June 2, 1959 G. B. DOREY 2,888,885

HOPPER DOOR LATCH MECHANISM

Filed Aug. 10, 1956 3 Sheets-Sheet 1

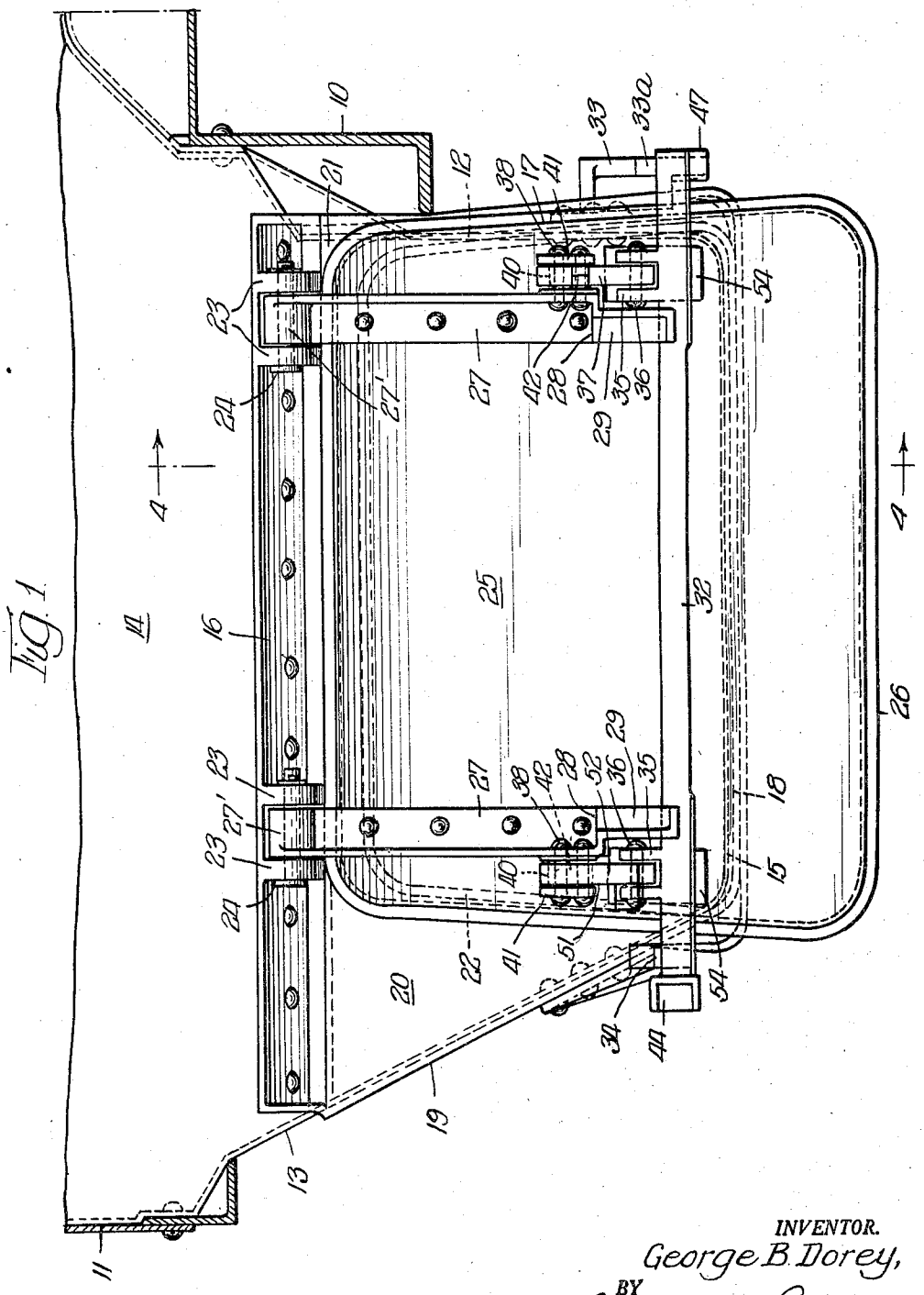


Fig. 1

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Fig. 2.

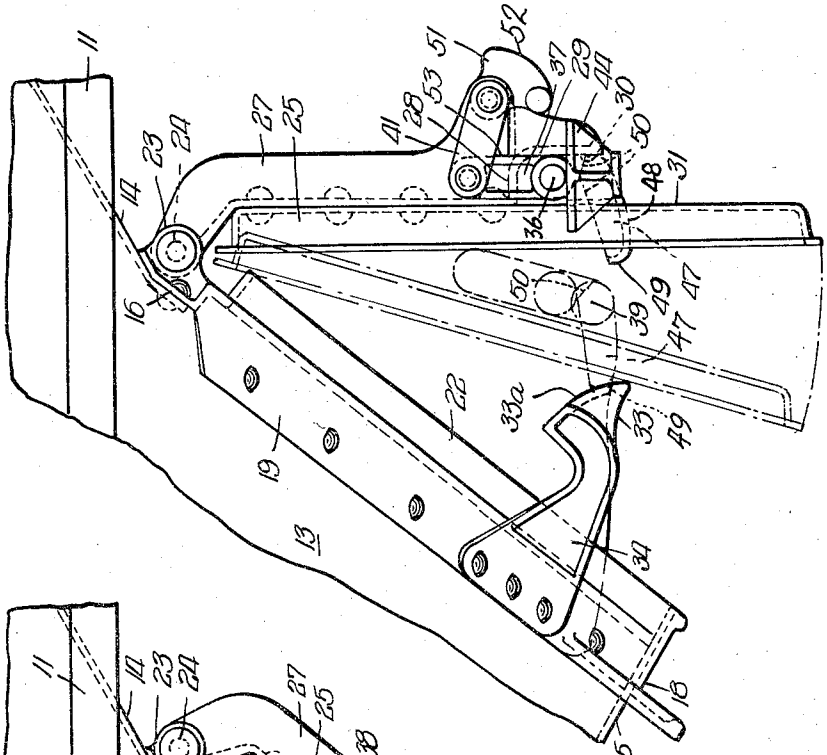


Fig. 3

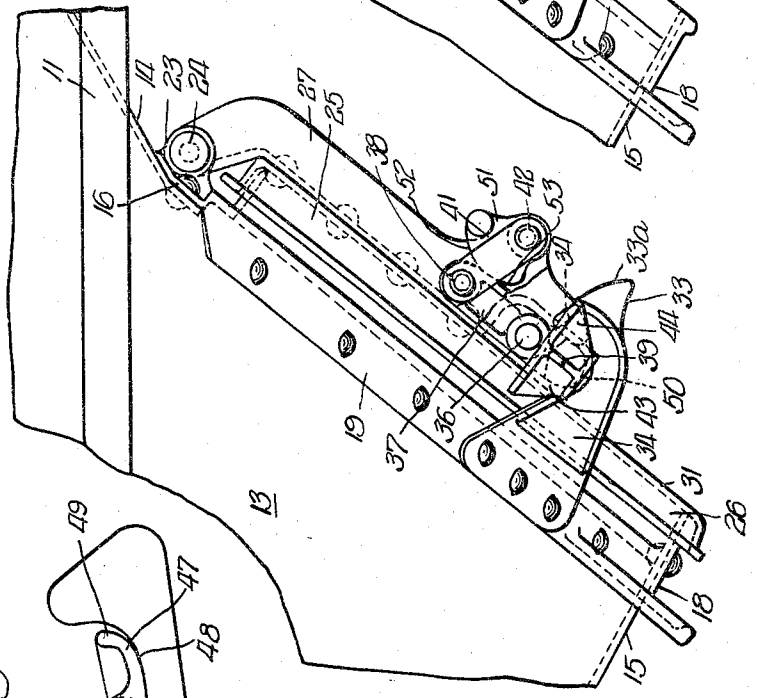


Fig. 3A

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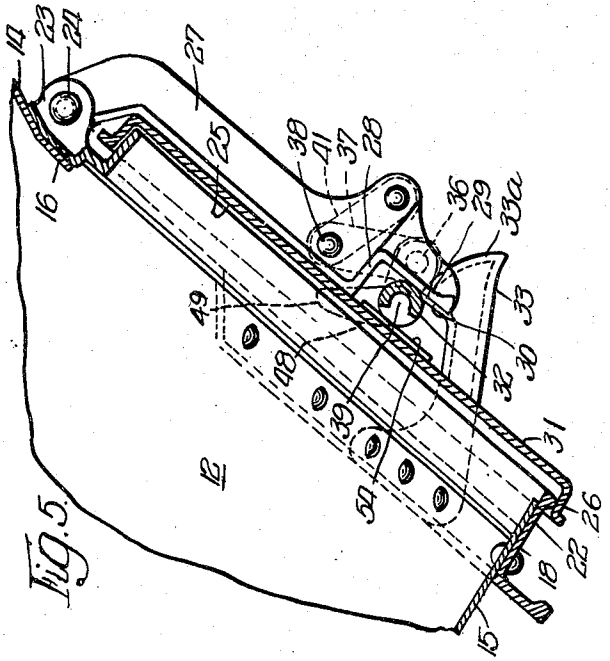


Fig. 5

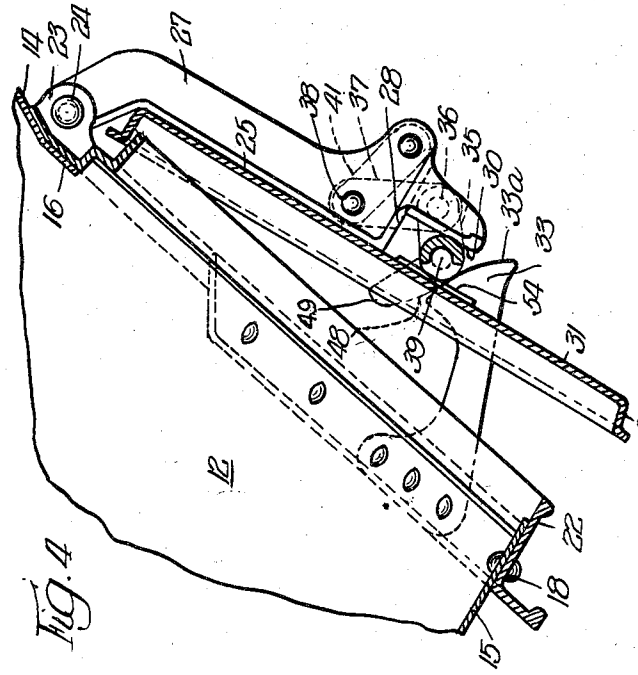


Fig. 4

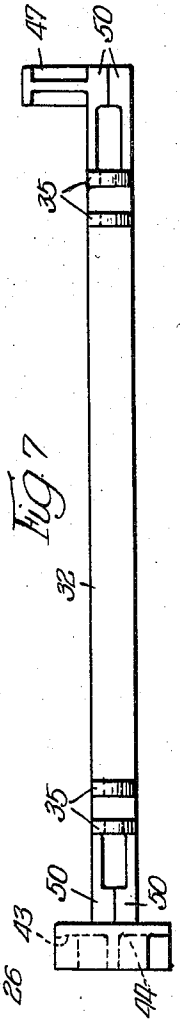


Fig. 7

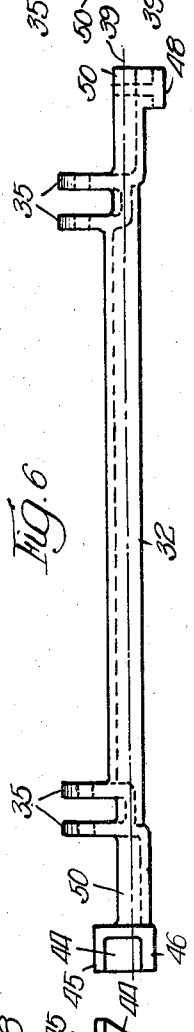


Fig. 6

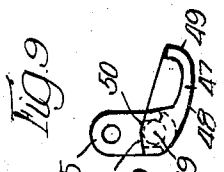


Fig. 9

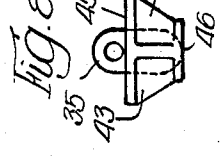


Fig. 8

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HOPPER DOOR LATCH MECHANISM

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Application August 10, 1956, Serial No. 603,285

8 Claims. (Cl. 105—309)

This invention relates to an improved latching mechanism such as employed for maintaining a pendantly mounted door of a hopper car in closed position.

The objects of this invention, among others, are: To provide cooperating means between a shouldered keeper on a hopper and a bodily movable latch element on a door to facilitate automatic displacement of the latch element as the door is moved to closed position; to provide a rotatable latch mechanism for retaining a door in partly closed position and moving said door to fully closed position by rotation of the latch element; to provide improved operating means for safely rotating the shaft; to provide improved guiding and locking means for a bodily movable latching element; and to provide a one piece latch element for simultaneously latching a door in closed position from a location at one side of the door.

For further comprehension of the invention reference may be had to the accompanying drawings wherein the improvement is shown as applied to a hopper car having discharge hoppers and pendantly mounted doors.

Figure 1 is a transverse vertical sectional view taken through the lower portion of a hopper car showing approximately one half the width of the car and incorporating the improved latching mechanism, said view showing the door in elevation and in pendantly open position.

Figure 2 is a side elevational view showing in full lines the structure illustrated in Figure 1 and indicating by conventional dot and dash lines the position of the door as the latch makes contact with the inner keeper.

Figure 3 is a view similar to Figure 2 except that the door is shown in closed and latched position.

Figure 3A is an elevational view of the right hand keeper and associated striker looking from right to left of Figure 1, the door being closed and locked.

Figure 4 is a vertical sectional view taken through the door as viewed at a location corresponding to a line 4—4 of Figure 1 and showing the door in partly closed position and the striker of the latching element riding on the beveled approach of the inner keeper.

Figure 5 is a view similar to Figure 4, except that the door closing operation is advanced to such an extent as to position the latch element in engagement with the shouldered keeper and the door thereby is maintained in a preliminary state of closure.

Figure 6 is a detached elevational view of the latch element.

Figure 7 is a top plan view of the latch element shown in Figure 6.

Figure 8 is a vertical end view of Figure 6 as viewed from left to right.

Figure 9 is a vertical end view of Figure 6 as viewed from right to left.

In said drawings, 10 indicates the center sill of a railway hopper car and 11 one of the side walls. Interposed between the center sill 10 and side wall 11 is a hopper including inner and outer side walls as indicated at 12 and 13, respectively, which meet with upper and lower oppositely sloping floors indicated at 14 and 15, respectively, to define an open area. Positioned in the open area is a frame which includes an upper beam portion 16 underlying the upper sloping floor 14 and flanges 17, 18 and 19 extending around the remaining three sides of the hopper. The outer side wall 13 of the hopper is inclined downwardly thereby providing a trapezoidal shaped discharge area and, in order to effect a four-sided trapezoidal shaped discharge opening, the frame is formed with a triangular shaped floor section 20 adjacent the downwardly inclined side wall 13, and another floor section 21 adjacent the inner side wall 12. Bordering the discharge opening the frame is provided with a projecting flange 22 extending beyond the floor sections 20 and 21 and forming a forwardly projecting four-sided chute like structure.

The upper beam portion 16 is provided with hinge butts 23 which receive pivots 24 for hingedly supporting a door 25. The door 25 is preferably formed of pan shape and an upwardly formed peripheral flange 26 and is arranged, when in closed position as shown in Figure 3 to lie at an incline from the horizontal plane and enclose the forwardly projecting chute like portion of the frame formed by the flange 22.

The door 25 is reinforced by means of hinge beams 27 which preferably include integrally formed hinge eyes 27' for receiving the hinge pivots 24. The beams 27 extend from the hinge axis of the door 25 towards the swinging edge thereof and adjacent the edge remote from the hinge axis they are deflected outwardly, as at 28, and thence downwardly, as at 29, to provide guiding wall faces 30 spaced outwardly from the outer surface 31 of the door. Located in the space between the surface 31 and guiding wall face 30 is a bodily movable latch element 32 which projects beyond the side edges of the door 25 to engage with shouldered keepers 33 and 34. As is apparent from Figures 4 and 5 of the drawings, the latch element 32, which is in the form of an elongated shaft, rolls along the guiding wall faces 30 in its movement into or out of latching position.

The keeper 33, which is located adjacent the inner side wall 12 of the hopper, is provided with an inclined runway 33a of extended length and preferably formed on an arc of comparatively large radius. The latch element 32 is bodily movable in a restrained path between the door 25 and guiding faces 30 and such movement is effected by rotation of the latch element 32. To effect bodily movement of the latch element 32 it is provided with arms 35, Figure 6, which are pivoted at 36 to links 37 which, in turn, are pivoted at 38 to the beams 27 which carry the door 25. The pivots 36 and 38 are preferably so located in relation to the longitudinal axis 39 of the latch element 32 as to provide a toggle locked mechanism to secure the latter against bodily movement. To this end, the links 37 and arms 35 are so related as to position the axis 39 of the latch element 32 on a straight line joining this axis and the pivot 38 when the latch element 32 is in latching position as shown in Figure 3. The mounting of each pivot 38 preferably includes a hollow trunnion 40 formed integrally with an overlying plate 41 which also includes another integrally formed hollow trunnion 42 which acts as a spacer for the respective plate 41 as the latter also serves as a guide for the respective link 37.

Rotation of the latch element 32 preferably is effected by sockets 43 and 44, the former being employed to operate in releasing the latch element 32, and the latter to force it closed. The respective sockets 43 and 44 are so formed as to retain an operating bar in only one direction of turning movement and to this end the hold-

ing socket 44 consists of walls of relatively long and short lengths as seen at 45 and in 46, Figure 8.

In order to effect automatic displacement of the latch element 32 in a releasing direction as the door 25 is slammed to closed position, there is provided a striker, 47, Figure 9, on the end of the latch element 32 adjacent the inner wall 12 of the hopper. The striker 47 is located at an appreciable distance from the axis 39 of the latch element 32 and is formed with an arcuately shaped surface 48 which terminates in an arc 49 formed of a relatively short radius.

The portion of the surface 48 having the arc 49 of the striker 47 is adapted to engage first with the arcuately shaped inclined approach 33*a* of the keeper 33 and, as the door 25 is moved further in a closing direction, the contact is continued along the curved surface 48, the radius of which is substantially greater than that of the arc 49. The portions of the latch element 32 which actually engage with the shoulders of the keepers 33 and 34 are provided with flat surfaces 50, Figure 7, which are preferably disposed to meet with each other at an obtuse angle and, in effect, serve to impart an eccentric action to wedge the door 25 to closed position.

The latch element 32 is maintained in latched position by a latching dog 51 which is pivoted on the trunnion 42. The dog 51 is formed with an arcuate surface 52 which is adapted to engage with surface 53 of the adjacent link 37.

Adjacent each side edge of the door 25, wear plates 54 are welded or otherwise secured to the surface 31 and present wearing surfaces on which the latch element 32 bears. The plates 54 may be of any desired thickness to operate as adjusting shims.

The operation of the device may be best understood by noting the cycle of movements involved in the closing operation of the door. Assuming the door in opened position as seen in Figures 1 and 2 with the latch mechanism in toggle locked position and the dog 51 released, the operator kicks or swings the door 25 in a closing direction bringing the striker arc 49 into engagement with the inclined surface 33*a* of the keeper 33 as shown by dot and dash lines in Figure 2. Continued movement of the door 25 in the closing direction moves the striker 47 upwardly until it overrides the surface 33*a* and the latching portions provided by the flat surfaces 50 of the latch element 32 then drop into engagement with the keepers 33 and 34 under the biasing action of gravity, as seen in Figure 5. The door 25 is now held in partially closed position by reason of the engagement between the flat surfaces 50 with the respective shoulders of the keepers 33 and 34. The operator now inserts a bar in socket 44 and, by a counter-clockwise turning movement of the latch element 32 through approximately 90 degrees forces the door 25 to fully closed position. The dog 51 is then swung into engagement with the link 35 and the door is then locked in the closed position as seen in Figure 3.

When the door 25 is to be opened, the dog 51 is swung out of locking engagement with its link 35 and an operating bar is inserted in the socket 43. By means of it the latch element 32 is rocked in a clockwise direction to roll the parts thereof below the flat surfaces 50 upwardly along the shoulders of the keepers 33 and 34 until they are cleared, whereupon the door 25 is free to swing to the open position.

What is claimed as new is:

1. In a railway car having a hopper with a discharge opening, side walls terminating at the sides of said discharge opening, a sloping floor terminating at the bottom of said discharge opening, and a door hinged to said hopper adjacent an upper side of said opening and swingable under the effect of gravity to an open position, in combination, a shouldered keeper mounted on each of said side walls and extending beyond the respective sides of said door, a latch element in the form of a shaft extending parallel to the hinge axis of said door adjacent the edge furtherest removed from said hinge axis and projecting at its ends beyond the sides of said door and engaging the keepers to hold said door closed, guide means on said door mounting said shaft for movement toward or away from said hinge axis, a pair of arms secured in parallel spaced relation to and extending radially from said shaft, a pair of links pivoted at one end to said door and at the other ends to said arms respectively, one of said shouldered keepers having a beveled approach to its latching shoulder, and operating means at one end of said shaft in alignment with the one shouldered keeper and having a shoulder eccentric with respect to the longitudinal axis of said shaft and engageable with said beveled approach as said door is swung toward closed position to rotate said shaft about its pivotal connections to said links and said links about their pivotal connections to said door for guiding the ends of said shaft into engagement with the respective locking shoulders on said keepers.

2. The invention, as set forth in claim 1, wherein the beveled approach to the latching shoulder of the one keeper has an arcuate convex striker receiving surface of relatively large radius and the operating means is in the form of a striker secured to the one end of the shaft, said striker having an arcuate convex striker surface of relatively small radius as compared to said relatively large radius.

3. The invention, as set forth in claim 1, wherein the guide means carried by the door has upwardly extending guiding wall faces in spaced relation to the door and in overlying relation to the shaft and the shaft rolls along the guiding wall faces in moving into or out of latching position.

4. In a railway car having a hopper with a discharge opening, side walls terminating at the sides of discharge opening, a sloping floor terminating at the bottom of said discharge opening, and a door hinged to said hopper adjacent an upper side of said opening and swingable under the effect of gravity to an open position, in combination, a shouldered keeper mounted on each of said side walls and extending beyond the respective sides of said door, a latch element in the form of a shaft extending parallel to the hinge axis of said door adjacent the edge furthest removed from said hinge axis and projecting at its ends beyond the sides of said door and engaging the keepers to hold said door closed, guide means on said door mounting said shaft for movement toward or away from said hinge axis, a pair of arms secured in parallel spaced relation to and extending radially from said shaft, a pair of links pivoted at one end to said door above said shaft and at the other ends to said arms respectively above said shaft when said shaft engages said keepers, one of said shouldered keepers having a beveled approach to its latching shoulder, and operating means at one end of said shaft in alignment with the one shouldered keeper and having a shoulder eccentric with respect to the longitudinal axis of said shaft and engageable with said beveled approach as said door is swung toward closed position to rotate said shaft about its pivotal connections to said links and said links about their pivotal connections to said door for guiding the ends of said shaft into engagement with the respective locking shoulders on said keepers.

5. In a railway car having a hopper with a discharge opening, side walls terminating at the sides of said discharge opening, a sloping floor terminating at the bottom of said discharge opening, and a door hinged to said hopper adjacent an upper side of said opening and swingable under the effect of gravity to an open position, in combination, a shouldered keeper mounted on each of said side walls and extending beyond the respective sides of said door, a latch element in the form of a shaft extending parallel to the hinge axis of said door adjacent the edge furthest removed from said hinge axis and projecting at its ends beyond the sides of said door and en-

gaging the keepers to hold said door closed, guide means on said door mounting said shaft for movement toward or away from said hinge axis, a pair of arms secured in parallel spaced relation to and extending radially from said shaft, a pair of links pivoted at one end to said door above said shaft and at the other ends to said arms respectively above said shaft when said shaft engages said keepers in fully latched position with the pivot axes of said links and the longitudinal axis of said shaft being located along a straight line, one of said shouldered keepers having a beveled approach to its latching shoulder, and operating means at one end of said shaft in alignment with the one shouldered keeper and having a shoulder eccentric with respect to the longitudinal axis of said shaft and engageable with said beveled approach as said door is swung toward closed position to rotate said shaft about its pivotal connections to said links and said links about their pivotal connections to said door for guiding the ends of said shaft into engagement with the respective locking shoulders on said keepers.

6. In a railway car having a hopper with a discharge opening, side walls terminating at the sides of said discharge opening, a sloping floor terminating at the bottom of said discharge opening, and a door hinged to said hopper adjacent an upper side of said opening and swingable under the effect of gravity to an open position, in combination, a shouldered keeper mounted on each of said side walls and extending beyond the respective sides of said door, a latch element in the form of a shaft extending parallel to the hinge axis of said door adjacent the edge furthest removed from said hinge axis and projecting at its ends beyond the sides of said door and engaging the keepers to hold said door closed, guide means on said door mounting said shaft for movement toward or away from said hinge axis, a pair of arms secured in parallel spaced relation to and extending radially from said shaft, a pair of links pivoted at one end to said door above said shaft and at the other ends to said arms respectively above said shaft when said shaft engages said keepers in fully latched position with the pivot axes of said links and the longitudinal axis of said shaft being located along a straight line, one of said shouldered keepers having a beveled approach to its latching shoulder providing a striker receiving surface, and a striker extending radially from one end of said shaft in alignment with the one shouldered keeper and having an arcuate convex striker surface engaging the striker receiving surface on the one shouldered keeper as said door is swung toward closed position and displacing said shaft, that end portion of the arcuate convex striker surface on said striker first engaging said striker receiving surface having a radius substantially smaller than the radius of the portion of the arcuate convex striker surface on said striker between said end portion and said shaft.

7. In a railway car having a hopper with a discharge opening, side walls terminating at the sides of said discharge opening, a sloping floor terminating at the bottom of said discharge opening, and a door hinged to said hopper adjacent an upper side of said opening and swingable under the effect of gravity to an open position, in combination, a shouldered keeper mounted on each of said side walls and extending beyond the respective sides of said door, a latch element in the form of a shaft extending parallel to the hinge axis of said door adjacent the edge furthest removed from said hinge axis and projecting at its ends beyond the sides of said door and engaging the keepers to hold said door closed, guide means on said door mounting said shaft for movement toward or away from said hinge axis, a pair of arms secured in parallel spaced relation to and extending radially from said shaft, a pair of links pivoted at one end to said door above said shaft and at the other ends to said arms respectively above said shaft when said shaft engages said keepers in fully latched position with the pivot axes of said links and the longitudinal axis of said shaft being located along a straight line, one of said shouldered keepers having a beveled approach to its latching shoulder provided with an arcuate convex striker receiving surface of relatively large radius, and a striker extending radially from one end of said shaft in alignment with the one shouldered keeper and having an arcuate convex striker surface of relatively small radius as compared to said relatively large radius engaging the striker receiving surface on the one shouldered keeper as said door is swung toward closed position to rotate said shaft about its pivotal connections to said links and said links about their pivotal connections to said door for guiding the ends of said shaft into engagement with the respective locking shoulders of said keepers.

8. In a railway car having a hopper with a discharge opening, side walls terminating at the sides of said discharge opening, a sloping floor terminating at the bottom of said discharge opening, and a door hinged to said hopper adjacent an upper side of said opening and swingable under the effect of gravity to an open position, in combination, a shouldered keeper mounted on each of said side walls and extending beyond the respective sides of said door, a latch element in the form of a shaft extending parallel to the hinge axis of said door adjacent the edge furthest removed from said hinge axis and projecting at its ends beyond the sides of said door and engaging the keepers to hold said door closed, guide means on said door mounting said shaft for movement toward or away from said hinge axis, a pair of arms secured in parallel spaced relation to and extending radially from said shaft, a pair of links pivoted at one end to said door and at the other ends to said arms respectively, and an operating head on one end of said shaft for receiving an operating bar to rotate said shaft about its pivotal connections to said links and said links about their pivotal connections to said door, said operating head including oppositely extending open sided sockets each formed by facing relatively long and short walls on opposite sides of the longitudinal axis of said shaft for gripping the removable operating bar therebetween, said short walls permitting gripping action by said operating bar in one direction only.

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