March 21, 1944. E. D. DALL 2,344,805

AUTOMOBILE DOOR LOCK

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Fig-1.

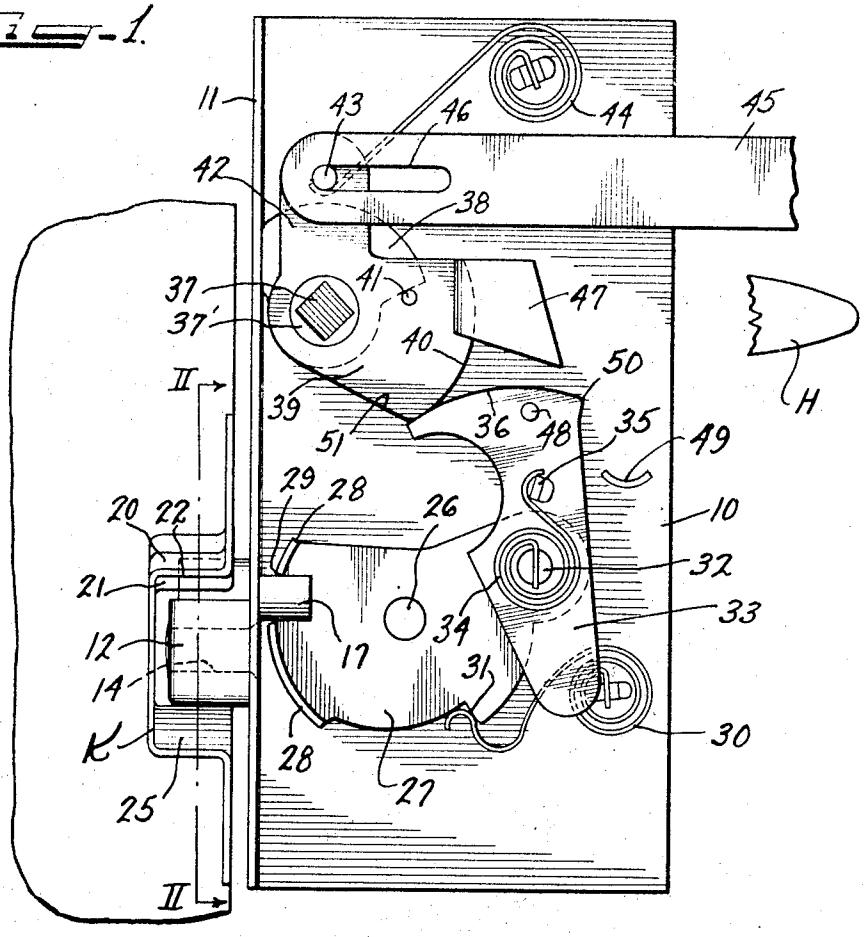
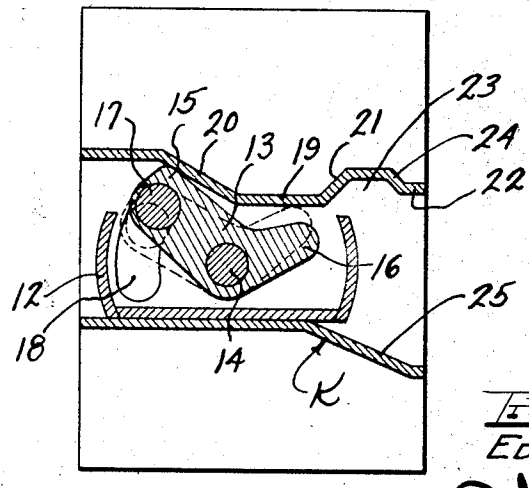


Fig-2.



Inventor
EDWARD D. DALL.
Charles Dall
Attys.

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Fig. 3.

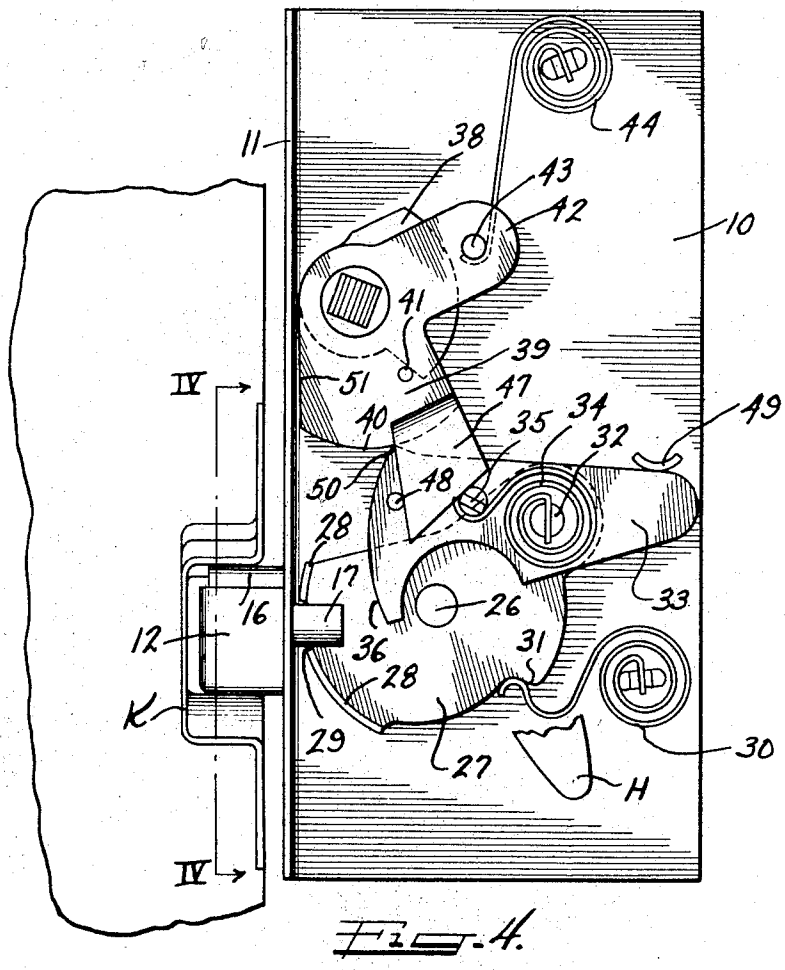
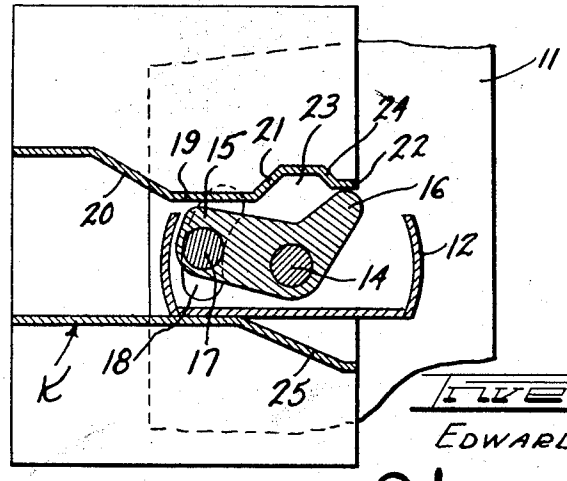


Fig. 4.



Inventor
EDWARD D. DALL.

by Charles Allen Atty.

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Fig. 5.

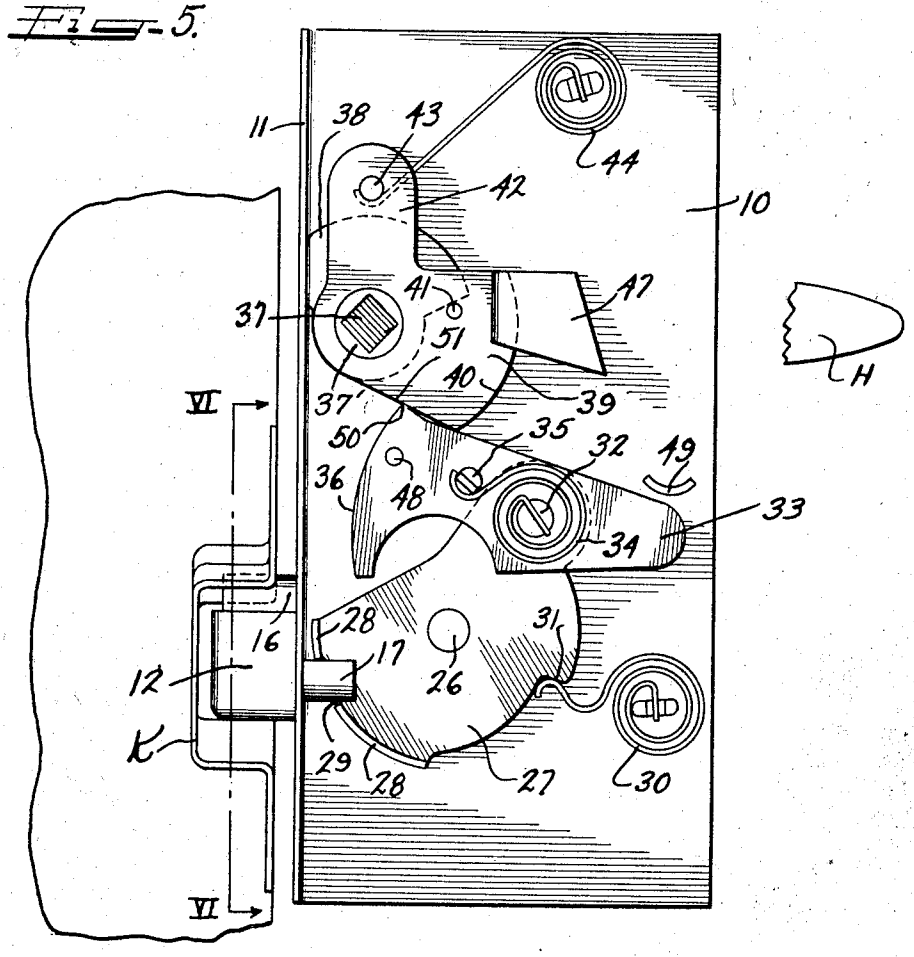
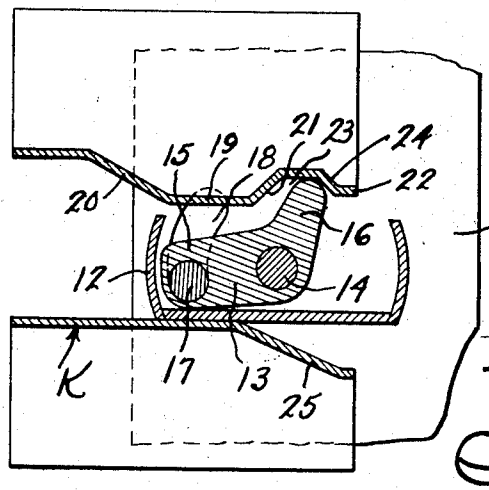


Fig. 6.



Inventor
EDWARD D. DALL.

by Attys.

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Fig. 7.

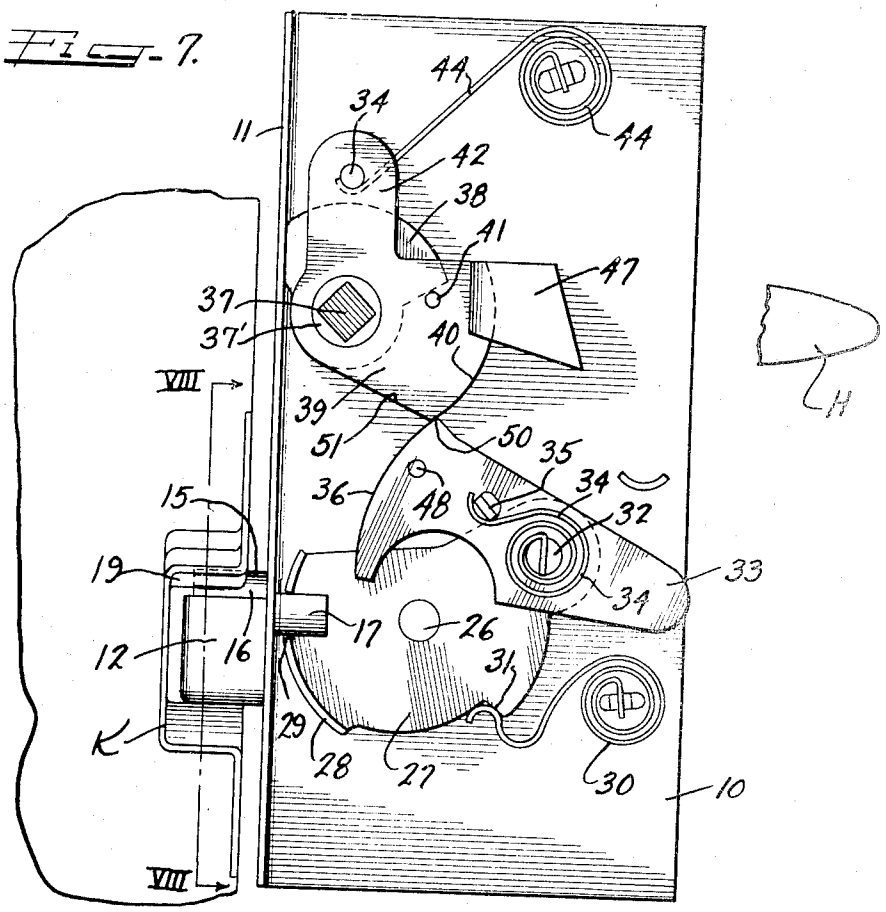
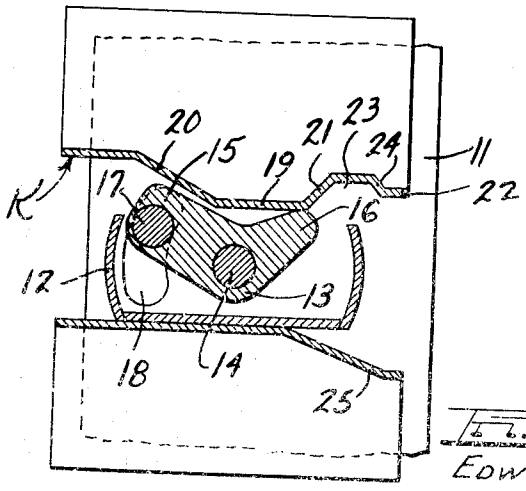


Fig. 8.



INVENTOR
EDWARD D. DALL.

BY

ATTYS

Patented Mar. 21, 1944

2,344,805

UNITED STATES PATENT OFFICE

2,344,805

AUTOMOBILE DOOR LOCK

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

Application February 19, 1943, Serial No. 476,404

9 Claims. (Cl. 292—198)

My invention relates to locks, particularly to locks of the rocking latch bolt type for automobile doors. In locks of this type, camming or wedging members have been employed, urged by spring pressure, to force the bolt 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 or wedging members tend to creep along the engaged surfaces under pressure of the spring and to become more or less set and stuck so that it then requires unnecessary force on the door handle to release the bolt for opening of the door.

An important object of my invention is to provide improved and more efficient means for urging the latch bolt to full locking position, but which means may be readily released by the exertion of ordinary pressure on the door handle for opening of the door.

More in detail, an important object of the invention is to provide cooperating camming members which will function to force the bolt into its full locking position after closure of the door, but which, upon operation of the door handle for opening of the door, have rolling engagement with each other instead of sliding friction engagement, whereby a comparatively light turning pressure on the handle will effect release of the bolt for opening of the door.

The various features of my invention are embodied in the structure shown on the drawings, in which:

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 a section on plane II—II of Figure 1;

Figure 3 is a view like Figure 1 showing the movement of the various parts for unlocking and opening of the door;

Figure 4 is a section on plane IV—IV of Figure 3;

Figure 5 is a view similar to Figure 1 but showing the various lock parts in safety locking position, or in position when the door is unlocked and in open position;

Figure 6 is a section on plane VI—VI of Figure 5;

Figure 7 is a view similar to Figure 1 showing the door handle released after swinging shut of the door and the camming members about to engage for forcing the bolt into its final locking position; and

Figure 8 is a section on plane VIII—VIII of Figure 7.

The supporting frame of the lock structure comprises the base wall 10 to be secured to the side wall of the door, and the flange 11 for extending across the edge of the door. On the outer side of the flange, near the bottom thereof, is secured the cup-shaped frame or housing 12 for the latch bolt 13. This bolt is of V or angle shape and is mounted for rocking movement on a pin 14 which extends therethrough near the apex thereof and is secured at its ends in the outer wall of the frame 12 and the flange 11, respectively. The bolt has the locking arm 15 and the setting arm 16, a stud 17 extending from the locking arm 15 through the arcuate slot 18 in the flange 11.

The keeper K, mounted on the door frame, is of U-shaped cross section, its upper wall having the downward deflection or locking abutment 19 presenting the inner incline 20 and the outer incline 21, the outer end 22 of the top wall being deflected downwardly to be a distance above the deflected part 19, to provide the safety catch recess 23 and the safety catch abutment 24. The bottom wall of the keeper has the inclined forward end 25 along which the bolt housing 12 is guided for engagement along the bottom wall of the keeper when the door is moved to closed position.

The base 10 has a fulcrum stud 26 extending forwardly therefrom on which the bolt actuating lever 27, in the form of a plate, is fulcrumed. At its outer end this plate has the forwardly projecting flange 28, concentric with the fulcrum axis, and provided with a slot 29 through which the bolt stud 17 extends. A spring 30 anchored on the base 10 engages the abutment 31 of the lever plate 27 and tends to rotate it in counter-clockwise direction.

At its inner end the plate 27 has the stud 32 projecting forwardly therefrom, and on this stud a locking cam lever 33 is fulcrumed intermediate its ends, a spring 34 anchored on the stud and engaging the abutment 35 on the lever 33 tending at all times to swing this lever in clockwise direction. The head end of the lever 33 terminates in an eccentric cam edge 36, the radius of this edge, from the fulcrum axis of the lever, increasing from the right end to the left end of the edge (Figure 1).

Extending through the base 10 is a polygonal spindle 37 to the outer end of which is secured the door handle H. Mounted on the spindle to rotate therewith is a roll-back 38. In front

of the roll-back a setting lever 39 is mounted for rotation on a collar 37' on the spindle 37, this lever being segment shaped and terminating in the eccentric cam edge 40 for cooperating with the cam edge 36 on the lever 33 the radius of this edge, from the axis of the spindle 37, increasing from the forward to the rearward end of the edge. The lever 39 has a pin 41 extending rearwardly therefrom for engagement by the inner edge of the roll-back so that when the door-handle is swung down the lever 39 rotates with the roll-back in clock-wise direction. The lever 39 has the arm 42 extending upwardly therefrom with a pin 43 extending therethrough and engaged behind the arm by a spring 44 anchored on the base 10, this spring tending to hold the lever 39 and the roll-back in normal position with the roll-back abutting the flange 11.

As shown on Figure 1, the door may be opened from the inside by an inside handle (not shown) connected by a link 45 with the front end of the pin 43 received in the slot 46 in the link, operation of the inside handle effecting clockwise rotation of the lever 39 directly and independently of the roll-back.

Extending from the upper portion of the end of the lever 39 is an abutment wing 47 offset forwardly from the lever for passage in front of the cam lever 33 and engagement with a pin 48 on this lever when the lever 39 is rotated in clockwise direction. Extending forwardly from the base 10 is an arcuate abutment 49 which is in the path of the tail end of the lever 33 when this lever is rotated in counter clockwise direction.

Describing now the operation of the lock structure, Figures 1 and 2 show the lock in door-locking position. The cam lever 33 is in substantially vertical position and is held downwardly by the lever 39 to hold the bolt actuating lever 27 with its flange 28 against the under side of the stud 17 for holding of the bolt in full locking position shown on Figure 2. When the parts are in door-locking position, the wing 47 of the lever 39 is a distance above the pin 48 of the lever 33. When the door was closed, this lever 33 was swung in clockwise direction by the spring 34, and the lever cam edge 36 engaged against the cam edge 40 of the lever 39, and this cam engagement, owing to the increasing radius of the edge 36, caused the downward movement of the lever 33 for setting of the actuating lever 27 for rocking of the bolt into its full locking position.

Figures 3 and 4 show the movement of the parts when the door is being unlocked and opened, by operation of the door handle H. The radius increase of the camming surface 36 on lever 33 is greater than the radius increase of the cam surface 40 on the setting lever 39, the high end of the surface 36 engaging the low end of the surface 40 when the door is closed and locked, as shown on Figure 1. Now, when the handle is swung down for unlocking of the door, the rotated setting lever 39 will carry with it the lever 33 by the rolling engagement of the levers along their cam surfaces, and the pressure by the lever 39 against the lever 33 will be gradually eased up so that the spring 30 may become effective to correspondingly rock the lever 27 counter-clockwise to relieve the locking pressure of the bolt against the keeper, and then when the wing 47 of the lever 39 reaches the pin 48 of the lever 33, the lever 33 will be positively rocked toward its horizontal position shown on Figure 3. During such rocking movement of the lever 33 the spring 30 will be free to rotate the bolt actuating lever 27 in counter clock-wise direction for engagement of its flange 28 with the top of the bolt stud 17, and at the end of the downward swing of the door handle, which is limited by the engagement of the lever 39 with the housing flange 11, the heel 50 of the lever 33 will engage against the cam surface 40 of the lever 39, and the tail end of the lever 33 will be in engagement with the abutment 49, the lever being held in this position by the spring 30, and then, so long as the door handle is held down, the latch bolt will be in the position shown in dotted lines on Figure 2, with its setting end 16 in engagement with the deflected part 19 of the keeper. As the door is now swung to open position, with the door handle still held down, the bolt housing 12 is moved out of the keeper, and when the bolt has reached the exterior of the keeper, the door handle is released for swing of the lever 39 and the roll-back by the spring 44 back to their normal positions, shown on Figures 1 and 5, the locking lever 33, during such return movement of the lever 39, rocking a distance clockwise for disengagement of its tail end from the abutment 49 and engagement of its heel 50 with the front edge 51 of the lever 39, as shown on Figure 5. Also during such return movement of the lever 39 and rocking of the lever 33, the spring 30 will rotate the lever 27 in counter clockwise direction for bodily movement of the lever 33 toward the left (Figure 5), and engagement of the flange 28 on lever 27 with the top of the bolt stud 17 for swing of the stud down to the bottom of the slot 18, as shown on Figure 6, and this will be the position of the bolt in its housing 12 when the door has been swung fully open.

If, after unlocking of the door by downward swing of the door handle, the handle is released before the door has been swung open sufficiently to bring the bolt with its setting arm 16 out past the lip 22 of the keeper, the various levers will move to the position shown on Figure 5 with the bolt rocked to project its setting arm 16 into the recess 23 of the keeper in front of the abutment 24, and the door will then be held in a safety catch position. To unlock from the safety-catch position, the handle would have to be again swung down for positioning of the levers as shown on Figure 3, and the door fully opened for withdrawal of the locking bolt out of the keeper, and the handle then released.

The door may be closed and locked from open position by turning down of the handle and then swinging the door shut and releasing the handle, or the door may be slammed or pushed shut without operation of the handle. When the door is fully opened the various levers and the locking bolt will be in the positions shown on Figures 5 and 6. If the door handle is now swung down on the open door, the various levers and the lock bolt will be moved to the position shown on Figures 3 and 4, and then the door, with the handle still held down, is swung shut, and the setting end 16 of the lock bolt will then encounter the deflected wall part 19 of the keeper and will be swung clockwise to the dotted line position in Figure 2. With the door thus shut, the handle is released and the various levers will move toward the position shown on Figure 1 for forcing of the latch bolt to its fully locked position shown on Figure 2.

Figures 7 and 8 show the positions of the parts just after the heel end of the cam surface 36 of

the lever 33 has come into engagement with the forward end of the cam surface 40 of the lever 39 which has just been restored to its normal position by the spring 44 after release of the door handle. The spring 34 is now effective to rock the lever 33 clockwise for engagement of its camming surface 36 against the lever 39 for bodily movement of the lever 33 and clockwise rotation of the lever 27 for forcing the bolt clockwise with its locking arm 15 into locking engagement with the keeper incline abutment 20, the levers and bolt then reaching the full locking position shown on Figures 1 and 2.

When the door is fully opened, with the bolt entirely withdrawn from the keeper, the bolt will be in a cocked position in its housing 12, with the upper end of its setting arm 16 above the level of the keeper lip 22. Now, when the door is slammed or pushed shut from its open position without operating the handle, as the bolt housing 12 enters the keeper the upper end of the bolt setting arm 16 will first encounter the keeper lip 22 and then the keeper wall 19 for rocking of the bolt clockwise to the position shown on Figure 6, which rocking movement moves the bolt stud 17 upwardly far enough for clockwise rotation of the lever 27 a sufficient distance for bodily movement of the lever 33 to bring the heel end of the cam surface 36 in front of the end of the cam surface 40 of the lever 39, as shown on Figure 7, and then the spring 34 will rock the lever 33 for camming engagement with the lever 39 and clockwise rotation of the lever plate 27 to rock the bolt into its full locking position as shown on Figures 1 and 2. If the swing or push movement of the door has not been sufficient to move the bolt with its setting arm 16 into engagement with the keeper wall 19, then the lever 27 will not be rotated clockwise far enough for disengagement of the heel 50 of the lever 33 from the front edge 51 of the lever 39, and the levers will swing back to the position shown on Figure 5 with the bolt rocked counterclockwise for projection of its setting end 16 in the keeper recess 23 behind the abutment 24, and the bolt is then in safety catch position and the door will be safety-locked in this partially closed position. For complete locking the door must then be pushed fully shut for engagement of the bolt setting arm 16 with the keeper wall 19 for release of the lever 33 from the lever 39 and engagement of its camming surface 36 with the end of the camming surface 40 on the lever 39.

Likewise, when the handle is pulled down on the open door, and the handle is released before the door has been swung far enough for engagement of the setting arm 16 of the lock bolt with the keeper wall 19, the various levers will return to the positions shown on Figure 5 and the setting arm 16 of the bolt will engage in the safety catch recess 23. The handle can then be again swung down and the door pushed shut, or the door can be pushed shut from the safety position to full locking position without re-swing of the handle.

As shown on Figure 1, when the various parts are in full locking position, a line through the axes of the levers 33 and 39 will pass through the line of contact between the cam surface 36 and 40 on the respective levers. Owing to the rolling engagement of the levers when the handle is swung down, any static friction at this line of contact is easily broken so that ordinary pressure on the handle will at all times effect unlocking of the door, the rolling engagement continuing until the wing 47 of the lever 39 encounters the pin 48 of the lever 33, whereafter the lever will be positively rocked for unlocking of the bolt from the keeper.

I have thus produced a practical and efficient lock of the rocking bolt type which can at all times be controlled without unnecessary pressure effort on the door handle, and in which the lock bolt is rocked into locking position and followed up to take up any loose motion of the door. All of the lock parts are in the form of simple metal stampings so that the lock may be economically produced.

I do not desire to be limited to the exact construction, arrangement and operation shown and described, as changes and modifications may be made without departing from the scope of the invention.

I claim as my invention:

1. An automobile door locking structure comprising a frame for mounting on the door, a rockable latch bolt on said frame for cooperating with a keeper adjacent to the door, an actuating lever fulcrumed on said frame and engaging at its outer end with said bolt to control the rocking movement thereof, a cam lever fulcrumed on the inner end of said actuating lever and having a cam surface thereon, an abutment on said frame for engagement by said cam surface, and spring means for rotating said cam lever for engagement of its cam surface from its low end to its high end with said abutment whereby to rotate said actuating lever for setting of the latch bolt into door-locking engagement with the keeper.

2. An automobile door locking structure comprising a housing on the door, a rocking latch bolt on said housing cooperable with a keeper on the door frame, an actuating lever fulcrumed on said housing for movement with said bolt, a spring tending to move said lever for movement thereby of the bolt into unlocking position, a cam lever fulcrumed on said actuating lever for bodily movement therewith and rotation thereon, an abutment on said housing for the tail end of said cam lever, a cam surface at the head end of said cam lever, a spring tending to rock said cam lever away from said abutment, a setting lever on said housing operable to engage said cam lever at its head end for rocking thereof on its fulcrum to move its tail end into fulcrum engagement with said abutment whereby said actuating lever will be rotated for setting of the bolt into position for entering the keeper when the door is moved into closing position, said bolt being engaged by passage through the keeper to be rocked thereby toward its locking position with corresponding rotation of said actuating lever and rotation of the cam lever away from said abutment and with its cam surface in operating position, said setting lever when returned to its normal position presenting a contact surface for said cam lever surface along which said cam lever surface is carried by the spring for said cam lever, said camming action by said cam lever resulting in movement of the actuating lever for final setting of said bolt into locking engagement with the keeper.

3. An automobile 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, an actuating lever fulcrumed intermediate its ends on said housing and having connection at its outer end with said bolt for movement therewith, a spring tending to move said actuating lever for setting

thereby of said bolt into unlocking position, a cam lever fulcrumed on the inner end of said actuating lever and terminating at its outer end in a cam edge, a setting lever fulcrumed on said housing having a cam edge engaging the cam edge on said cam lever to hold said cam lever and actuating lever in position for setting of said bolt in locking position, means for actuating said setting lever for rolling engagement of said setting lever and cam lever along said cam edges for primary movement of said actuating lever for movement of said bolt toward unlocking position, an abutment on said cam lever, and an abutment on said setting lever engageable with said cam lever abutment when said setting lever is operated whereby to cause further movement of said cam lever and said actuating lever for setting of said bolt into full unlocking position.

4. Door locking structure comprising a housing on the door, a rockable latch bolt on the housing for coperation with a keeper on the door frame, an actuating lever fulcrumed intermediate its ends on said housing and having engagement at its outer end with said bolt, a spring for holding said actuating lever for setting of the lock thereby in unlocking position when the door is open, a setting lever fulcrumed on said housing having an abutment edge and a cam edge, said cam lever having a cam edge at its end, a spring for said cam lever normally holding it against the abutment edge of said setting lever with its cam edge displaced from the setting lever cam edge, engagement of said bolt with the keeper when the door is moved to closed position causing rocking of said bolt toward its locking position and corresponding rotation of said actuating lever to carry said cam lever bodily away from the abutment edge on said setting lever and to bring said cam lever cam edge into engagement with the cam edge of said setting lever whereafter said cam lever spring may rotate said cam lever for cooperation of said cam edges for further rotation of said actuating lever for setting thereby of said bolt into final locking engagement with the keeper.

5. Door locking structure comprising a housing on the door, a rockable latch bolt on the housing for cooperation with a keeper on the door frame, an actuating lever fulcrumed intermediate its ends on said housing and having engagement at its outer end with said bolt, a spring for holding said actuating lever for setting of the lock thereby in unlocking position when the door is open, a setting lever fulcrumed on said housing having an abutment edge and a cam edge, said cam lever having a cam edge at its end, a spring for said cam lever normally holding it against the abutment edge of said setting lever with its cam edge displaced from the setting lever cam edge, engagement of said bolt with the keeper when the door is moved to closed position causing rocking of said bolt toward its locking position and corresponding rotation of said actuating lever to carry said cam lever bodily away from the abutment edge on said setting lever and to bring said cam lever cam edge into engagement with the cam edge of said setting lever whereafter said cam lever spring may rotate said cam lever for cooperation of said cam edges for further rotation of said actuating lever for setting thereby of said bolt into final locking engagement with the keeper, an abutment on said cam lever and an abutment extension on said setting lever, means for rotating said setting lever for rolling engagement of said cam edges and preliminary return movement of said cam lever for operation of said actuating lever to release the bolt from pressure engagement with the keeper and for engagement then of the setting lever abutment extension with the cam lever abutment for positive rotation of said cam lever and corresponding movement of said actuating lever to fully disengage the bolt from locking engagement with the keeper, said actuating lever spring being effective upon return of said setting lever to normal position after opening of the door to rock said actuating lever for setting of the bolt to its unlocking position and for bodily movement of the cam lever back into engagement with the abutment edge of the setting lever.

6. Door locking structure comprising a housing on the door, a rockable latch bolt 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, an actuating member movable with said bolt, a cam member fulcrumed on said actuating member and having an eccentric camming surface, and a setting member engaged by said camming surface upon rocking of said bolt to locking position whereby said actuating member is moved to force said bolt intimately into locking engagement with the keeper.

7. An automobile door lock structure comprising a housing on the door, a rockable latch bolt on the housing for cooperation with a keeper on the door frame, an actuating lever fulcrumed intermediate its ends on said housing and having connection at its outer end with said bolt for movement therewith, a spring tending to hold said actuating lever for setting of the bolt to unlocking position, a cam lever fulcrumed on the inner end of said actuating lever and terminating in a cam surface, an abutment on said housing, and a spring for said cam lever tending to move said lever for engagement of its cam surface with said abutment whereby to move said actuating lever for setting of said bolt to locking engagement with the keeper when the door is closed.

8. An automobile door lock structure comprising a housing on the door, a rockable latch bolt on the housing for cooperation with a keeper on the door frame, an actuating lever fulcrumed intermediate its ends on said housing and having connection at its outer end with said bolt for movement therewith, a spring tending to hold said actuating lever for setting of the bolt to unlocking position, a cam lever fulcrumed on the inner end of said actuating lever and terminating in a cam surface, an abutment on said housing, and a spring for said cam lever tending to move said lever for engagement of its cam surface with said abutment whereby to move said actuating lever for setting of said bolt to locking engagement with the keeper when the door is closed, and a setting lever on said housing operable by the door handle to engage with said cam lever for movement thereof for disengagement of its cam surface from said abutment to permit said actuating lever spring to move said actuating lever for setting of the bolt to unlocking position so that the door may be opened.

9. A door lock structure comprising a housing for mounting on the door, a rockable latch bolt on said housing for cooperation with a keeper on the door frame, an actuating lever fulcrumed on said housing and having connection with said bolt for movement therewith, a spring for holding said actuating lever in position for setting

of the bolt in its unlocking position when the door is opened, a cam lever fulcrumed on said actuating lever, an abutment on said housing, said cam lever having a cam surface thereon, a spring holding said cam lever against said abutment with its cam surface displaced therefrom, engagement of said bolt with the keeper when the door is moved to closed position causing setting of the bolt for movement of said actuating lever to carry said cam lever into position for engagement of its cam surface with said abutment whereby said cam lever spring may then rotate said lever with its cam surface in engagement with the abutment whereby to move said actuating lever for setting of the bolt in door locking engagement with the keeper when the door has been closed.

EDWARD D. DALL.