releasing the bolt 52 when locked by either the push button mechanism or the key mechanism, from the inside of the door, to permit the door to be quickly opened from the inside in cases of emergency such as during a fire or other times when it is necessary to quickly pass through the door 51.

The quick releasing means is characterized by a rod 209 slidably supported at its ends for horizontal movement by guides 210 formed on the side walls of the casing 50. The rod 209 passes behind the vertically extending fingers 67 and is formed intermediate of its ends with a stem 211 which is slidably extended through an opening formed in the plate 53. The outer end of the stem 211 is formed with a knob 212, by which the end of the stem 211 can be manually gripped to slide the rod 209 horizontally toward the inside face of the plate 53. This movement of the rod 209 pivots the fingers 67 against the holding action of the springs 64 and moves the top ends of the fingers 67 beyond the peripheral edges of the ratchet wheels 68, freeing the bolt 52 to be retracted into the casing 50 by the spring 70.

The rod 209 also includes an upstanding post 213 which has its upper end overlapping a depending projection 214 formed on the circular bar 181, so that when the knob 212 is pulled for horizontally sliding the rod 209 it will move the upstanding post 213 to move the projection 214 and rotate the circular bar 181 against the holding action of the spring 187 and move the fingers 182 on the circular bar 181 free of the flanges 123 and in turn releasing the bolt 52 to be retracted into the casing 50 by the spring 70, in the event the bolt is locked in its extended position by the key mechanism.

It is appreciated that the rod 209 and associated mechanism may also be used for opening the lock from the inside of the door 51 under normal conditions rather than by manipulating the pull buttons 105 or turning the knob 192.

The operation of the present invention is as follows:

For the purpose of illustration let us first as-

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sume that the lock is closed by the push button mechanism and that the ratchet wheels 68 are mounted on the shaft 69 in such position that the combination for releasing the bolt 52 is 12, 3, 5 and 15, these numbers correspond respectively to the push buttons 102 identified by the numerals "1," "2," "3" and "4" in Fig. 1 and the pull buttons 105 identified by the numerals "1," "2," "3" and "4" in Fig. 2. Assume that the person wishing to open the lock is on the outside of the door. The person first presses twice on the low part 104 of the push button 102 identified by the numeral "1" to advance the respective ratchet wheel 68 ten teeth and then pushes twice on the high part 103 of that push button to advance the ratchet wheel 68 the required additional two teeth to align its cutout portion 74 with the top end of the respective finger 67. The high part 103 of the push button 102 identified by the numeral "2" is then depressed three times to align the cutout portion 74 of the respective ratchet wheel 68 with the top end of the respective finger 67. Next, the push button 102 identified by the numeral "3" is pressed on its low part 104 once to advance the respective ratchet wheel 68 five teeth and align the cutout portion of that ratchet wheel with the top end of its respective finger 67. Finally, the push button 102 identified by the reference numeral "4" is operated. That push button is pressed on its low part 104 three times to advance the respective ratchet wheel 68 fifteen teeth and align its cutout portion 74 with the top end of the respective finger 67.

The cutout portions 74 of all of the ratchet wheels 68 will now be aligned with the top ends of the respective fingers 67, so that the top ends of the fingers will pass through the cutout portions 74 as the spring 70 acts to automatically draw the bolt 52 into a retracted position within the casing 50 withdrawing its rectangular portion 52^a from the keeper (not shown) freeing the door to be opened. If the door is to be opened from the inside, when locked by the push button mechanism, the same procedure is followed, except that the pull buttons 105 are pulled for advancing the ratchet wheels 68 the desired number of teeth. It being understood that the pull buttons are pulled until the flanges 108 strike the inside face of the plate 53 to advance the ratchet wheels 68 five teeth, and that it is necessary to depress the finger portions 113 to pivot the levers 110 against the action of the springs 114 to extend the stops 112 from the recesses 109 if it is desired to advance the respective ratchet wheels 68 one ratchet tooth. In the extended positions of the stops 112, the stops will strike the inside face of the plate 53 and retain the pull buttons 105 against further outward movement.

In order for the push button mechanism to operate properly it is necessary that all of the ratchet wheels 68 be at their starting positions; that is, with the lugs 79 of the ratchet wheels 68 engaging the lugs 78 of the stops 75, as shown in Figs. 6 and 9. Therefore, before manipulating any of the push buttons 102 or pull buttons 105, it may be necessary to longitudinally slide the door knob rod 132 to pivot the U-shaped bracket 135 which in turn pivots the dogs 125 against the holding action of the spring 130, thus freeing the ratchet wheels, which may have been turned from their starting position, to be turned back to their starting positions by their respective coil springs 80.

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To relock the door with the push button mechanism after having been opened, the door 51 is first swung to a closed position about its supporting hinges (not shown) and the door knob rod 132 is rotated to fully extend the bolt 52 from the casing 50 and engage its rectangular end 52^a into the keeper (not shown). This movement of the bolt 52 against the action of the spring 70 moves the ends of the fingers 67 back through the cutout portions 74 of the ratchet wheels 68. In this rotated position, the door knob rod 132 is moved longitudinally to move the fan shaped member 137, which is shaped to engage behind the U-shaped bracket 135 in the turned positions of the door knob rod 132, which in turn pivots the U-shaped brackets 135. The U-shaped brackets 135 in turn pivot the dogs 125 against the action of the spring 130 and free the ratchet wheels 68 to be returned to their starting positions by the coil springs 80.

To operate the lock when closed by the key mechanism, it should be remembered that all of the ratchet wheels 68 were turned to the positions in which their cutout portions 74 are aligned with the top ends of the fingers 67, so that these fingers 67 will not interfere with the operation of the bolt 52. Also, the lever 139 has been pivoted to the full line position shown in Fig. 18, behind the circular flange 144 on the door knob rod 132, so that the rod cannot be moved longitudinally to pivot the dogs 125 and free the ratchet wheels 68 to be returned to their starting position by the coil spring 80. This engagement of the lever 139 behind the flange 144 does not, however, interfere with rotative movement of the door knob rod 132.

If the lock is locked with the key mechanism and the person desiring to open the lock is outside of the door 51, he merely inserts the key 201 into the key hole opening 208. This act properly extends the plunger 207 against the holding action of the springs 207^a, from the inner end of the cylinder 206. These plungers 207 bear against the projections 204 on the sides of the half collars 202 and rotate the rings 81 with the half collars 202 against the holding action of the springs 120. This automatically aligns all of the slots 205 of the flanges 123 with the fingers 182 of the bar 181. Immediately, the bars 177 and 181 are free to be urged laterally to the right in Fig. 8, by the spring 189. Instantly, the keeper 198 is pivoted to disengage its keeper notch 200 from behind the endmost sleeve 61 freeing the bolt 52 to be retracted into the casing 51 by the spring 70.

To relock the lock by the key mechanism, the person within the room, on the inside of the door 51, first turns the knob 192 against the action of the spring 187 to move the fingers 182 on the circular bar 181 free of the periphery of the flanges 123, which now have their slots 205 disaligned with the fingers 182. When the fingers 182 have cleared the periphery of the flanges 123, the knob 192 is then pressed inwards to move the bars 177 and 181 longitudinally against the action of the spring 189. This action simultaneously engages the hooks 179 of the bar 177 into the openings 180 in the sides of the push button rods 99 to lock those rods against movement and disposes the fingers 182 of the circular bar 181 on the opposite sides of the flanges 123. The bolt 52 is still retracted into the casing 50 by the spring 70, so that the keeper 198 is held against pivoting by the endmost sleeve 61 on the bolt 52. However, longitudinal

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movement of the bars 177 and 181 pivoted the depending finger 193 about its pivot pin 194 and loaded the leaf spring 196. The person leaves the room and pivots the door to a closed position about its supporting hinges and from the outside of the door turns the door knob rod 132 to extend the bolt 52 against the holding action of the spring 70. As the end of the endmost sleeve 61 moves clear of the keeper 198, the loaded leaf spring 196 will immediately straighten out the depending finger 193 and pivot the keeper 198 to engage the keeper notch 200 behind the endmost sleeve 61 securing the bolt in its extended positions.

In the modification of the invention disclosed in Figs. 28 to 30, the construction of the lock is similar to that previously described, differing merely in the construction and operation of the push button mechanism.

In this modified form of the invention, the push button rods 99' of the number "3" and "4" push buttons 102 and pull buttons 105 are connected together for unitary movement by a tie rod 220 secured to the push button rods 99' by rivets 221. If desired, the tie rod 220 could be integrally formed with the push button rods 99'. The push button rods 99 of the number "1" and "2" push buttons 102 and pull buttons 105 are the same as the push button rods in the previous form of the invention.

Also, in this form of the invention, the dogs 125' of the number "2" and "3" ratchet wheels 68 are formed with integral tubular portions 222 which are rotatively engaged about the supporting rod 124'. These dogs 125' are retained in aligned positions with their respective ratchet wheels 68 and against longitudinal movement on the rod 124' by means of pins 223 mounted through the tubular portions 222 and which engage in circular grooves 224 cut in the supporting rod 124'. The tubular portion 222 of the dog 125' of the number "2" ratchet wheel 68 is formed with a lug 225 which extends toward and overlaps a lug 226 which is formed on the tubular portion 222 of the dog 125' of the number "3" ratchet wheel 68. These lugs are so arranged that when the number "3" ratchet wheel 68 is advanced causing its dog 125' to pivot, due to the action of the teeth 127 of the dog snapping over the teeth on the periphery of the ratchet wheel 68, the lug 226 on the tubular portion 222 of that number "3" dog merely moves away from the lug 225 on the tubular portion 222 of the number "2" dog 125'. However, the reverse is true when the number "2" dog 125' is pivoted by rotation of the number "2" ratchet wheel 68. In that case, the lug 225 of the tubular projection 222 of the number "2" dog 125' will strike the lug 226 of the number "3" dog 125' and pivot the number "3" dog to free the number "3" ratchet wheel 68 to be returned to its starting position by its respective coil spring 80.

The operation of this modified form of the invention is as follows:

Assume that the combination for opening the lock by the push button mechanism is 12, 3, 5 and 6. To open the lock the number "3" or "4" push button 102 or pull button 105 is first manipulated—either can be used as the number "3" and "4" push button rods 99' are connected together for unitary movement—to advance the number "3" and "4" ratchet wheels 68 one tooth. The operator then moves to the number "2" push button 102 or pull button 105 and manipulates the same to advance the number "2"

ratchet wheel 68 three teeth. Upon the first manipulation of either the number "2" push button 102 or pull button 105, the number "2" dog 125' was pivoted against the action of the spring 130 and its lug 225 bearing against the lug 226 of the tubular portion 222 of the number "3" dog 125' also pivoted that latter dog and freed the number "3" ratchet wheel 68 to be returned to its starting position by its respective coil spring 80. The operator then returns to the combined number "3" and "4" push button 102 and pull buttons 195 and operates either to advance the number "3" and "4" ratchet wheels five teeth. As the number "4" ratchet wheel 68 still retains its one tooth advance from the first manipulation of the combined number "3" and "4" push buttons 102 and pull buttons 105, this number "4" ratchet wheel will have been advanced a total of six ratchet teeth to align its cutout portion 74 with the top end of the respective finger 67. The one tooth advance of the number "3" ratchet wheel 68 had been erased by the operation of the number "2" ratchet wheel 68, so that the number "3" ratchet wheel 68 has been advanced a total of five ratchet teeth to align its cutout portion 74 with the top end of its respective finger 67.

The operator then turns to the number "1" push button 102 or pull button 105 and operates either to advance the respective number "1" ratchet wheel 68 a total of twelve ratchet teeth to align the cutout portion of that number "1" ratchet wheel 68 with the top end of its respective finger 67. This completes the alignment of the cutout portions 74 of the ratchet wheels 68 with the top end of the fingers 67 and frees the bolt 52 to be retracted into the casing 50 by the spring 70.

In illustrating this form of the invention, the number "3" and "4" push button rods 99' are shown connected by the tie rod 220; however it is pointed out that any two adjacent push button rods could be chosen for connection in the manner outlined.

In other respects this form of the invention is similar to the first form and like reference numerals identify like parts in each of the several views.

It is apparent from the foregoing description that a novel lock mechanism is proposed which may be selectively operated by either the push button mechanism or the key mechanism, and one which will have a great number of different combinations for operation by the push button mechanism and which combinations may be quickly changed by the owner of the lock for the purpose of excluding persons who at one time were rightfully in possession of the combination.

While I have illustrated and described the preferred embodiments of my invention, it is to be understood that I do not limit myself to the precise constructions herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claims.

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

1. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels

toward said stops, fingers extended substantially vertically from said bolt and having free ends along one side of said ratchet wheels for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cutout portions, and push button mechanism for individually advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, said shaft being formed of separate sections in end alignment and having a group of said ratchet wheels on each section, means rotatively supporting the adjacent ends of said sections, and means for holding said sections in relative rotative positions for changing the relative disposition of the cutout portions of the ratchet wheels of each shaft section and the free ends of the respective fingers.

2. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels toward said stop, fingers extended substantially vertically from said bolt and having free ends along one side of said ratchet wheels for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cutout portions, and push button mechanism for individually advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, said shaft being formed of separate sections in end alignment and having a group of said ratchet wheels on each section, means rotatively supporting the adjacent ends of said sections, and means for holding said sections in relative rotative positions for changing the relative disposition of the cutout portions of the ratchet wheels of each shaft section and the free ends of the respective fingers, and means on said shaft sections for indicating the relative rotative positions thereof.

3. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels toward said stops, fingers extended substantially vertically from said bolt and having free ends along one side of said ratchet wheels for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cutout portions, and push button mechanism for individually advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, said shaft being formed of separate sections in end alignment and having a group of said ratchet wheels on each section, means rotatively supporting the adjacent ends of said sections, and means for holding said sections in relative rotative positions for changing the relative disposition of the cutout portions of the ratchet wheels of each shaft section and the free ends of the respective fingers, said holding means comprises a gear on each of said shaft sections and a cam

operated plate for each gear having a tooth engageable between adjacent teeth of the respective gear.

4. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels toward said stops, fingers extended substantially vertically from said bolt and having free ends along one side of said ratchet wheels for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cutout portions, and push button mechanism for individually advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, sleeves rotatively supported on said bolt one for each of said fingers and from which said fingers extend vertically, pins extended through said bolt retaining said sleeves against longitudinal movement, lugs projecting from said sleeves to abut the adjacent ends of said pins, and springs operating between said pins and said lugs retaining said sleeves in a rotative position in which said lugs engage said pins and the free ends of said fingers extend along the sides of said ratchet wheels.

5. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels toward said stops, fingers extended substantially vertically from said bolt and having free ends along one side of said ratchet wheels for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cutout portions, and push button mechanism for individually advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, sleeves rotatively supported on said bolt one for each of said fingers and from which said fingers extend vertically, pins extended through said bolt retaining said sleeves against longitudinal movement, lugs projecting from said sleeves to abut the adjacent ends of said pins, and springs operating between said pins and said lugs retaining said sleeves in a rotative position in which said lugs engage said pins and the free ends of said fingers extend along the sides of said ratchet wheels, and manually controlled means for rotating any one of said sleeves against the holding action of said springs to move the free end of the respective finger beyond the periphery of the respective ratchet wheel rendering the respective finger inoperative for bolt locking purposes.

6. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels toward said stops, fingers extended substantially vertically from said bolt and having free ends along one side of said ratchet wheels for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout

portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cutout portions, and push button mechanism for individually advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, sleeves rotatively supported on said bolt one for each of said fingers and from which said fingers extend vertically, pins extended through said bolt retaining said sleeves against longitudinal movement, lugs projecting from said sleeves to abut the adjacent ends of said pins, and springs operating between said pins and said lugs retaining said sleeves in a rotative position in which said lugs engage said pins and the free ends of said fingers extend along the sides of said ratchet wheels, and separate key operated mechanism for locking the bolt in an extended position in the rotative position of said ratchet wheels in which their cutout portions are aligned with the free ends of said fingers.

7. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels toward said stops, fingers extended substantially vertically from said bolt and having free ends along one side of said ratchet wheels for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cut-out portions, and push button mechanism for individually advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, sleeves rotatively supported on said bolt one for each of said fingers and from which said fingers extend vertically, pins extended through said bolt retaining said sleeves against longitudinal movement, lugs projecting from said sleeves to abut the adjacent ends of said pins, and springs operating between said pins and said lugs retaining said sleeves in a rotative position in which said lugs engage said pins and the free ends of said fingers extend along the sides of said ratchet wheels, and separate key operated mechanism for locking the bolt in an extended position in the rotative position of said ratchet wheels in which their cutout portions are aligned with the free ends of said fingers, and means controlled by said key operated mechanism for holding said push button mechanism inoperative to rotate said ratchet wheels when the bolt is secured in its extended position by said key operated mechanism.

8. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported in said casing parallel to said bolt, a plurality of rings rotative on said shaft, radially extending flanges formed on said rings and having staggered slots, a slidably mounted bar having fingers engageable along one side of said flanges, means controlled by movements of said bar and terminating in a keeper engageable behind a portion of said bolt for securing the same in an extended position, and key operated plungers controlling rotation of said rings to align their cutouts with said fingers freeing said bar for movement in a direction to withdraw said keeper from its operative engagement with said portion of said bolt.

9. A lock, comprising a casing, a bolt slidably

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extended through said casing, a shaft supported in said casing parallel to said bolt, a plurality of rings rotative on said shaft, radially extending flanges formed on said rings and having staggered slots, a slidably mounted bar having fingers engageable along one side of said flanges, means controlled by movements of said bar and terminating in a keeper engageable behind a portion of said bolt for securing the same in an extended position, and key operated plungers controlling rotation of said rings to align their cutouts with said fingers freeing said bar for movement in a direction to withdraw said keeper from its operative engagement with said portion of said bolt, said rings being resiliently retained in operative engagement with said key operated plungers.

10. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported in said casing parallel to said bolt, a plurality of rings rotative on said shaft, radially extending flanges formed on said rings and having staggered slots, a slidably mounted bar having fingers engageable along one side of said flanges, means controlled by movements of said bar and terminating in a keeper engageable behind a portion of said bolt for securing the same in an extended position, and key operated plungers controlling rotation of said rings to align their cutouts with said fingers freeing said bar for movement in a direction to withdraw said keeper from its operative engagement with said portion of said bolt, said keeper being pivotally supported and said control means includes a depending finger engaging a slot in said keeper for moving said keeper between operative and inoperative positions.

11. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels toward said stops, fingers extended substantially vertically from said bolt and having free ends along one side of said ratchet wheels for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cutout portions, and push button mechanism for advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, and pivotally mounted dogs for holding said ratchet wheels in rotative position away from said stops, said push button mechanism including a longitudinally movable push button rod for each of said ratchet wheels, means connecting together an adjacent pair of said push button rods to uniformly rotate the respective ratchet wheels when either of said connected pair of push button rods is moved longitudinally, and means interconnecting the dog of one of the ratchet wheels of the interconnected pair of push button rods and the dog of an adjacent ratchet wheel to pivot the dog of the said ratchet wheel of the interconnected pair to free that ratchet wheel when the latter-mentioned ratchet wheel is advanced against the action of its respective retaining means.

12. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels toward said stops, fingers extended substantially

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vertically from said bolt and having free ends along one side of said ratchet wheels for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cutout portions, and push button mechanism for advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, and pivotally mounted dogs for holding said ratchet wheels in rotative position away from said stops, said push button mechanism including a longitudinally movable push button rod for each of said ratchet wheels, means connecting together an adjacent pair of said push button rods to uniformly rotate the respective ratchet wheels when either of said connected pair of push button rods is moved longitudinally, and means interconnecting the dog of one of the ratchet wheels of the interconnected pair of push button rods and the dog of an adjacent ratchet wheel to pivot the dog of the said ratchet wheel of the interconnected pair to free that ratchet wheel when the latter-mentioned ratchet wheel is advanced against the action of its respective retaining means, said push button rods having their one ends extended in a circle from one side of said casing, a circular boss formed on the said one side of said casing concentric with said push button rods, each of said push button rods having its outer end shaped to have a high part aligned with said boss and a low part positioned radially outward from said boss, so arranged and constructed that finger pressure on either of said parts will cause the push button rods to be pressed inward different amounts to vary the rotative movement of the respective ratchet wheels.

13. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels toward said stops, fingers extended substantially vertically from said bolt and having free ends along one side of said ratchet wheels for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cutout portions, and push button mechanism for advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, and pivotally mounted dogs for holding said ratchet wheels in rotative position away from said stops, said push button mechanism including a longitudinally movable push button rod for each of said ratchet wheels, means connecting together an adjacent pair of said push button rods to uniformly rotate the respective ratchet wheels when either of said connected pair of push button rods is moved longitudinally, and means interconnecting the dog of one of the ratchet wheels of the interconnected pair of push button rods and the dog of an adjacent ratchet wheel to pivot the dog of the said ratchet wheel of the interconnected pair to free that ratchet wheel when the latter-mentioned ratchet wheel is advanced against the action of its respective retaining means, said push button rods having their one ends extended in a circle from one side of said casing, a circular boss formed on the said one side of said casing concentric with said push

button rods, each of said push button rods having its outer end shaped to have a high part aligned with said boss and a low part positioned radially outward from said boss, so arranged and constructed that finger pressure on either of said parts will cause the push button rods to be pressed inward different amounts to vary the rotative movement of the respective ratchet wheels, said push button rods having their other ends extended from the other side of said casing, and pull buttons mounted on the said other ends of said push button rods by which said push button rods can be pulled from the other side of said casing to rotate said ratchet wheels.

14. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels toward said stops, fingers extended substantially vertically from said bolt and having free ends along one side of said ratchet wheels for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cutout portions, and push button mechanism for individually advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, sleeves rotatively supported on said bolt one for each of said fingers and from which said fingers extend vertically, pins extended through said bolt retaining said sleeves against longitudinal movement, lugs projecting from said sleeves to abut the adjacent ends of said pins, and springs operating between said pins and said lugs retaining said sleeves in a rotative position in which said lugs engage said pins and the free ends of said fingers extend along the sides of said ratchet wheels, and separate key operated mechanism for locking the bolt in an extended position in the rotative position of said ratchet wheels in which their cutout portions are aligned with the free ends of said fingers, and means controlled by said key operated mechanism for holding said push button mechanism inoperative to rotate said ratchet wheels when the bolt is secured in its extended position by said key operated mechanism, and means controlled by a knob projecting from one side of said casing for quickly freeing said bolt when locked by said ratchet wheels or said key operated mechanism.

15. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels toward said stops, fingers extended substantially vertically from said bolt and having free ends along one side of said ratchet wheels for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cutout portions, and push button mechanism for individually advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, said shaft being formed of separate sections in end alignment and having a group of said ratchet wheels on each section, means rotatively supporting the adjacent ends

of said sections, and means for holding said sections in relative rotative positions for changing the relative disposition of the cutout portions of the ratchet wheels of each shaft section and the free ends of the respective fingers, said shaft sections having a plurality of longitudinal serrations, preferably twenty in number, engaged by a like number of serrations on said stops, so constructed and arranged that said ratchet wheels can be held in any desired adjusted positions on said shaft sections.

16. A lock, comprising a casing, a bolt slidably extending through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels toward said stops, fingers extended substantially vertically from said bolt and having free ends along one side of said ratchet wheels for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cutout portions, and push button mechanism for individually advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, said stops being adjustably fixedly mounted on said shaft for controlling the spacing of the cutout portion of said ratchet wheels with relation to the free ends of said fingers, said stops being in the form of rings engaged about said shaft, serrations within said stops, and serrations on said shaft selectively engageable by the serrations of said stops for holding said stops in desired adjusted positions on the shaft sections.

17. A lock comprising a casing, a bolt slidably extended through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels toward said stops, fingers extended substantially vertically from said bolt and having free ends along one side of said ratchet wheels for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cutout portions, and push button mechanism for individually advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, said ratchet wheel retaining means comprises coil springs operating between said ratchet wheels and said stops, each ratchet wheel having a tubular portion surrounding said shaft and extended toward the stop of the next adjacent ratchet wheel, each of said stops having a portion overhanging the tubular portion of the adjacent ratchet wheel, said coil springs being wound about said tubular portions and having one end connected to the respective ratchet wheel and the other end connected to the overhanging portion of the adjacent stop.

18. A lock, comprising a casing, a bolt slidably extended through said casing, a shaft supported within said casing parallel to said bolt, ratchet wheels rotatively supported on said shaft, stops limiting rotation of said ratchet wheels in one direction only, means biasing said ratchet wheels toward said stops, fingers extended substantially vertically from said bolt and having free ends along one side of said ratchet wheels

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for retaining said bolt in a position extended from said casing, said ratchet wheels being formed with cutout portions alignable with the free ends of said fingers through which said free ends pass in the aligned positions of the cutout portions, and push button mechanism for individually advancing said ratchet wheels to align the cutout portions thereof with the free ends of said fingers, said shaft being formed of separate sections in end alignment and having a group of said ratchet wheels on each section, means rotatively supporting the adjacent ends of said sections, and means for holding said sections in relative rotative positions for changing the relative disposition of the cutout portions of the ratchet wheels of each shaft section and the free ends of the respective fingers, said holding means comprises a gear on each of said shaft sections and a cam operated

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plate for each gear having a tooth engageable between adjacent teeth of the respective gear, said push button mechanism including means engaging said ratchet wheels at the side thereof for turning the same.

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