Nov. 2, 1943. E. D. DALL 2,333,473

DOOR LOCK

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Fig. 2.

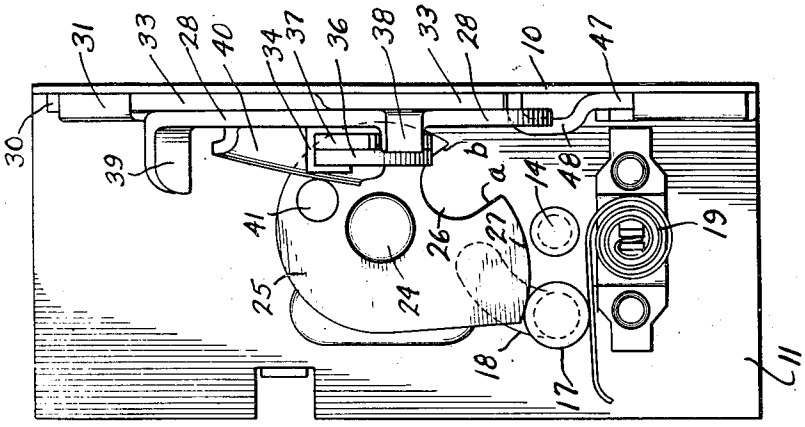
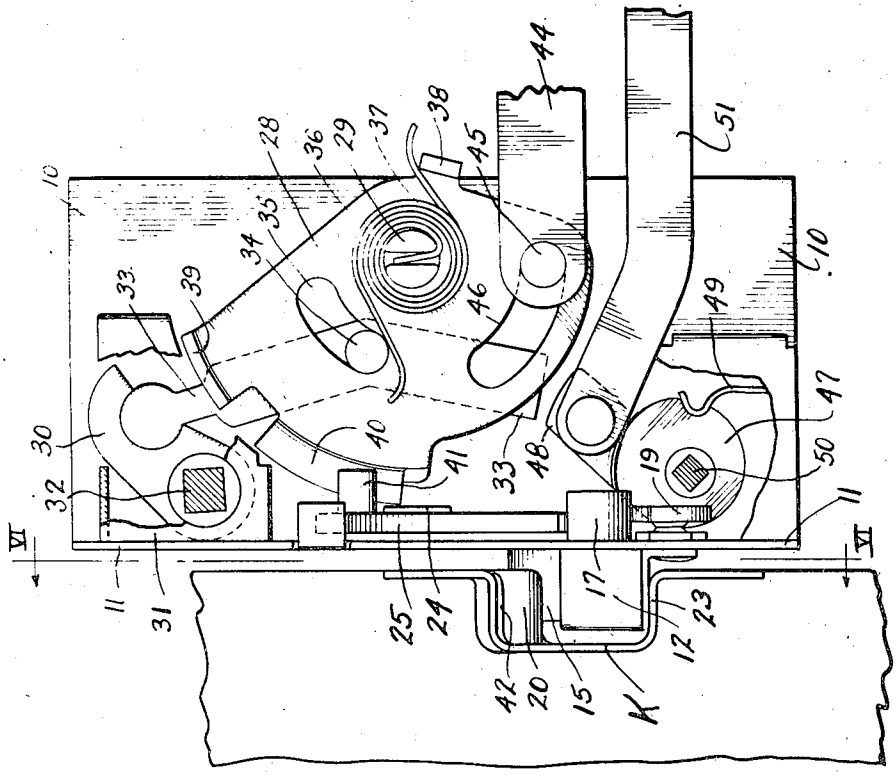


Fig. 1.



Inventor

EDWARD D. DALL.

Charles W. Hills

Attorney.

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DOOR LOCK

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Fig-4.

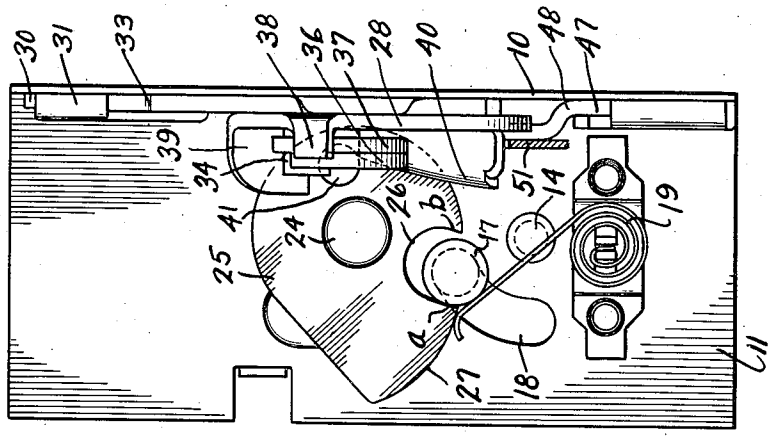
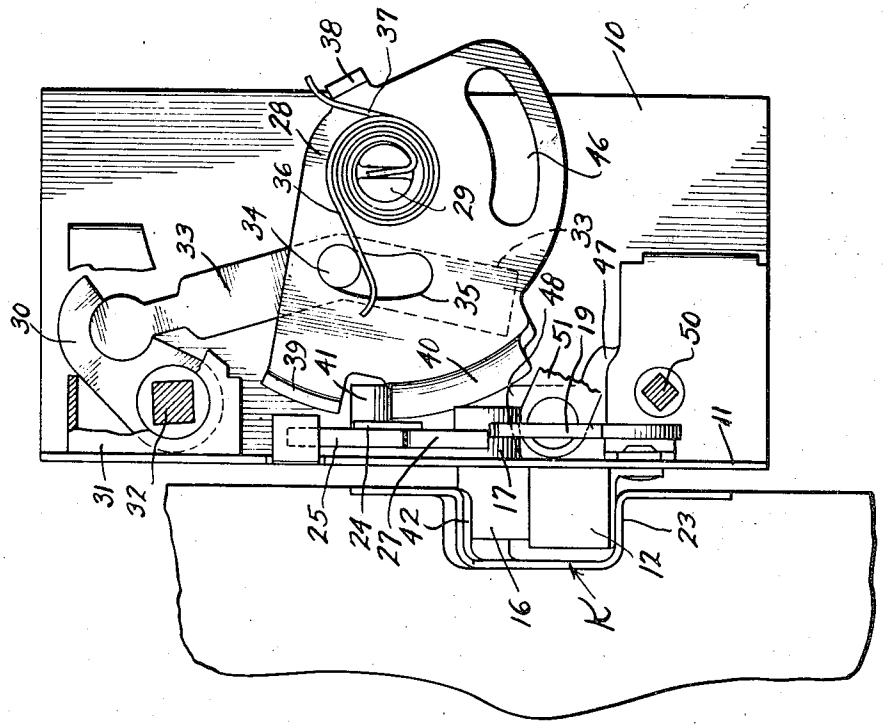


Fig-3.



Inventor

EDWARD D. DALL.

Charles W. Hills

by Attys.

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DOOR LOCK

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Fig. 6.

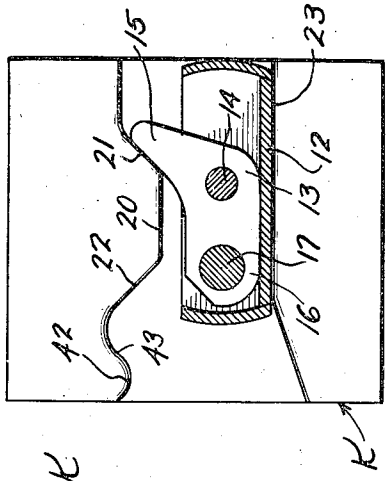


Fig. 7.

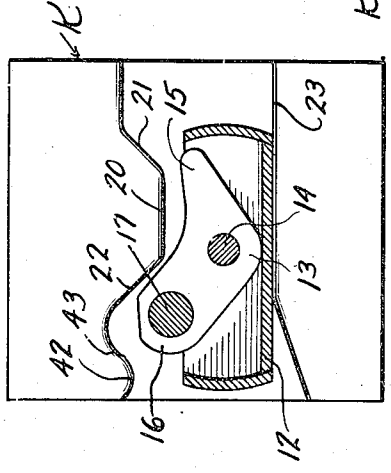


Fig. 8.

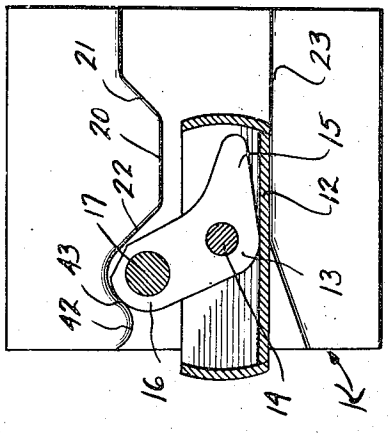
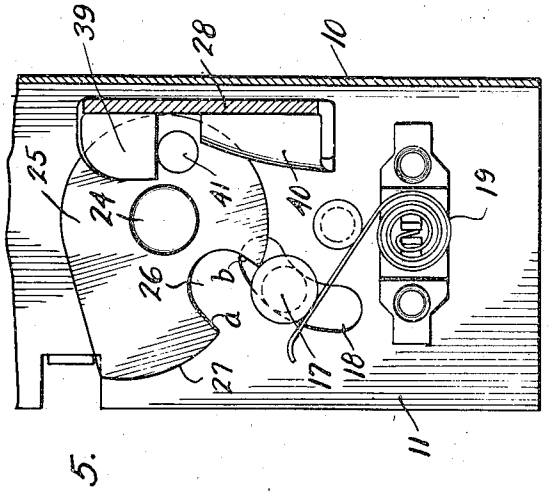


Fig. 5.



Inventor

EDWARD D. DALL.

Charles W. Wills

By Atty.

Patented Nov. 2, 1943

2,333,473

UNITED STATES PATENT OFFICE

2,333,473

DOOR LOCK

Edward D. Dall, Detroit, Mich., assignor to Houdaille-Hershey Corporation, Detroit, Mich., a corporation of Michigan

Application May 23, 1942, Serial No. 444,160

8 Claims. (Cl. 292—198)

My invention relates to locks, particularly to locks of the rocking bolt type for automobile doors, such as the locks disclosed in my Patent No. 2,246,782 issued June 24, 1941.

In a locking structure such as in my patent referred to, camming or wedging members are forced under comparatively heavy spring pressure into engagement with the latch bolt for camming it into full locking position as the door is being closed and to hold it in such locking position. However, due to jarring, as the vehicle is running, these camming and wedging members tend to creep along the latch bolt under pressure of the springs and to become more or less set and stuck by their frictional engagement with the latch bolt. It then requires unnecessary force on the door handle to release the camming and wedging members and it is therefore the object of my present invention to provide improved and more practical means cooperable with the latch bolt under control of the door handle for camming the bolt into full locking position and holding it there and which means may be readily released by the exertion of ordinary pressure upon the door handle for opening of the door.

More in detail, an important object of the invention is to provide a take-up and holding member for the latch bolt which is free of heavy spring pressure thereagainst and whose movements for setting of the latch bolt into cocked position and for moving the bolt into locking position and holding it there are effected by a setting member under control of the door handle.

A further object is to provide a setting member, under control of the door handle, for positively moving the latch bolt take-up and holding member into position for release of the latch bolt for opening of the door, and for camming engagement with the take-up and holding member for operating said member to move the latch bolt into its locking position for locking of the door.

A further important object is to provide keeper means cooperable with the latch bolt to hold the door in a partially open or safety position in the event that the door has not been fully closed by slamming, or the handle has not been turned sufficiently for full closing of the door, or by insufficient handle operation, the latch bolt has not been fully released for opening of the door.

My invention also embodies other features of structure, arrangement and operation, and all the various features of the invention are embodied in the structure shown on the drawings, in which drawings

Figure 1 is a front or outside elevation of the lock structure on the door and the keeper structure on the door frame, with the parts in door-locking position;

Figure 2 is an elevational view looking at the structure in Figure 1 from the right;

Figure 3 is an elevational view like Figure 1 but showing the various parts in unlocking or door-releasing position;

Figure 4 is an elevational view of the parts in Figure 3 looking from the right;

Figure 5 is an elevational view similar to Figure 4 showing the arrangement when the latch bolt has been swung out of its safety latching position;

Figure 6 is a section on plane VI—VI of Figure 1 to show the latch bolt in its full door-locking engagement with the keeper element;

Figure 7 is a view similar to Figure 6 showing the latch bolt in full released position relative to the keeper for opening of the door; and

Figure 8 is a similar section showing the safety catch engagement of the latch bolt with the keeper when the door is only partially opened, and also the cocked position of the bolt when the door is fully open.

The supporting frame of the latch structure comprises the base wall 10 to be secured to the side wall of a door, and the flange wall 11 which extends across the edge of the door. On the outer side of the flange wall, near the bottom thereof, is secured the cup-shaped frame or housing 12 for the latch bolt 13. This latch bolt is of V or angle shape and is mounted for rocking movement on the pin 14 which is secured at its ends in the outer wall of the frame 12 and the flange wall 11, respectively. The bolt has the locking arm 15 and the setting arm 16, a stud 17 extending from the setting arm inwardly through the arcuate slot 18 in the flange wall 11. On the inner side of the wall 11 is anchored the coil spring 19 which engages the stud 17 and tends to swing the bolt to carry its locking arm 15 downwardly into the frame 12 and its setting arm 16 upwardly out of the frame, to the position shown in Figure 8, this being the cocked position of the bolt when the door is open. The keeper element K, mounted on the door frame, is of U-shape cross section, its upper wall having the downward deflection or locking abutment 20 presenting the inner incline 21 and the outer incline 22. As the door is swung to closing position, the housing 12 with the bolt therein enters

the keeper and the leg 16 of the bolt engages the incline 22 and the bolt is swung to bring its locking leg 15 into position behind the incline 21, as shown on Figures 6, 7 and 8. During closing of the door, the frame 12 rides on the bottom wall 23 of the keeper.

Mounted on the inner side of the flange wall 11 above the slot 18 is a stud 24 on which the take-up and holding member 25 for the lock bolt is fulcrumed. This take-up and holding member is in the form of a metal plate and has the recess 26, and forwardly of this recess the surface 27 which is eccentric or tapering relative to the fulcrum axis of the plate. When this holding member or plate is rotated to bring the recess into alignment with the arcuate slot 18, the lock bolt stud 17 will be shifted by the spring 19 into the recess for setting of the lock bolt in its cocked position as shown on Figures 4 and 8. Upon withdrawal of the stud from the recess, and rotation of the holding member in counterclockwise direction, the eccentric or cam surface 27 on the holding member will engage the stud 17 for forcing the locking arm 15 of the latch bolt into its locking engagement with the keeper incline 21 (Figures 2 and 6).

The rotary movements of the take-up and holding member 25 are controlled by the setting member 28 fulcrumed on a post 29 extending forwardly from the wall 10. Above the setting member a roll-back 30 is fulcrumed in the housing 31 on the base wall 10 to be rocked by the rotation of a spindle 32 which terminates in a handle (not shown) on the outside of the door. The roll-back receives the circular upper end of a link 33 extending downwardly behind the setting member 28 and having a stud 34 thereon projecting through the arcuate slot 35 in the setting member. A coil spring 36 anchored on the fulcrum post 29 engages the stud 34 and tends to hold the link 33 and the roll-back in normal or upper position, while another coil spring 37 anchored on the post 29 engages the abutment 38 on the setting member 28 and tends to hold this member with the lower end of its slot 35 against the stud 34 (Figure 1).

The setting member 28 is in the form of a metal plate and at its inner end has a portion deflected forwardly to form an abutment 39. Below this abutment the metal is deflected forwardly and laterally to provide a cam rail 40.

On the holding member 25, at a point above its fulcrum, is a pin 41 which projects into the path of the abutment and cam rail on the setting member 28. When the setting member is rotated in counterclockwise direction (Figures 3 and 4), the abutment 39 will encounter the pin for clockwise rocking of the holding member, and when the setting member is rotated in clockwise direction (Figures 1 and 2) the cam rail 40 acts against the pin to rock the member 25 in counterclockwise direction for application of its tapering or camming surface 27 to the lock bolt stud 17 for forcing the lock bolt into its locking engagement with the keeper and to thereafter take up any looseness of the bolt so as to keep it securely held in locking position while the door is closed.

When, by the operation of the door handle, the setting member 28 is rotated in a counterclockwise direction a distance sufficient only to rock the member 25 for reception in its recess 26 of the locking bolt stud, the lock bolt will be rocked to its cocked position by the spring 19, and the pin 41 on the member 25 will be above the upper end of the cam rail 40 of the setting member to form a stop therefor when the handle is released, the spring 37 then holding the setting member in this position, as indicated on Figures 3 and 4. Although the locking bolt is now in position of release of its locking leg 15 from the keeper incline 21, the door cannot be fully opened because provision is made for functioning of the locking bolt to hold the door in this partially open or so-called safety position. Referring to Figures 6, 7 and 8, the keeper, in its upper wall and in advance of the deflection 20 has a shorter downward deflection or safety catch abutment 42 providing the inner incline 43 which forms an abutment for the end of the setting leg 16 of the bolt and prevents the full opening of the door after the incomplete operation of the door handle referred to. Before the door can be fully opened, the bolt must be swung to the position shown in Figure 7 with its leg 16 clear of the abutment deflection 42. This is accomplished by a full operation of the door handle. After an only partial rotation of the handle, the edge *a* of the member 25 in front of its recess 26 is held as shown on Figure 4 against the lock bolt stud by the force of the spring 37 acting on the setting member 28 which engages the pin 41 on the member 25, and the lock bolt is thus held independently of spring 19 in its cocked position shown on Figure 8. Now when the door handle is moved to its final or full movement as shown on Figure 5, the abutment 39 on the setting member will engage the pin 41 to rock the member 25 to release its edge *a* from the lock bolt stud and bring its edge *b* at the rear of the recess 26 into engagement with lock bolt stud to rock the bolt against the force of spring 19 and beyond its cocked position to the position, shown in Figures 5 and 7, to clear the bolt arm 16 from the keeper safety catch abutment 42 so that the door may then be fully opened. When, after such complete movement of the handle and full opening of the door, the handle is released, the spring 37 will rock the setting member back for reengagement of the upper end of its cam rail 40 with the pin 41 for rocking of the member 25 back to its position shown on Figure 4 for reentry of the lock bolt stud into the recess 26 and resetting of the locking bolt to its cocked position and for holding of the bolt in this position by the spring 19 and the edge *a* on the holding member 25. The outer door handle may now be turned, independently of movement of the setting member 28, to the extent of the slot 35 of the setting member through which the stud 34 extends from the link 33 which connects with the roll-back 30, the spring 36 tending to hold the link and the roll-back and the handle in normal position.

The door may be closed from its open position by first swinging the handle down its full distance for setting of the lock bolt to the position shown in Figures 5 and 7, and then swinging the door to its closed position while the handle is being held down, the setting leg 16 of the bolt, during the final closing movement of the door, then encountering the keeper deflection 20 so that the bolt will be rocked from its cocked position toward its locking position and its stud withdrawn from the recess 26 (Figure 5), and then, upon release of the handle, the spring 37 will function to rotate the setting member 28 in clockwise direction for counter-clockwise rocking of the holding member 25 for engagement of its tapering surface 27 with the bolt stud and final

setting of the bolt into its locking position in locking engagement with the locking incline 21 on the keeper, as shown on Figures 2 and 6. Should the handle, during closing movement of the door, be released before the locking bolt has had sufficient engagement with keeper abutment 20 to withdraw the bolt stud from the holding member recess 26, then the bolt stud, will be returned by the spring 19 into the recess 26 and the bolt will be in its safety catch position behind the safety abutment 42 on the keeper, as shown on Figure 8. The door handle may then be turned the required full distance and the door swung completely shut, or the partially open door may be pushed shut, during which pushing operation the bolt will be rocked toward its locking position to clear its stud out of the recess 26 for release of the holding member 25 and rocking thereby of the bolt into its final locking position as the door is being fully closed.

When the door is to be shut by slamming, and the slamming effort is sufficiently great, the setting arm of the bolt will encounter the keeper projection 20 and the bolt stud will be moved out of the recess 26 of the holding member 25 to free the holding member for rocking thereof by the setting member for engagement with the bolt stud for rocking of the bolt into its full locking position. If the slamming effort is not sufficient for engagement of the bolt with the keeper abutment 20, the bolt stud will not be withdrawn from the recess 26 of the holding member and spring 19 will then rock the bolt back to its cocked or safety position shown on Figure 8 and the door will then be held in its partially closed position and against full opening. The locking bolt thus cooperates with the keeper to safety lock the door or to lock it in fully closed position.

Provision is also made for unlocking the door by operation of the inside handle usually provided on doors. Such handle is not shown on the drawings, but as is usual, a bar 44 extends therefrom, and in the arrangement shown the bar has the pin 45 engaging in the slot 46 in the setting member 28, and when it is desired to open the door from the inside, the inside handle is rotated for pull on the bar 44 and rotation of the setting member for release of the holding member 25 from the locking bolt, such operation of the setting member by the inside handle being independent of the outside handle and the roll-back 30 by virtue of the arcuate slot 35 in the setting member which receives the stud 34 on the link 33 extending from the roll-back. The slot 46 in the setting member also permits unlocking of door by the outside handle without movement of the bar 44 connected with the inside handle.

Means are also provided for locking the door against opening from the outside by operation of the outside handle. Such locking means may be controlled from the inside of the door or from the outside thereof. As shown, a locking plate 47 is fulcrumed on the base wall 10 and has a dogging arm 48 extending therefrom for setting below the lower end of the roll-back actuated link 33. Figure 1 shows the locking plate with its dogging arm in dogging position and unlocking and opening of the door by operation of the outside handle will be prevented. A spring 49 tends to hold the locking plate in this locking position. The setting of the locking plate to dogging position may be accomplished by means of suitable key operable lock mechanism (not shown) connected with the spindle 50 engaging the locking plate, such locking being accomplished from the outside of the door. For setting the locking plate from the inside of the door, a bar 51 is shown connected to the dogging arm 48 at one end and having connection at its other end with a suitable handle or lever (not shown) on the inside of the door. Figure 3 shows the locking plate in its unlocking position to permit opening of the door by operation of the outside handle.

It will be noted that the holding member 25 is not engaged directly by any spring means tending to force it into bolt holding position. The movement of the locking bolt to its locking position is accomplished by two tapering or camming surfaces, one of these surfaces being the surface 27 on the holding member which engages the locking bolt stud, and the other surface being on the cam rail 40 on the setting member which engages the pin 41 on the holding member. These camming surfaces are of gradual tapering or incline and the camming load is distributed or divided between these two surfaces. There is therefore no chance for the holding member to become set or stuck and substantially the only effort required on the door handle for unlocking of the door is that necessary to overcome the resistance of the springs 36 and 37, and as this resistance is substantially constant, the force of the spring 37 will keep the camming surface 27 of the holding member against the lock bolt stud to take up any looseness in the bolt and to keep it in secure engagement with the locking abutment on the keeper to keep the door at all times securely closed and to prevent rattle. When the lock bolt is in locking position shown on Figures 2 and 6, the pressure engagement of the bolt stud with the surface 27 of the holding member is to one side of the fulcrum axis of the holding member to hold the holding member with its pin in engagement with the cam rail. The slope of the cam rail being gradual, the cam rail will prevent rotation of the holding member and unlocking rocking of the latch bolt when an attempt is made to open the door by pull on the handle without rotation of the handle, and the door will be kept securely locked.

The spring 19, which is comparatively light, tends to hold the bolt stud 17 at all times against the edge of the holding member 25 or in the member recess 26. When the door is open, the bolt should be in cocked position with its stud engaged by the edge *a* of the member 25 under pressure from the spring 37 acting through the setting member 28 and pin 41. When the door is slammed, the initial rocking of the bolt by engagement with the keeper must rock member 25 against the resistance of spring 37 as the bolt stud leaves the recess 26. This resistance to rocking of the bolt by the combined resistance of the springs 19 and 37, will prevent accidental movement of the bolt out of its cocked position while the door is open.

I have thus produced simple and efficient lock structure of the type described which may be readily controlled by ordinary effort on the door handle, and in which lock structure the lock bolt functions to safety latch the door as well as to securely lock it in fully closed position.

I have shown a practical embodiment of the various features of my invention but do not desire to be limited to the exact construction, arrangement and operation shown and described as changes and modifications may be made with-

out departing from the spirit and scope of the invention.

I claim as follows:

1. Lock structure for a door comprising a housing on the door, a latch bolt fulcrumed on the housing for engagement with a keeper on the door frame to be rocked from a cocked position into latching engagement with the keeper when the door is swung to closed position, yieldable means tending to hold said bolt in cocked position, a holding member fulcrumed on said housing and having an eccentric edge engageable with said bolt for rocking said bolt to final locking position, a setting member on said housing, a camming connection between said setting member and said holding member adapted to move said holding member to holding position, and means under control of the door handle for actuating said setting member for release of said camming connection whereby to permit rocking of said bolt to unlocking position.

2. Door locking structure comprising a housing on the door, a rockable latch bolt fulcrumed on said housing for engagement with a keeper on the door frame to be rocked into latching engagement therewith when the door is swung to closed position, a rotatable holding member, a setting member, an eccentric camming surface on said holding member engageable with said bolt, a camming surface on said setting member engageable with said holding member, said camming surfaces cooperating, upon rocking of said bolt to locking position when the door is closed, to force said bolt intimately into locking engagement with the keeper.

3. Door lock structure comprising a housing on the door, a lock bolt fulcrumed for rocking movement on the housing for engagement with a keeper on the door frame, yielding means tending to hold said lock bolt in cocked position when the door is open, a holding member held in one position by said bolt when in cocked position and being released from said bolt when the bolt is rocked by engagement thereof with the keeper when the door is swung to closed position, a setting member on said housing having a cam surface thereon cooperable with said holding member to move said holding member to another position upon release thereof from said lock bolt, and an eccentric surface on said holding member engaged with said bolt upon movement of said holding member to said other position by said camming surface whereby said bolt is rocked into full locking position with said keeper to hold the door fully closed.

4. Lock structure for a door comprising a rockable lock bolt cooperable with a keeper adjacent to the door, a rotatable holding member having an eccentric camming surface engageable with the bolt for rocking thereof to locking position, setting means having camming connection with said holding member for rotation thereof for engagement of its camming surface with the bolt, and means under control of the door handle for actuating said setting means to release said camming connection to free said bolt for door opening movement.

5. Door locking structure comprising a rockable lock bolt on the door for cooperation with a keeper adjacent the door, a rotatable holding member having an eccentric edge for rocking the bolt to locking position after closing of the door, a setting member provided with camming means, yielding means tendiing to move said setting member for operation of said camming means to rotate said holding member for rocking of the bolt thereby to locking position, and means under control of the door handle for actuating said setting member for release of said camming means for freeing said bolt from said holding member to permit opening of the door.

6. A door lock structure for mounting on a door comprising a rockable lock bolt for cooperation with a keeper on the door frame and adapted to assume a cocked position when the door is open, a holding member on the door, means effective when said bolt is in cocked position to interlock said bolt and said holding member to thereby hold said member in a release position when the door is open, a setting member on the door, spring means tending to move said setting member, cooperable abutments on said holding member and said setting member for holding said setting member against movement by said spring means when said holding member is in its release position, said bolt cooperating with said keeper to be rocked from its cocked position to locking position in the keeper when the door is moved to closed position, said movement of the bolt to locking position releasing said holding member for release of said setting member for operation thereof by said spring means, said holding member having a camming surface and said setting member having camming connection with said holding member, said camming connection being effective upon movement of said setting member by said spring means to move said holding member for application of its camming surface to said bolt for gradual forcing of said bolt into its final locking engagement with said keeper.

7. A door lock structure for mounting on a door and comprising a rockable lock bolt for cooperation with a keeper on the door frame, said bolt adapted to assume a cocked position when the door is open, a holding member on the door, means effective when said bolt is in cocked position to interlock said bolt and said holding member to thereby hold said member in a release position when the door is open, a setting member on the door, spring means tending to move said setting member, cooperable abutments on said holding member and said setting member for holding said setting member against movement by said spring means when said holding member is in its release position, said bolt cooperating with said keeper to be rocked from its cocked position to locking position in the keeper when the door is moved to closed position, said movement of the bolt to locking position releasing said holding member for release of said setting member for operation thereof by said spring means, said holding member having a camming surface and said setting member having camming connection with said holding member, said camming connection being effective upon movement of said setting member by said spring means to move said holding member for application of its camming surface to said bolt for gradual forcing of said bolt into final locking engagement with said keeper, an abutment on said setting member, and means under control of the door handle for moving said setting member for release of said camming connection and for engagement of said abutment with said holding member for return of said holding member to its release position whereby to free said bolt for return from its locking position to its cocked position.

8. A lock structure for a door comprising a

rockable lock bolt on the door cooperable with a keeper mounted on the door frame and provided with a locking abutment and a safety catch abutment, a holding member on the door movable to a release position or to a holding position, yielding means for holding said bolt in a cocked position, means effective when said bolt is in cocked position to hold said holding member in its release position, a setting member on the door, spring means tending to move said setting member in one direction, cooperating abutments on said setting member and said holding member for preventing movement of said setting member by said spring means when said holding member is held in its release position by said bolt, said bolt upon closing movement of said door being cooperable with said locking abutment on the keeper to be rocked thereby from its cocked position into locking engagement with said locking abutment, rocking of said bolt out of its cocked position releasing said holding member therefrom whereby said setting member is released for operation by said spring means, said holding member having a camming surface, said setting member having a camming surface cooperable with said holding member upon movement of said setting member by said spring means whereby said holding member camming surface will be engaged with said bolt for final rocking movement thereof into locking engagement with the keeper locking abutment, means under control of the door handle for moving said setting member in reverse direction against said spring means for disengaging its cam means from said holding member, said setting member having an abutment engageable with said holding member during such reverse movement of said setting member for restoring said holding member to its release position whereby said bolt may return to its cocked position as the door is being opened, said safety catch abutment on said keeper being in the path of said bolt when returned to its cocked position, and means effective upon continued movement of said setting member by said door handle for moving said holding member beyond its release position and into engagement with said bolt to rock said bolt a sufficient distance to clear it from said safety catch abutment whereby said door may then be fully opened.

EDWARD D. DALL.