Feb. 19, 1957 G. A. SMITH 2,782,062

DOOR LOCK

Filed Jan. 5, 1953 2 Sheets-Sheet 1

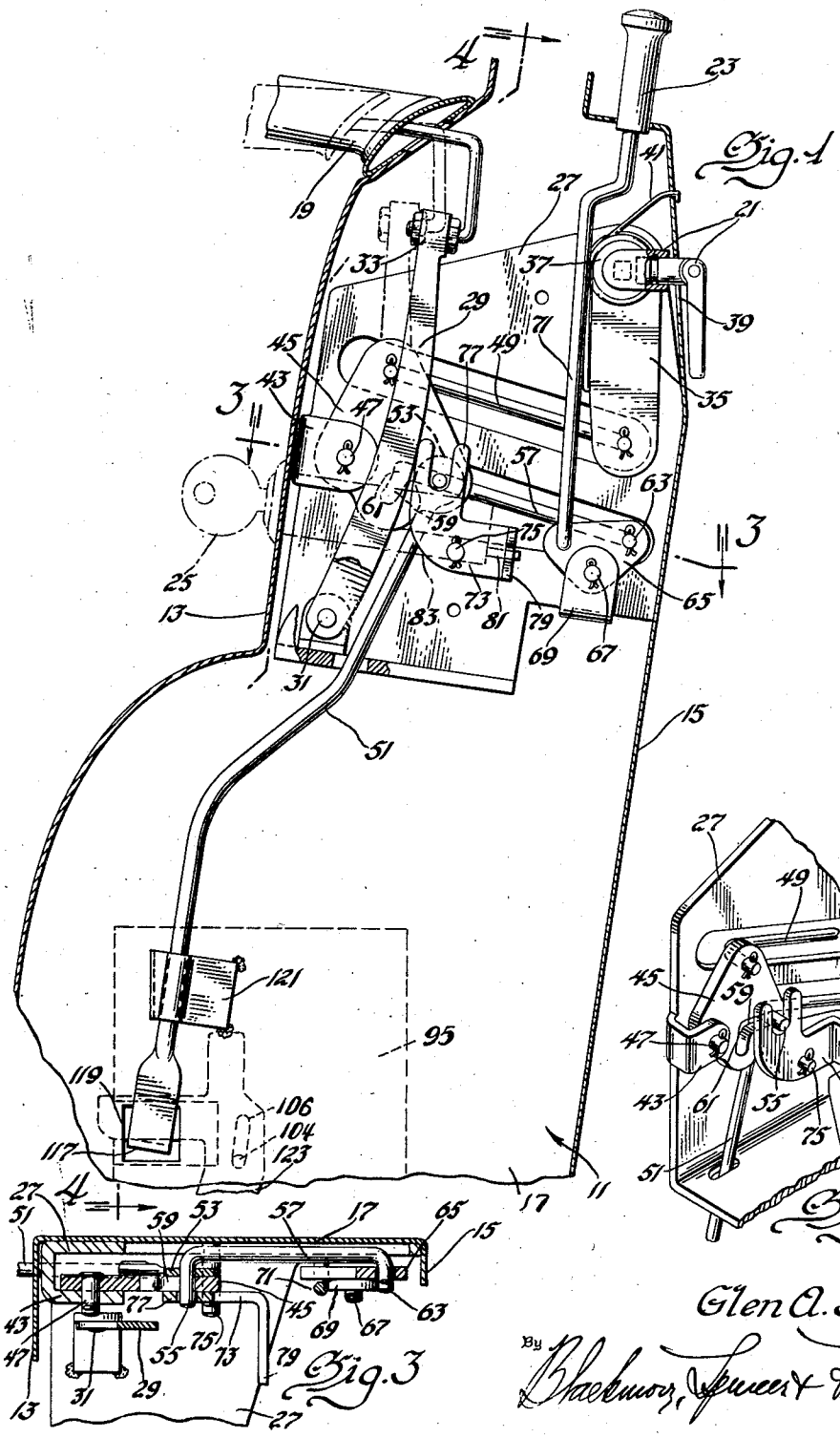


Fig. 1

Fig. 2

Fig. 3

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DOOR LOCK

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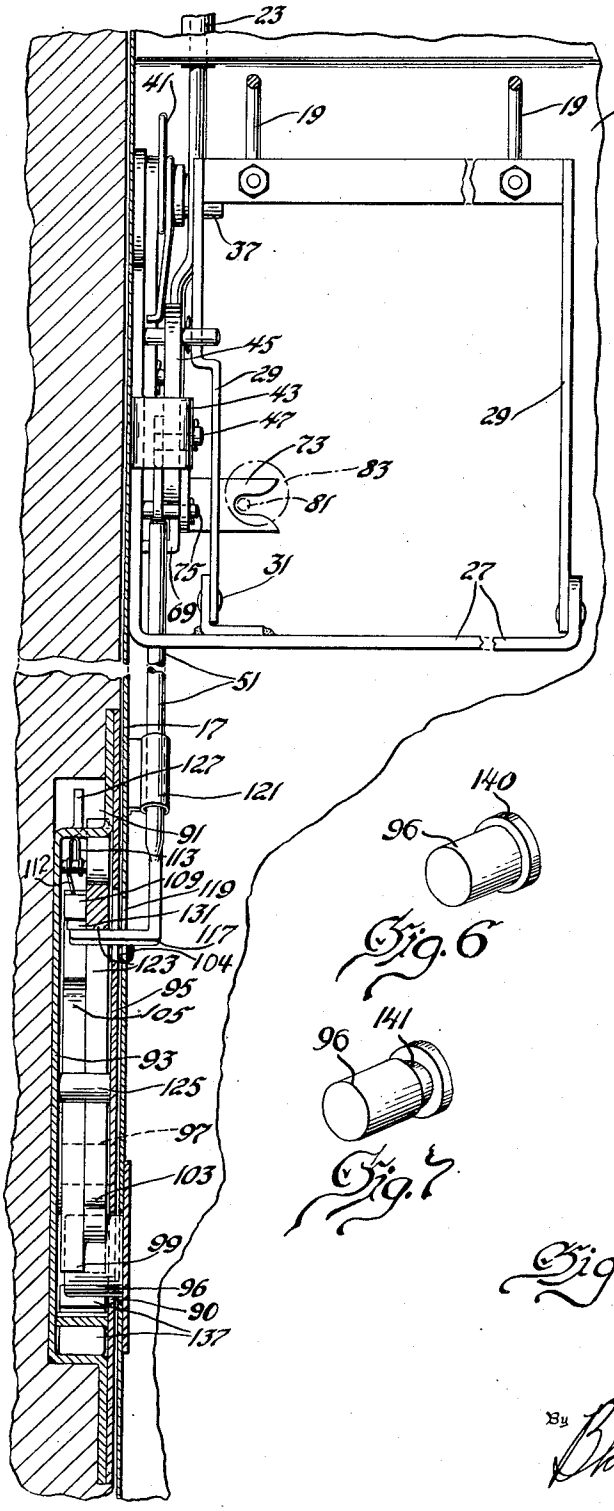


Fig. 4

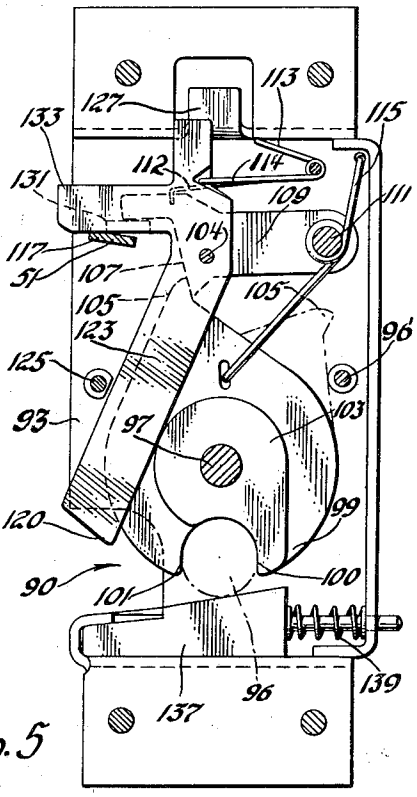


Fig. 5

Fig. 6

Fig. 7

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DOOR LOCK

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Application January 5, 1953, Serial No. 329,546

19 Claims. (Cl. 292—216)

This invention relates to locks and latches and is intended for use particularly on vehicles for latching and locking the doors, and is a continuation in part of the inventor's prior application, S. N. 573,850, filed January 22, 1945, now abandoned.

One of the features of the lovel latch is concerned with the location of the parts. As is conventional, the device as a whole includes a movable bolt which engages a striker, the striker being stationary with reference to the part on which it is mounted. In accordance with this invention the striker is carried by the swinging door and the movable bolt which holds it to retain the door closed is carried by a fixed door post.

The means to release the bolt and free the striker is carried by the swinging door. To provide for such a construction the fixed door post casing has slots or notches, one for the passage of the striker as the door closes to permit the bolt to grip the striker, and a second to receive a part of the bolt releasing mechanism carried by the door so that, as the door closes, this part may move through its notch into a position from which it may be moved by an operating member on the door to release the hold of the bolt on the striker.

The invention is illustrated on the accompanying drawings in which:

Fig. 1 is a vertical transverse section through the door.

Fig. 2 is a perspective of certain parts seen in Fig. 1.

Fig. 3 is a section on line 3—3 of Fig. 1.

Fig. 4 is a vertical section on line 4—4 of Fig. 1 showing the adjacent operating parts on the door and post.

Fig. 5 is an end view of the latch mechanism removed from the door post.

Figs. 6 and 7 show modified strikers.

Referring to the several figures, numeral **11** is used to identify the door which swings in the usual way on hinges not shown. Its outer surface is marked **13**, its inner surface **15** and its locking face, which closes adjacent the post, is seen at **17**. Projecting from the door on its outside is a handle of convenient shape marked **19**. This handle is to be pulled away from the outer surface of the door to release the door from the post when latched as will be explained. An inside handle **21** serves also, but from within the vehicle, to release the bolt. A knob or push button **23** adjacent the top of part **15** and slidable therethrough is for the purpose of locking the door to prevent the release of the bolt from the striker. The door can be locked and unlocked from the outside by a key **25**.

To the face **17** of the door and within the enclosure is secured a plate **27**. The operating mechanism for actuation by the several manipulating parts mentioned above is carried by this plate. There is a long lever **29** pivoted to plate **27** at **31**. It extends vertically and is attached at **33** to the handle **19** so that the latter may swing it from the full line to the dotted line position as shown in Fig. 1. A link or arm **35** is secured to a rotatable pin or rockshaft **37** to which is secured any form of inside handle marked **21** as stated above. When the

handle **21** is moved in the slot **39** the link **35** swings in the plane of the paper (see Fig. 1). A coil spring **41** wound about pin **37** and engaging the link **35** biases the link to the position shown.

At **43** is a bent over tab on plate **27**. It pivots a primary lever **45** of generally triangular shape at one of its apices **47**. The normally uppermost apex is connected by a handle link **49** to the lower end of link or arm **35** above referred to. The long lever **29** manipulated by handle **19**, when swung to its dotted line position shown in Fig. 1, engages the angular end or projection of link **49** and swings the triangular lever **45** counterclockwise as will be readily understood. Similarly rotation of link **35** by handle **21** will rotate lever **45** through the instrumentality of link **49**. A latch operating or lock release rod **51** has at its upper end an eye **53** encircling and pivoting on the bent over end **55** or pivot member of a locking link **57**. The engagement is between the lever **45** and surface **17**. The lever **45** has adjacent what may be called its third apex a slot through which this bent end **55** extends as shown in Fig. 2. The slot has a generally horizontal part **59** and a portion **61** which is substantially in the form of an arc with its center at **47**. The other end of locking link **57** is connected at **63** to one apex of a lever **65** pivoted at **67** to another tab **69** on plate **27**. The third apex of lever **65** is connected to a link **71** which carries the knob **23** mentioned before.

Another lever **73** is pivoted at **75** to plate **27**. It has a forked end **77** straddling the end **55** of link **57** as shown by Fig. 2 and its other end is bent angularly and has forks **79** between which there is received a pin **81** projecting from a lock mechanism **83**. Rotation of the pin by the key operates to rotate lever **73** and move the link end **55** in the slot **59—61**.

When the bolt in the door post is in latching engagement with the door-carried striker it may be released for opening the door by an upward pull on lock release rod **51**. If the link end **55**, which carries the eye **53** at the end of rod **51**, is in the horizontal part **59** of the slot, rotation of lever **45** counterclockwise raises link end **55** and pulls rod **51** to release the bolt. This release may be effected by the handle **19** from outside the door or by the handle **21** from within the vehicle. If, however, link end **55** is moved to the upper end of the arcuate slot **61** by a depression of knob **23** the bolt release cannot be effected by rotation of lever **45** by either handle because the vertical walls of the slot merely slide along the link end. The movement of the link end **55** to the end of the arcuate slot to thus render the opening of the door by the handles impossible is accomplished by depressing the knob **23** which operates in an obvious manner through the lever **65**, or by the rotation of the key which, by means of pin **81**, turns the lever **73** and thus moves the link end **55**.

The bolt and its associated latch mechanism are shown on Sheet 2 of the drawings. The door post has a recess **91** into which is fitted a hollow member **93** with a cover **95**, these parts forming an enclosure for the bolt. The enclosure is suitably cut away as at **90** to form an opening through which the door carried striker marked **96** may move. Pivoted at **97** to the walls of the enclosure is a bolt **99**. It has a pocket **101** shaped to fit the striker. The bolt **99** has a centrally disposed overlying part **103** which has a wall forming a half pocket **100** registering with the corresponding part of bolt **99** as best shown in Fig. 5. Bolt **99** has a toothed projection **105** which is engaged by a shoulder **107** of a detent **109**, the latter pivoted at **111** and biased by a leg **112** of the spring **113** to hold the detent shoulder against the tooth **105** of the bolt and thus prevent the clockwise rotation of the bolt by its spring **115** to a position such that the

striker 96 is moved out of the pocket 100. As shown in Figs. 4 and 5, the spring 113 is of the hair-pin type. One leg 112 engages detent 109 and the other leg 114 engages a safety catch 123. The legs are looped around an anchor pin intermediate their ends and the closed end of the hair-pin spring 113 engages the housing 93.

The following structural arrangement has been provided to release the latch mechanism. The operating rod 51 referred to as carried by the door and adjacent the door plate 17, has an angular end 117 extending through a slot 119 in the door plate 17 and through a slot formed in the post enclosure member 95. When one of the door handles raises the rod 51 it slides through a door guide 121 and operates to lift the detent 109. Instead of directly engaging the detent 109 it operates indirectly through the safety catch 123 which is mounted to slide and rock between a guide 125 and the edge of part 103, as best shown in Fig. 5, and about a pin 104 projecting into a slot 106 in the mounting plate cover 95 as best shown in Fig. 1. The upper end of safety catch 123 slides in a notch 127 of the latch casing and a spring 113 biases the safety device or catch toward its lower position by acting through detent 109 and the lug 131 on the safety catch 123. Lug 131 projects from a lateral arm 133 on safety catch 123, and the lug is adapted to engage the detent 109, and the outer end of arm 133 is engaged by the end 117 of the rod 51. Fig. 5 shows the striker locked by the bolt 99. When the rod 51 is pulled up the safety catch 123 is raised. The safety catch lifts detent 109 to free the bolt 99 and its spring 115 rotates the bolt and ejects the striker 96, the bolt coming to a stop at 96'.

When the door is being closed the safety catch and the tip 100 of part 103 are in the slot 90 in the path of the incoming striker. The safety catch is lifted by the engagement of the striker with its tip 120. The lifting of the safety catch 123 by the entrance of striker 96 in closing the door normally does not perform any function, but if the bolt 99 has in some way been locked by lever 109 in latched position, the lifting of the safety catch 123 will lift detent 109 and release bolt 99 to allow the spring 115 to position the bolt so that the striker may enter pocket 101. As the striker moves inwardly it passes the tip 120 of catch 123 and the spring pressed catch then moves down to prevent the escape of the striker even if it is not latched in the pocket of the bolt 99. A further push on the door causes the striker to rotate the bolt 99 by its engagement with the tip 100 of part 103. As the door approaches its latched position the bolt 99 turns sufficiently to permit the striker to roll into the pocket, at which time the detent 109 engages the bolt 99 and holds it in the position shown. It will be seen from Fig. 5 that as the striker approaches the pocket it engages and pushes rearwardly a sliding wedge 137 against the resilient resistance of a spring 139. After the striker is in the pocket any tendency of the door and its striker 96 to move downwardly relative to the post is cushioned by the resiliently pressed wedge 137.

The striker 96 may also be modified by providing an enlarged head 140 at the free end of the striker as shown in Fig. 6 so that the rotating bolt 99 and 103 would be positioned between the face 17 of the door and the enlarged head 140 on the striker 96. The striker 96 may also be provided with an annular recess 141 as shown in Fig. 7 adjacent the free end to receive the rotating bolt 99 and 103. The bolt 99 has a pocket 101 locking the striker against transverse movement with respect to the bolt and the striker 96 has a head or recess locking the striker against axial movement with respect to the bolt. In these modifications the door is not only securely latched against lateral or swinging movement but also is latched to the door jamb or post against fore and aft movement or movement in the plane of the door. Since the striker 96 with a head or recess would be slightly longer the hollow member 93 would be suitably

formed or positioned to provide clearance for the modified striker 96.

The foregoing detailed description of the preferred embodiment of the invention is not intended to limit the invention since the inventive principles involved are capable of modification without departing from the spirit of the invention and the scope of the appended claims.

I claim:

1. A door fastening mechanism consisting of a release mechanism and a striker adapted to be mounted on a door and a latch mechanism adapted to be mounted on a post, said release mechanism including a vertically reciprocating rod, a door handle, means connecting said door handle and said rod to reciprocate said rod, said rod having an angularly directed end, said latch mechanism including a housing having openings for the striker and rod end, a bolt having a pocket to receive said striker, said bolt being rotatably mounted in said housing for movement between releasing and fastening positions, a detent lever pivotally mounted in said housing, cooperating means on said detent lever and bolt to hold said bolt in fastening position, a spring mounted on said housing and urging said bolt toward release position, a safety catch movably mounted in said housing and having a part in front of said bolt pocket so that the striker strikes said safety catch before entering said pocket, said safety catch having another part adjacent said detent lever to release said detent lever when the striker strikes the safety catch, a lateral lug on said safety catch, said rod end positioned under said lug whereby on upward movement of said rod the safety catch and detent lever are raised to release said catch.

2. In a door fastening mechanism, an operating mechanism adapted to be mounted on a door and including a support, a primary lever for releasing the fastening mechanism from inside and outside the door, said lever being pivoted to said support and having a slot with a radial part and a circumferential part with respect to said primary lever pivot, locking link means slidably mounted in said slot, means to move said locking link means from the radial to the circumferential part of said slot, a lock release rod operably connected to said link means, and manually operable means for rotating said primary lever.

3. The invention defined by claim 2, said manually operable means for rotating said primary lever including a projection on said primary lever, a handle lever pivoted at one end on said support and engaging said projection, and a handle connected to said handle lever.

4. The invention defined by claim 2, said manually operable means for rotating said primary lever including a rockshaft rotatably mounted on said support, a handle on said rockshaft, an arm on said rockshaft, a handle link connecting said arm and said primary lever.

5. In a door fastening mechanism, an operating mechanism adapted to be mounted on a door and including a support, a primary lever pivoted to said support, said primary lever having a slot with a radial part and a circumferential part with respect to said primary lever pivot, a pivot member slidably mounted in said slot, a locking link connected to said pivot member, means on said support to guide said locking link in movement transverse to the circumferential part of said slot to move said pivot member, a lock release rod connected to said pivot member, inside and outside manual operating means connected to said primary lever to rotate said lever, manually operable locking means connected to said locking link to position the pivot member in the radial part of said slot for manual operation and in the circumferential part of said slot to render the manual operating means inoperative.

6. A door fastening mechanism consisting of a release mechanism and a striker adapted to be mounted on a door and a latch mechanism adapted to be mounted on a post, said release mechanism including a vertically reciprocating rod, a door handle, means connecting said door

handle and said rod to reciprocate the rod, said rod having an angularly directed end, said latch mechanism including a rotatable bolt having a pocket to receive said striker, a detent lever having a shoulder to engage and hold said bolt in striker-holding position, said rod end operable by its upward movement to move said detent lever and thereby release said bolt, said means connecting said door handle and said rod including a primary pivoted lever, said handle being operatively connected to said primary lever to rotate the primary lever, said primary lever having a slot with a radial part and a circumferential part with respect to the primary lever pivot, support means slidably supporting said rod in said slot, and lever means to move said support means from the radial part of said slot to the circumferential part to render said handle inoperative to release said bolt.

7. A door fastening mechanism consisting of a release mechanism and a striker adapted to be mounted on a door and a latch mechanism adapted to be mounted on a post, said release mechanism including a vertically reciprocating rod, a door handle, means connecting said door handle and said rod to reciprocate the rod, said rod having an angularly directed end, said latch mechanism including a rotatable bolt having a pocket to receive said striker, a detent lever having a shoulder to engage and hold said bolt in striker-holding position, said rod end operable by its upward movement to move said detent lever and thereby release said bolt, said means connecting said door handle and said rod including a primary pivoted lever, said primary lever having a projection, a handle lever pivotally mounted to engage said projection, said handle being connected to said handle lever, said handle lever operatively engaging said projection to rotate the primary lever, said primary lever having a slot with a radial part and a circumferential part with respect to the primary lever pivot, support means slidably supporting said rod in said slot, and lever means to move said support means from the radial part of said slot to the circumferential part to render said handle inoperative to release said bolt.

8. In a door fastening mechanism, a latch mechanism adapted to be mounted on supports on a post and on a door including a bolt rotatably mounted on one of said supports, detent means for holding said bolt in door latched position, a striker-receiving pocket in the periphery of said bolt, a wedge-shaped cam slidably mounted on said one support, the surface of said cam being generally parallel to a line tangential to the periphery of said bolt, a spring mounted between said one support and said cam to urge the thicker portion of said wedge-shaped cam toward said striker-receiving pocket, a striker on the other support and movable toward said wedge-shaped cam to enter said pocket and contact said wedge-shaped cam to lock the striker in said pocket between the bolt and the wedge-shaped cam.

9. A door fastening mechanism consisting of a release mechanism and a striker pin adapted to be mounted on a door and a latch mechanism adapted to be mounted on a post, said release mechanism including a rod mounted for axial reciprocating movement engaging said latch mechanism to actuate said latch mechanism and having a portion mounted for lateral bodily shifting movement, means to disable said release mechanism in response to said lateral bodily shifting movement of said portion of said rod, said latch mechanism including bolt means operable to hold said pin, detent means to hold said bolt in pin holding position, and means on said rod extending to said latch mechanism operable to disengage said detent means and release said bolt.

10. A door fastening mechanism consisting of a release mechanism and a striker pin adapted to be mounted on a door and a latch mechanism adapted to be mounted on a post, said release mechanism including operating means, disabling means and a rod, said rod mounted for axial reciprocating movement engaging said latch mechanism to operate said latch mechanism and having a portion mounted for transverse shifting movement for disabling said release mechanism, said operating means being connected to said rod to reciprocate said rod, said disabling means being connected to said rod to transversely shift said rod to disable said release mechanism, said latch mechanism including bolt means to hold said pin and detent means to hold said bolt in pin holding position, and means on said rod of said release mechanism extending to said latch mechanism operable upon said detent means to disengage said detent means and release said bolt.

11. A door fastening mechanism consisting of a release mechanism and a striker pin adapted to be mounted on a door and a latch mechanism adapted to be mounted on a post, said release mechanism including a reciprocable rod, a portion of said rod also being mounted for transverse movement, said rod having an angular projection at one end, said latch mechanism including bolt means operable to hold said pin, detent means to hold said bolt means in pin holding position, safety catch means to hold said pin in one position, and said projection on the rod end positioned to operatively engage said safety catch and detent means to release said bolt means.

12. A door fastening mechanism consisting of a release mechanism and a striker pin adapted to be mounted on a door and a latch mechanism adapted to be mounted on a post, said pin extending from said door to said latch mechanism, said release mechanism including a rod mounted for longitudinally reciprocating movement between a latching and a releasing position to release said latch mechanism and for transversely shifting movement from an operative to an inoperative position, a handle, means connecting said handle and said rod in said operative position to reciprocate the rod upon actuation of said handle and operatively disconnecting said handle and said rod in said inoperative position, said rod having an angularly directed end projecting into said latch mechanism, said latch mechanism including a rotatable bolt having a pocket to receive said pin, detent lever means having a shoulder positioned to engage and hold said bolt in pin holding position, said rod end located adjacent said detent lever means and operable upon said detent lever means during said longitudinally reciprocating movement from said latching to said releasing position to move said detent lever means and release said bolt.

13. In a door fastening mechanism, a latch mechanism and a striker pin adapted to be mounted on a door and a post, said latch mechanism including a support, bolt means mounted on said support for movement between pin releasing and pin fastening positions, detent means mounted on said support to hold said bolt means in fastening position, a spring positioned between said support and said bolt means to urge said bolt toward the releasing position, a safety catch slidably mounted on said support for movement between a fastening and a releasing position and having one part when said safety catch is in the fastening position located in front of said bolt means to block complete release of said pin from said bolt means and having another part when said safety catch is in the release position located to engage and release said detent means.

14. In a door fastening mechanism, a latch mechanism and a striker pin adapted to be mounted on a door and a post and including a support, a bolt rotatably mounted on said support for movement between pin releasing and pin fastening positions, a spring mounted on said support and engaging said bolt to urge said bolt toward releasing position, a detent lever pivoted on said support, cooperating means on said bolt and lever to hold said bolt in fastening position, a safety catch slidably mounted on said support for movement between a fastening and a releasing position, means on said support and said bolt to guide said safety catch, said safety catch in the fastening position having a part located in front of said bolt to prevent release of said pin from said bolt, and said safety catch in

the release position having another part engaging said detent lever to release said bolt whereby said spring will rotate said bolt to the release position.

15. A door lock mechanism for a door member and a frame member comprising a rotatable bolt adapted to be mounted on one of said members for cooperation with a striker on the other of said members and positioned to cooperate with said rotatable bolt, said rotatable bolt being rotated in one direction for latching said door with respect to said striker and being rotated in an opposite direction for releasing said striker, detent means mounted on said one of said members for rotation in one direction for latching said bolt with respect to said striker and in an opposite direction for releasing said bolt with respect to said striker, the direction and planes of rotation of said bolt and detent means being the same when said bolt is rotated for latching said striker and said detent means is rotated for latching said bolt, a rod mounted on said door for axially shiftable movement and for transverse swinging movement in a plane parallel to the plane of said detent means and bolt, means on said rod for operating said detent means to rotate said detent means out of engagement with said bolt when said rod is axially shifted, operating means accessible from the exterior of said door for moving said rod axially, and means accessible from the interior of said door for transversely swinging said rod into an inoperative position with respect to said operating means.

16. A door lock mechanism for a door member and a frame member comprising a rotatable bolt adapted to be mounted on one of said members for cooperation with a striker on the other of said members and positioned to cooperate with said rotatable bolt, said rotatable bolt being rotated in one direction for latching said door with respect to said striker and being rotated in an opposite direction for releasing said striker, detent means mounted on said one of said members for rotation in one direction for latching said bolt with respect to said striker and in an opposite direction for releasing said bolt with respect to said striker, a rod mounted on said door for axial shifting movement and for transverse swinging movement in a plane parallel to the plane of movement of said detent means, said rod being positioned with respect to said detent means to rotate said detent means out of engagement with said latch means when said rod is axially shifted, operating means accessible from a surface of said door for moving said rod axially, and means accessible from a surface of said door for transversely swinging said rod into an inoperative position with respect to said operating means.

17. A door lock mechanism for a door member and a frame member comprising a rotatable bolt adapted to be mounted on one of said members for cooperation with a striker on the other of said members and positioned to cooperate with said rotatable bolt, said rotatable bolt being rotated in one direction for latching said door with respect to said striker and being rotated in an opposite direction for releasing said striker, detent means mounted on said one of said members for rotation in one direction for latching said bolt with respect to said striker and in an opposite direction for releasing said bolt with respect to said striker, the direction and planes of rotation of said bolt and detent means being the same when said bolt is rotated for latching said striker and said detent means is rotated for latching said bolt, a rod, operating means for said rod including a lever pivotally mounted on said door and pivotally connected to said rod to support said rod for axial shifting movement to release said detent and for transverse swinging movement between an operative and an inoperative position and including means to operate said rod in said operative position and means disconnecting said rod in said inoperative position, said rod being positioned with respect to said detent means to rotate said detent means out of engagement with said bolt when said rod is axially shifted, means accessible from a surface of said door connected to said operating means for moving said rod axially in said operative position, and means accessible from a surface of said door for transversely swinging said rod into an inoperative position with respect to said operating means.

18. A door lock mechanism for a door member and a frame member comprising a rotatable bolt adapted to be mounted on one of said members for cooperation with a striker on the other of said members and positioned to cooperate with said rotatable bolt, said rotatable bolt being rotated in one direction for latching said door with respect to said striker and being rotated in an opposite direction for releasing said striker, detent means mounted on said one of said members for rotation in one direction for latching said bolt with respect to said striker and in an opposite direction for releasing said bolt with respect to said striker, a rod, operating means for said rod including a lever pivotally mounted on said door and pivotally connected to said rod to support said rod for axial shifting movement to release said detent and for transverse swinging movement between an operative and an inoperative position and including means to operate said rod in said operative position and means disconnecting said rod in said inoperative position, said rod being mounted for transverse swinging movement in a plane parallel to the plane of rotation of said detent means, said rod having a portion positioned with respect to said detent means to rotate said detent means out of engagement with said bolt when said rod is axially shifted, means accessible from a surface of said door connected to said operating means for moving said rod axially, and means accessible from a surface of said door for transversely swinging said rod into an inoperative position with respect to said operating means.

19. A door lock mechanism for a door member and a frame member comprising a rotatable bolt adapted to be mounted on one of said members for cooperation with a striker on the other of said members and positioned to cooperate with said rotatable bolt, said rotatable bolt being rotated in one direction for latching said door with respect to said striker and being rotated in an opposite direction for releasing said striker, detent means mounted on said one of said members for rotation in one direction for latching said bolt with respect to said striker and in an opposite direction for releasing said bolt with respect to said striker, the direction and planes of rotation of said bolt and detent means being the same when said bolt is rotated for latching said striker and said detent means is rotated for latching said bolt, a rod, operating means for said rod including a lever pivotally mounted on said door and pivotally connected to said rod to support said rod for axial shifting movement to release said detent and for transverse swinging movement between an operative and an inoperative position and including means to operate said rod in said operative position and means disconnecting said rod in said inoperative position, said rod being positioned with respect to said detent means to rotate said detent means out of engagement with said bolt when said rod is axially shifted, said operating means further including means accessible from a surface of said door connected to said lever for moving said rod axially, and means accessible from a surface of said door for transversely swinging said rod into an inoperative position with respect to said operating means.

References Cited in the file of this patent

UNITED STATES PATENTS

2,236,702	Andersen	Apr. 1, 1941
2,261,796	Courtney	Nov. 4, 1941
2,458,751	Voight	Jan. 11, 1949
2,480,688	Allen	Aug. 30, 1949
2,634,147	Robertson	Apr. 7, 1953
2,649,321	Smith	Aug. 18, 1953