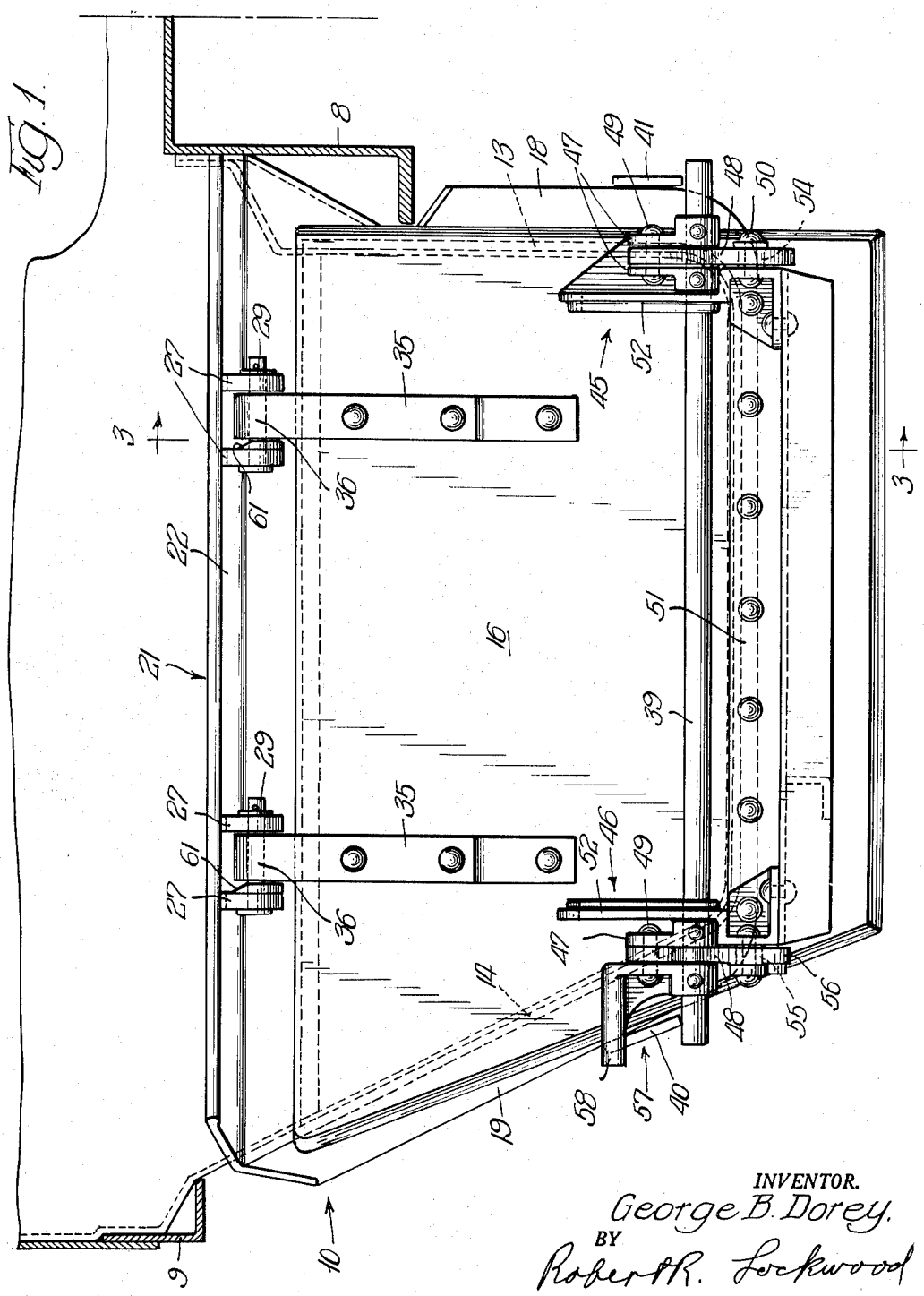
Oct. 11, 1955 G. B. DOREY 2,720,174

HOPPER CONSTRUCTION AND DOOR LATCHING MECHANISM THEREFOR

Filed Aug. 16, 1950 4 Sheets-Sheet 1

Fig. 1.



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HOPPER CONSTRUCTION AND DOOR LATCHING MECHANISM THEREFOR

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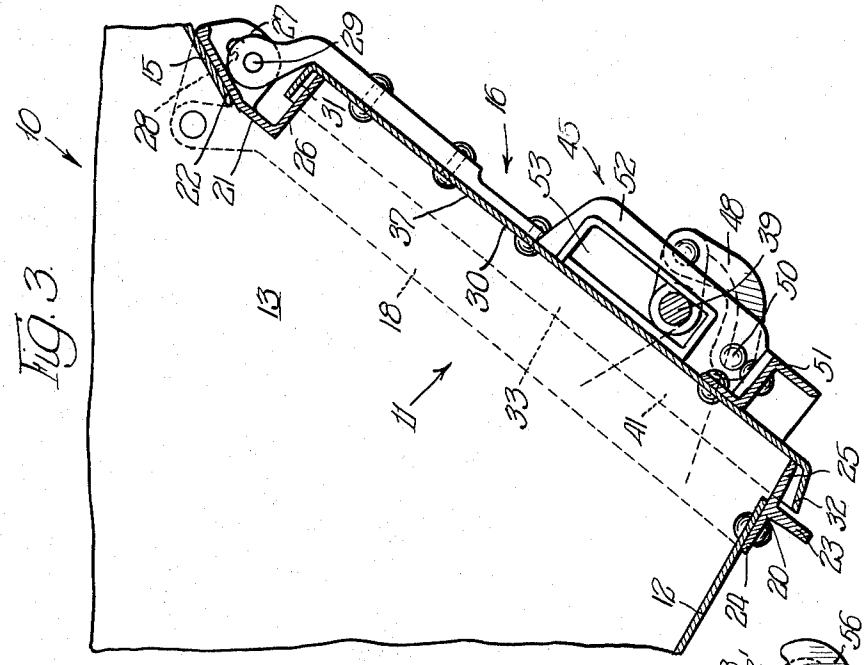


Fig. 3.

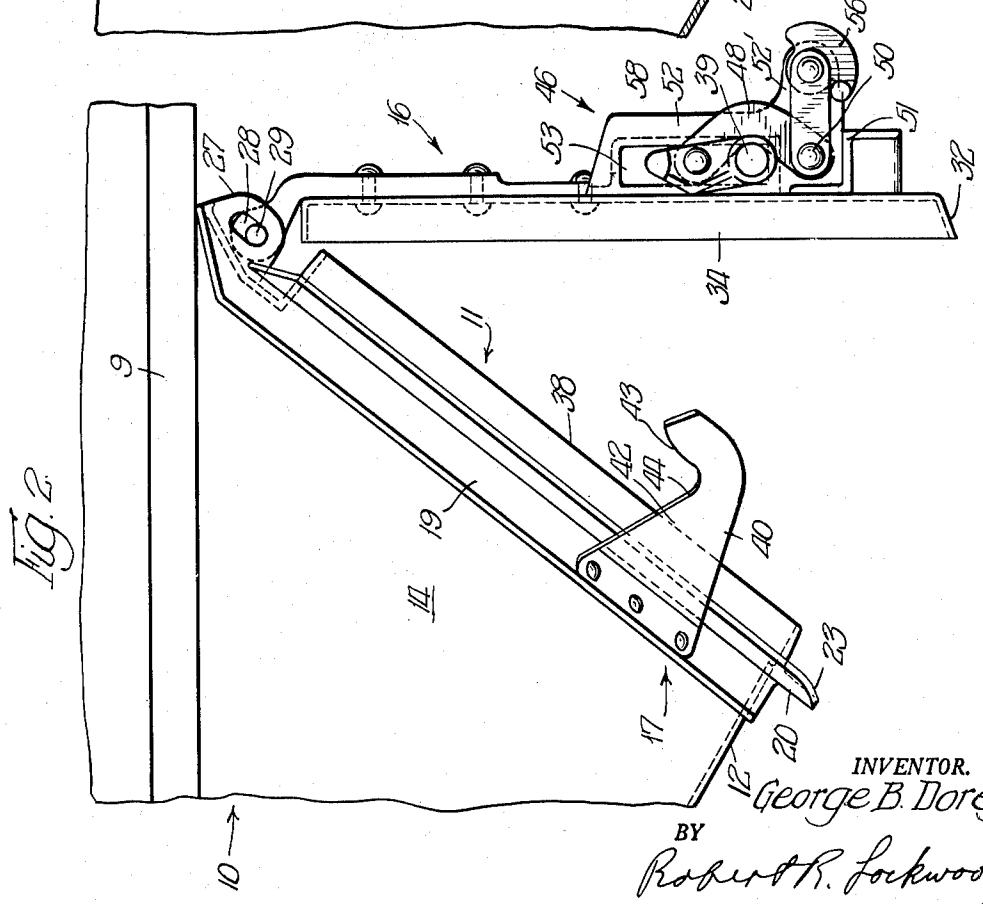


Fig. 2.

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HOPPER CONSTRUCTION AND DOOR LATCHING MECHANISM THEREFOR

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Fig. 5.

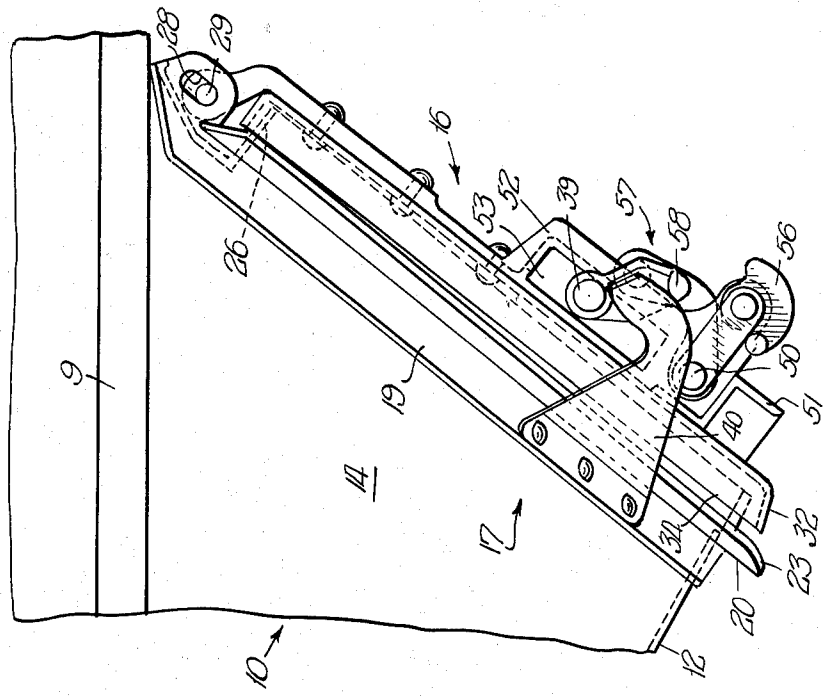
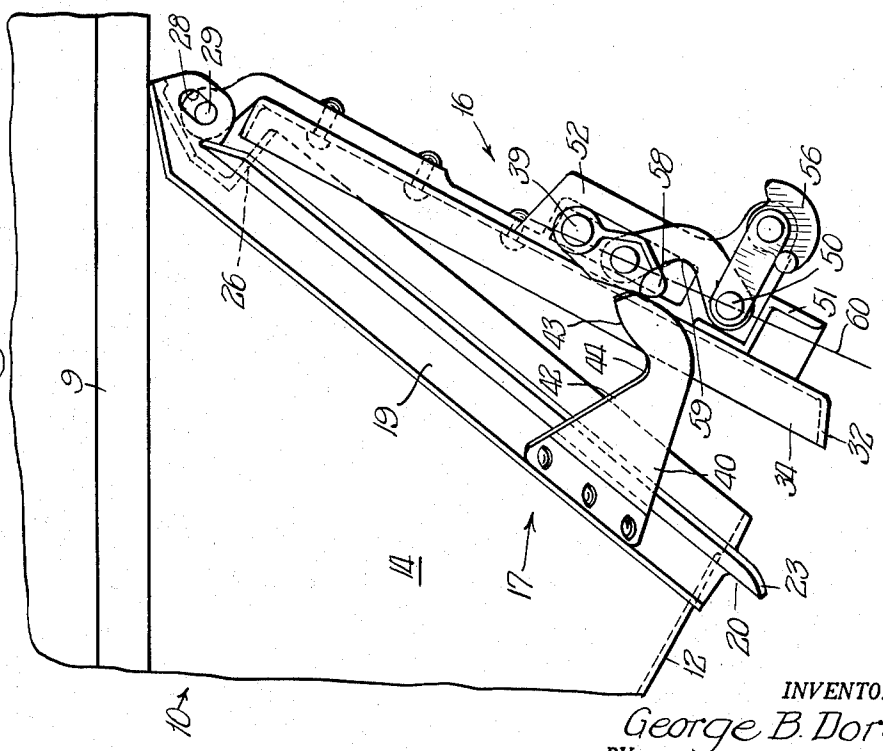


Fig. 4.



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HOPPER CONSTRUCTION AND DOOR LATCHING MECHANISM THEREFOR

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Fig. 7.

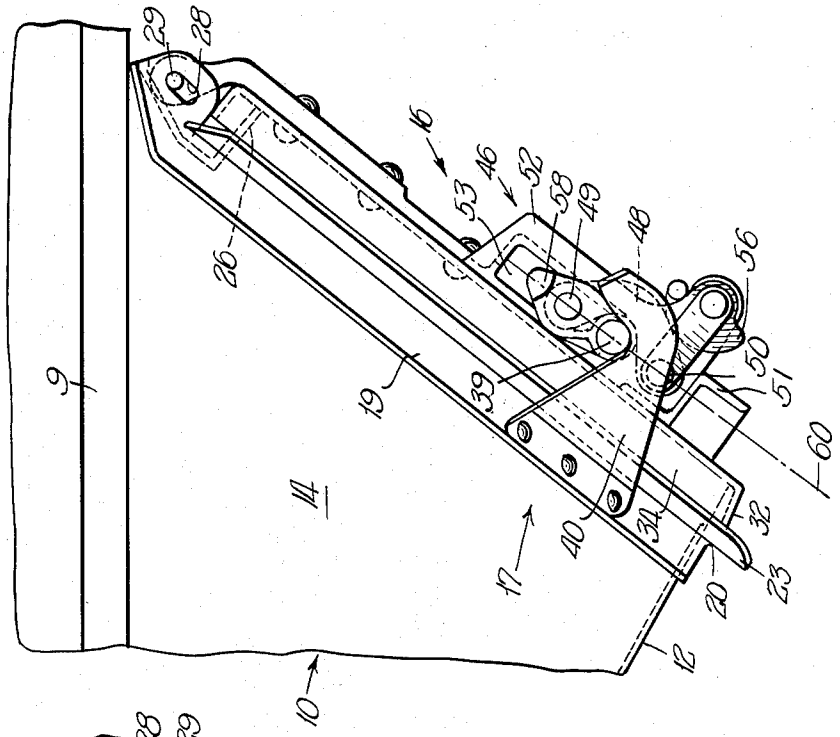
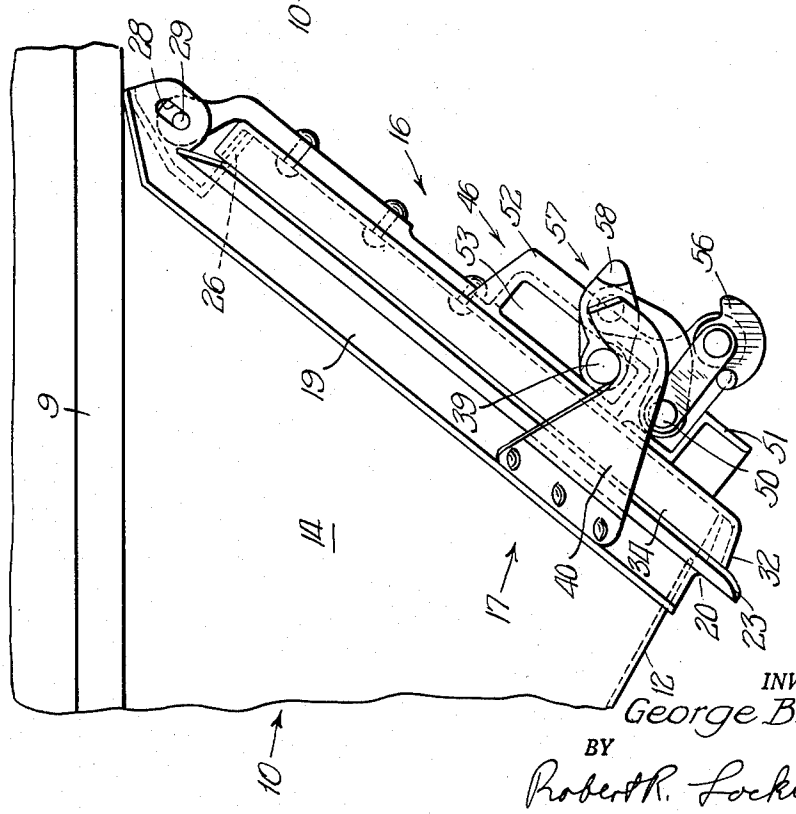


Fig. 6.



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HOPPER CONSTRUCTION AND DOOR LATCHING MECHANISM THEREFOR

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Application August 16, 1950, Serial No. 179,795

9 Claims. (Cl. 105—308)

This invention relates to an improved latching mechanism for the swinging doors of railway car hopper discharge openings and the like.

The objects of the invention among others are: To provide a bodily movable latch element for engagement with keeper means carried by the hopper and so arranged that the latch element in its released position will be moved away from the swinging edge of the door toward the hinged edge thereof until such time as a door lifting operation is completed; to provide a door latching element having means for retaining the same in either latching or non-latching position; to construct the latching mechanism so that it performs a door lifting function; to provide for a coordinating means whereby a latch element will gravitate to latching position upon a predetermined extent of door lifting movement; and to provide mechanism for automatically latching a swinging door in closed position and also for moving the same bodily along the face of a door opening.

Other objects of this invention will, in part, be obvious and in part appear hereinafter.

For a more complete understanding of the nature and scope of this invention, reference can be had to the following detailed description, taken together with the accompanying drawings in which the improvements of the present invention are illustrated as applied to the discharge opening of a railway hopper car having a pivoted door with a limited degree of bodily movement and wherein:

Figure 1 is a transverse sectional, elevational view showing approximately one-half of the lower portion of a hopper car having the improvement of the present invention applied thereto, the door being shown in open position;

Figure 2 is a vertical side elevational view of the structure shown in Figure 1 as viewed from left to right;

Figure 3 is a sectional view taken generally along the line 3—3 of Figure 1 with the exception that the door is shown as having been swung to the closed position but with the door resting in its lowermost position of bodily movement;

Figure 4 is a view, similar to Figure 2, illustrating the bodily movable latching shaft in its extreme position of release with the axis of the shaft past dead center in toggle locking relation and the operating head in contact with one of the keepers carried by the hopper;

Figure 5 is a view, similar to Figure 4, illustrating the parts in position with the toggle joint broken and the shaft moving into latching position under the influence of gravity with respect to the keepers;

Figure 6 is a view, similar to Figure 5, except that the shaft is shown as resting upon the shank of one of the keepers for the initiation of the bodily movement of the door; and

Figure 7 is a view, similar to the preceding Figures 4, 5 and 6, except that the door is shown as fully closed and bodily moved toward the hinged axis thereof to the completely sealed position and with the toggle acting link mechanism in the final latched position.

Referring now particularly to Figures 1, 2 and 3 of the drawings, the reference character **8** indicates a portion of the center sill structure, **9** the lower portion of the side wall of the car and positioned between the center sill **8** and the side wall **9** is a discharge hopper **10** having a discharge opening **11**. The hopper **10** includes a sloping bottom floor **12**, inner and outer side walls indicated at **13** and **14**, respectively, and an upper floor **15** sloping in a direction oppositely to the direction in which the bottom floor **12** slopes. The edge portions of the floors and walls **12**, **13**, **14** and **15** thus define the discharge opening **11** with which are associated a door **16** and a frame **17**, the latter extending around the floors and side walls and the former being mounted thereon and arranged to be latched thereto.

The inner wall **13** of the hopper **10** extends downwardly substantially vertically and the outer wall **14** is inclined downwardly and inwardly thereby providing a substantially trapezoidal configuration to which the frame **17** is shaped. The frame **17** includes a lower stirrup portion comprising spaced legs indicated at **18** and **19** and a lower connecting wall section **20**. The upper portion of the frame **17** is in the form of a beam member **21** preferably formed of a bulb angle section having a web **22** underlying the upper sloping floor **15** and secured thereto. The lower stirrup section of the frame is preferably of T-shaped section with a centrally disposed stem **23** outstanding therefrom. One side of the stem **23** includes a flange portion **24**, Figure 3, underlying the bottom floor **12** and the side walls **13** and **14** of the hopper **10**. On the other side of the stem **23** the flange portion **25** constitutes the side and bottom walls of a forwardly projecting chute-like structure which, in combination with angularly related flange **26** of the top beam member **21**, constitute the four marginal walls of the discharge opening **11**. Depending from the underside of the beam member **21** are hinge brackets **27** which are arranged in pairs and each is provided with aligned elongated apertures **28** for the reception of door supporting hinge pins **29**. The elongated apertures **28** are used to permit bodily sliding movement of the door **16** from and to the completely sealed position.

The door **16** preferably comprises a body portion **30**, Figure 3, having upwardly extending flanges **31**, **32**, **33** and **34** at the top, bottom, inner side and outer side, respectively, these flanges lying adjacent to and parallel with the corresponding sides of the frame **17**. The door **16** is provided with hinge straps **35** which are secured thereto and each is formed adjacent the upper portion with an eye portion **36** for the reception of the hinge pin **29**. The door **16** is arranged to be swung to closed position with the inner face **37**, Figure 3, meeting the edge portion **38**, Figure 2, of the frame **17**.

In order to retain the door **16** in closed position there is provided a latching mechanism in the form of a bodily movable shaft **39** having end portions projecting beyond the sides of the door **16** for cooperating with keepers one of which is indicated at **40** for the outer side of the hopper **10** and at **41** for the inner side. Each keeper **40** and **41** includes a shank portion **42**, Figure 2, and a shoulder **43** leading therefrom, the shank portion **42** having a bottoming wall **44** of arcuate shape adjacent the shouldered part **43** against which the projecting ends of the shaft **39** are arranged to react for shifting the door **16** bodily from the position shown in Figure 3 to the fully sealed position as shown in Figure 7 of the drawings.

The shaft **39** is bodily movable and rotatable in slotted guide brackets **45** and **46**, respectively, located adjacent the inner and outer side edges of the door **16** and secured thereon. The mechanism whereby the shaft **39** is moved bodily and is rotated includes arms **47**, Figure 1, nonrotatably mounted on the shaft **39** and links **48** which are

pivoted at one end to the corresponding arm **47** of the shaft **39**, as at **49** and at the opposite end to the associated guide brackets **45** and **46**, as at **50**, thereby pivoting these ends of the links **48** on the door **16**.

The guide brackets **45** and **46** are each secured to a door beam **51**, extending along the swinging edge of the door **16**, adjacent the sides of the door and each includes a web **52** having an elongated guideway **53** in which the ends of the shaft **39** are slidable and rotatable. At the lower end of each bracket **45** and **46** there is provided an integrally formed trunnion **54**, shown by broken lines, which constitutes the support for the corresponding link **48**. In the case of the outer bracket **46** the web **52** is extended outwardly, as indicated at **52'** in Figure 2, and is formed with a second trunnion **55**, shown by broken lines in Figure 1, on which a latching dog **56** is pivotally mounted for engagement with the associated link **48** for holding it in a position where the shaft **39** locks the door **16** in the fully closed and sealed position, as will be apparent from Figure 7. Adjacent the outer side wall **14** of the hopper **10** the shaft **39** is provided with an operating head **57** which includes a laterally extending crank arm **58**. The crank arm **58** is extended lengthwise so as to be in the path of the outer end of the outer shouldered keeper **40** as illustrated more clearly in Figures 4 and 5 of the drawings.

The links **48** are formed with an indented arcuate shaped inner contour **59**, Figure 4, to accommodate the shaft **39** with its longitudinal axis slightly past a straight line **60**, Figure 7, joining the pivotal axes of the links **48**. This permits the shaft **39** to assume a locking position past dead center when in latching position. The ends of the shaft **39** are movable in the guideways **53** and the shaft **39** is rotatable therein through an arc of slightly in excess of 180° in order to permit it to assume an over center locking position in the released position past the line **60** as shown in Figure 4.

In the operation of doors of the character here described, it is customary to provide for automatic displacement of the latch by movement of the door. This is usually accomplished by the impingement of the latch on an inclined striker surface which has the effect of imposing a retarding influence on the upward lifting movement of the door thus greatly hampering its closing movement, especially with doors which assume an inclined closed position. It will be understood that such retardation is effective when the doors approach the closed position and at a time when the lifting effort of the operator is spent.

In accordance with the present invention this disadvantage is overcome by first providing for moving the shaft **39** from the latched position shown in Figure 7 to the released position shown in Figure 4, when the door is opened, and in a direction away from the swinging edge of the door **16** toward its hinge axis when the door is swung toward closed position and by making provision for retaining the shaft **39** in such position until the door lifting operation has been nearly completed. Thereafter release of the shaft is effected to permit it to fall in place behind the shoulders **43** of the keepers **40** and **41** the initiation of which movement is illustrated in Figure 5. This is accomplished by making provision for the shaft **39** to assume an over center toggle locking position in the extreme released position as shown in Figure 4 and providing for release of the toggle by contact between the crank arm **58** and the outer end of the outer keeper **40** thereby causing the release of the shaft **39** and permitting it to assume the successive positions illustrated in Figures 5 and 6 of the drawings on continued closing movement of the door **16**. In Figure 6 the shaft **39** is shown with the ends in engagement with the bottoming walls **44** of the keepers **40** and **41**. Here the door **16** is shown in its lowermost closed position. The shaft **39** in moving from its position shown in Figure 5 to that shown in Figure 6 is aided by centrifugal force applied thereto resulting from the swinging movement of the door **16**. In order to move the door **16** bodily relative to the discharge opening **11**, the crank arm **58** is rotated from the position shown in Figure 6 in a counterclockwise direction to the position shown in Figure 7. This may be accomplished by applying a suitable prying bar to the crank arm **58**. While the crank arm **58** is being swung to this position, the ends of the shaft **39** bearing against the bottoming walls **44** of the keepers **40** and **41** react thereagainst to cause the bodily sliding movement of the door **16** generally upwardly as permitted by the elongated apertures **28** for the hinge pins **29**. The continued movement of the crank arm **58** causes the longitudinal axis of the shaft **39** to be placed slightly to the right of the line **60** joining the pivot points **49** and **50** of the links **48**. In this manner the shaft **39** is locked in an over center toggle position. Thereafter the latching dog **56** is swung to the position shown in Figure 7 to insure that the shaft **39** will be held in this over center position.

The present invention as described hereinbefore and shown in the drawings is particularly adapted for use with doors having a bodily movement of translation inasmuch as this system of latching not only forces the door **16** tightly closed but also operates to move the door **16** bodily by reason of the engagement between the ends of the shaft **39** and the bottom walls **44** of the shanks **42** of the keepers **40** and **41**. The bodily movement of the door **16**, as permitted by the elongated apertures **28**, is of importance in connection with a door and door frame having cooperating sealing walls arranged in wedging relation. In this particular embodiment of the invention only the outer side of the door **16** is employed in effecting a wedging action, there being a slight sidewise movement of the door **16** in relation to the frame **17** which movement is transversely of the length of the car. In order to compensate for the relative sidewise movement of the door **16** just referred to, a limited clearance is provided between the walls of the hinge brackets **27** as shown in Figure 1. The inner face of one wall of each pair of bracket walls is provided with an inclined cam face portion **61** which is effective to return the door **16** to the centralized position.

Since certain changes can be made in the foregoing construction and different embodiments of the invention can be made without departing from the spirit and scope thereof, it is intended that all matter shown in the accompanying drawings and described hereinbefore shall be interpreted as illustrative and not in a limiting sense.

What is claimed as new is:

1. In a hopper having a discharge opening and a door pivotally mounted adjacent the upper part thereof and swingable in an inclined closed position, means for retaining said door in closed position including keeper means carried by said hopper and an elongated latch member carried by said door parallel to its hinge axis and bodily movable toward and away from said hinge axis for engaging and disengaging said keeper means, said latch member being bodily movable toward said hinge axis to released position, and overcenter toggle means connected between said door and said latch member for retaining said latch member locked in its released position until said door reaches a predetermined position in its swinging movement toward closed position relative to said keeper means, and operating means carried by said toggle means for engaging said keeper means when said door is swung to closed position to unlock said toggle means whereby said latch member thereupon is movable to engage said keeper means and hold said door closed.

2. In a hopper having a discharge opening and a door pivotally mounted adjacent the upper part thereof and swingable to an inclined closed position, means for retaining said door in closed position including keeper means carried by said hopper and an elongated latch member carried by said door parallel to its hinge axis and bodily movable toward and away from said hinge axis

for engaging and disengaging said keeper means, said latch member being bodily movable toward said hinge axis to released position, overcenter toggle means connected between said door and said latch member for retaining said latch member locked in its released position until said door reaches a predetermined position in its swinging movement toward closed position relative to said keeper means, and release means engageable with said keeper means for unlocking said latch member from its released position whereby the same thereupon is movable to engage said keeper means and hold said door closed.

3. In a hopper having a discharge opening and a door pivotally mounted adjacent one side thereof, means for retaining said door in closed position including shouldered keeper means carried by said hopper and a shaft carried by said door parallel to its hinge axis and movable toward and away from said hinge axis to engage and disengage said shouldered keeper means, and toggle acting means including an arm non-rotatably mounted on said shaft and a link pivotally mounted at one end of said door and having its opposite end pivotally connected to said arm on said shaft, said toggle acting means being movable from one extreme position where the pivotal connection between said arm and link occupies an overcenter position between the longitudinal axis of said shaft and the pivot axis of said link on said door to another extreme position where said longitudinal axis of said shaft occupies an overcenter position between said pivotal connection between said arm and link and said pivot axis of said link on said door.

4. In a hopper having a discharge opening and a door pivotally mounted adjacent one side thereof, means for retaining said door in closed position including shouldered keeper means carried by said hopper and an elongated latch member carried by said door parallel to its hinge axis and bodily movable toward and away from said hinge axis for engaging and disengaging the shoulder part of said keeper means, said latch member being movable by rotation and translation thereof to assume positions of rest in either of two extreme positions of movement, means for moving said latch member and retaining the same in its extreme positions of movement including a toggle joint having linkage connected to said door and to said latch member and arranged to fold and maintain said latch member in overcenter locking relation to maintain the same in one of its extreme positions and to straighten out to maintain it in overcenter relation in the other of its extreme positions, said latch member in one of its extreme positions being in engagement with said shouldered keeper means and in the other of its extreme positions lying therebeyond, and operating means carried by said movable latch member for engaging said shouldered keeper means when said door is swung to closed position to unlock said toggle joint when said latch member occupies said other extreme position.

5. In a hopper having a discharge opening and a door pivotally mounted adjacent one side thereof, means for retaining said door in closed position including shouldered keeper means carried by said hopper and a shaft carried by said door parallel to its hinge axis and bodily movable toward and away from said hinge axis for engaging and disengaging the shoulder part of said keeper means, said shaft being movable by rotation and translation thereof to assume positions of rest in either of two extreme positions of movement, means for moving said shaft and retaining the same in its extreme positions of movement including a toggle joint having linkage connected to said door and to said shaft and arranged to fold and maintain said shaft in overcenter locking relation to maintain the same in one of its extreme positions and to straighten out to maintain it in overcenter relation in the other of its extreme positions, said latch member in one of its extreme positions being in engagement with said shouldered keeper means and in the other of its extreme positions lying therebeyond, and means engageable with said keeper means when said door is swung toward closed position for moving said latch member out of its last named position.

6. In a hopper having a discharge opening and a door pivotally mounted adjacent one side thereof, said door being swingable to closed position to engage with said hopper and also being bodily movable along the face of said opening to a sealed position, means for retaining said door in closed position and moving the same bodily and retaining it in its bodily moved closed position including a keeper carried by the hopper at each side thereof and each formed with a shank and shoulder, and a bodily movable shaft carried by said door and arranged to have its ends engage with said keepers, said shaft being movable by rotation thereof and having a toggle mechanism near each end each including an arm non-rotatably mounted thereon and a link pivoted thereto and to said door, said shaft being movable to first engage with the shoulder of each keeper and thereafter upon continued rotation of the shaft to engage with the shank thereof and move the door bodily to seal the same to said hopper.

7. In a hopper having a discharge opening and a door pivotally mounted adjacent one side thereof, means for latching said door in closed position including a shouldered keeper carried by said hopper at each side of said opening, a shaft slidably and rotatably mounted on said door with its ends projecting beyond the sides thereof for engaging and disengaging said keepers, toggle acting means for moving said shaft including an arm extending from said shaft adjacent each end and a V-shaped toggle link pivoted at one end to each arm and at the other end to said door, said toggle acting means being movable from one extreme position where the pivotal connections between said arms and links occupy an overcenter position between the longitudinal axis of said shaft and the pivot axes of said links on said door to another extreme position where said longitudinal axis of said shaft occupies an overcenter position between said pivotal connections between said arms and links and said pivot axes of said link on said door, and operating means carried by one of said arms for engaging the corresponding shouldered keeper when said door is swung to closed position to unlock said shaft from said overcenter related position.

8. In a hopper having a discharge opening and a door pivotally mounted adjacent one side thereof, means for latching said door in closed position including a shouldered keeper carried by said hopper at each side of said opening, a shaft slidably and rotatably mounted on said door with its ends projecting beyond the sides thereof for engaging said keepers when said door is closed, an arm extending from said shaft adjacent each end, a toggle link pivoted at one end to each arm and at the other end to said door and arranged to effect movement of said shaft from an over center released position away from the swinging edge of said door and toward its hinge axis to an over center locked position toward said swinging edge of said door and away from its hinge axis with said ends in engagement with the shoulders of said keepers, and an operating head fast on said shaft having a laterally projecting crank arm spaced therefrom and engageable with one of said keepers when said door is swung toward closed position for moving said shaft from said released position toward said locked position, said movement of said shaft being assisted by centrifugal force acting thereon and incident to the swinging movement of said door.

9. In a hopper having a discharge opening and a door pivotally mounted adjacent one side thereof and bodily slidable with respect thereto into and out of sealed position, means for latching said door in closed and sealed position including a shouldered keeper carried by said hopper at each side of said opening, a shaft slidably and rotatably mounted on said door with its ends projecting beyond the sides thereof for engaging said keepers when said door is closed, an arm extending from said shaft adjacent each end, a toggle link pivoted at one end to each arm and at the other end to said door and arranged to

effect movement of said shaft from an over center released position away from the swinging edge of said door and toward its hinge axis to an over center locked position toward said swinging edge of said door and away from its hinge axis with said ends in engagement with the shoulders of said keepers, and an operating head fast on said shaft having a laterally projecting crank arm spaced therefrom and engageable with one of said keepers when said door is swung toward closed position for moving said shaft from said released position toward said locked position, said movement of said shaft being assisted by centrifugal force

acting thereon and incident to the swinging movement of said door, said shaft being rotatable by said operating head with said ends engaging said keepers to an over center locked position accompanied by bodily slidable movement of said door to its sealed position.

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