Jan. 17, 1956 G. B. DOREY 2,730,966

HOPPER DOOR LATCHING MECHANISM

Filed Oct. 23, 1952 4 Sheets-Sheet 1

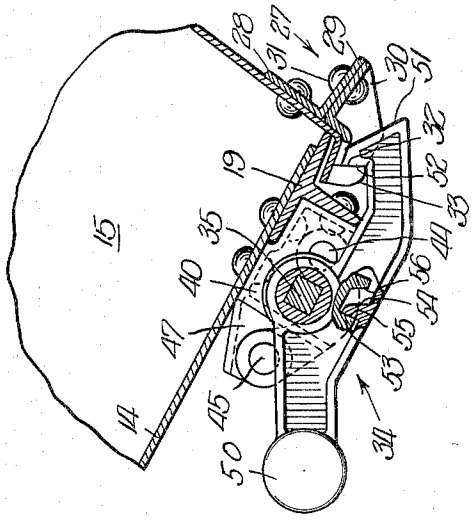


Fig. 4

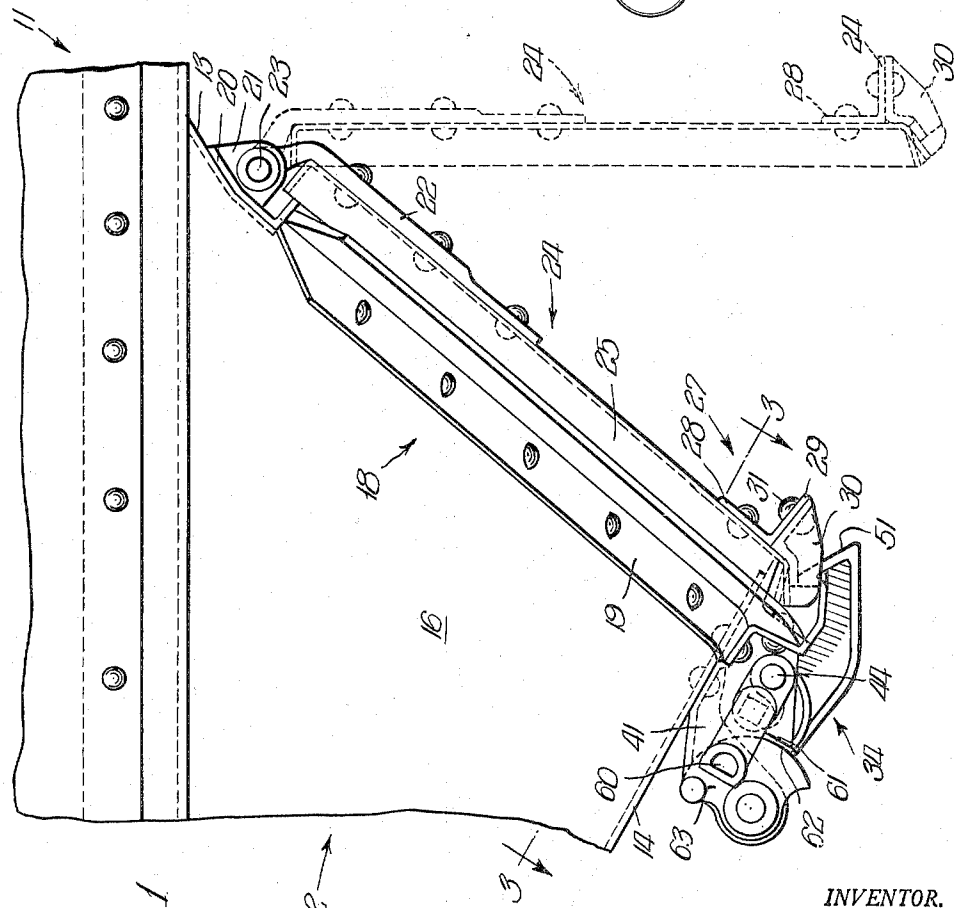


Fig. 1

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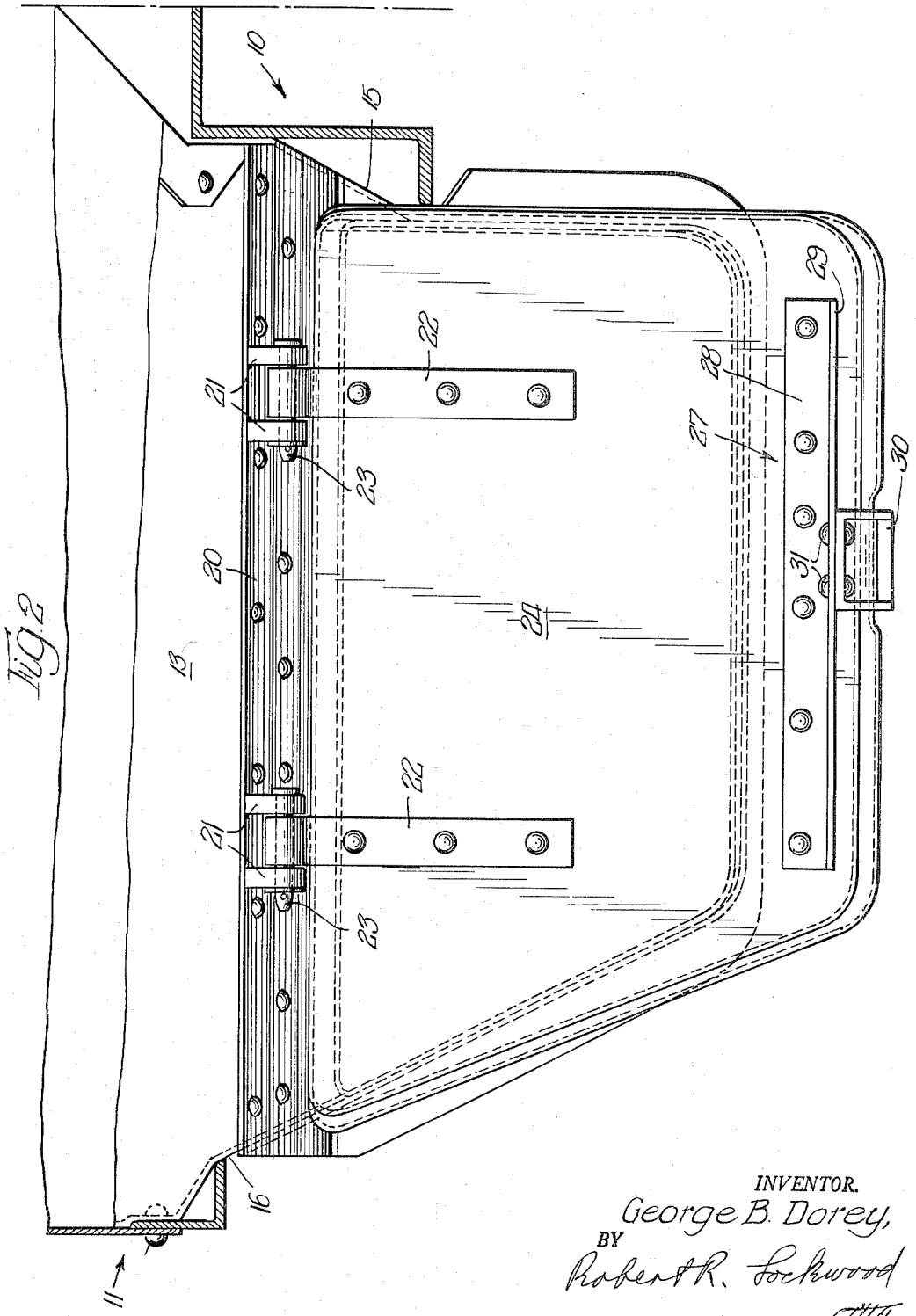


Fig 2

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HOPPER DOOR LATCHING MECHANISM

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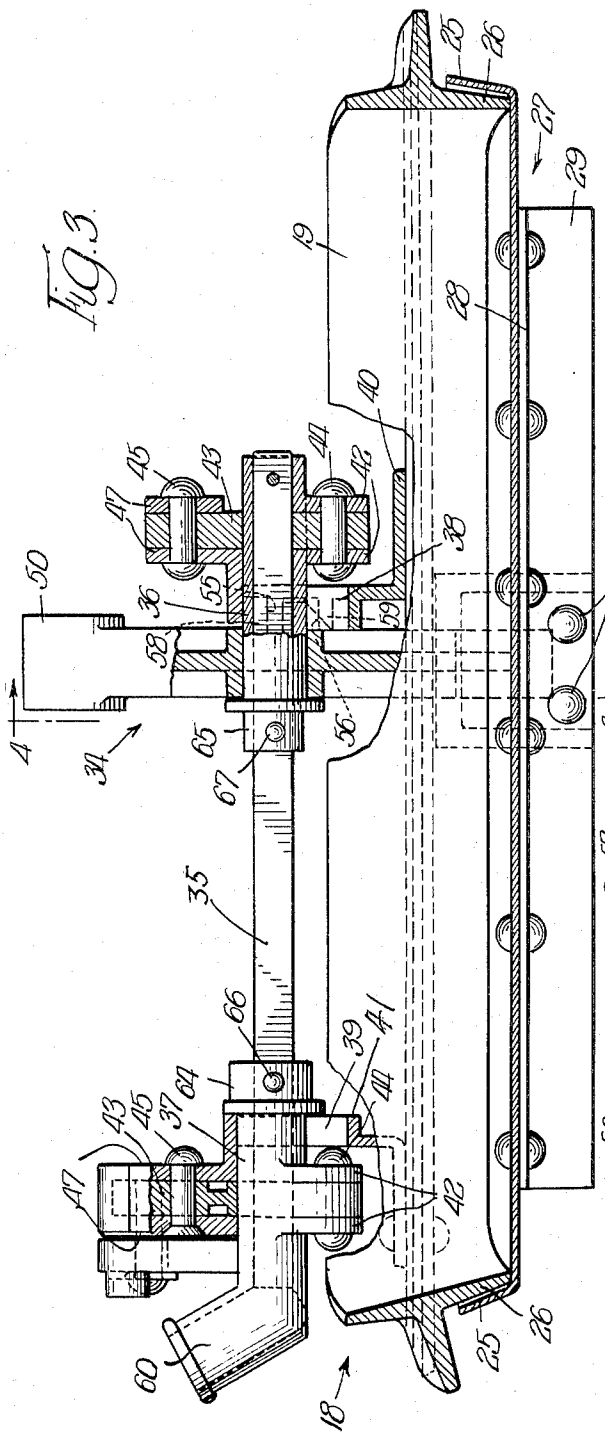


Fig. 3.

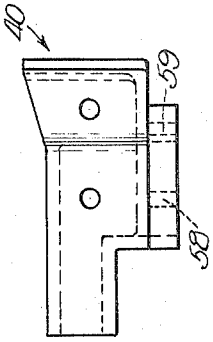


Fig. 8.

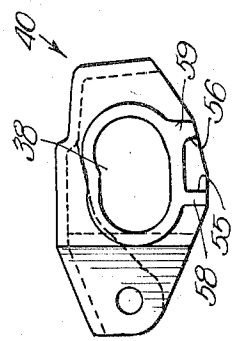


Fig. 7.

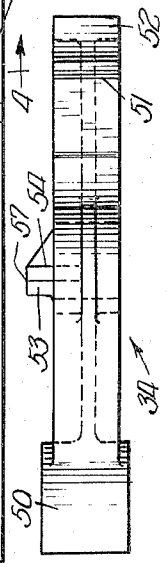


Fig. 10.

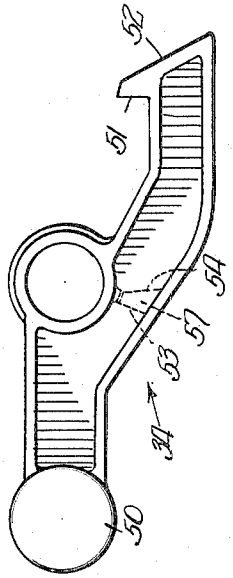


Fig. 9.

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HOPPER DOOR LATCHING MECHANISM

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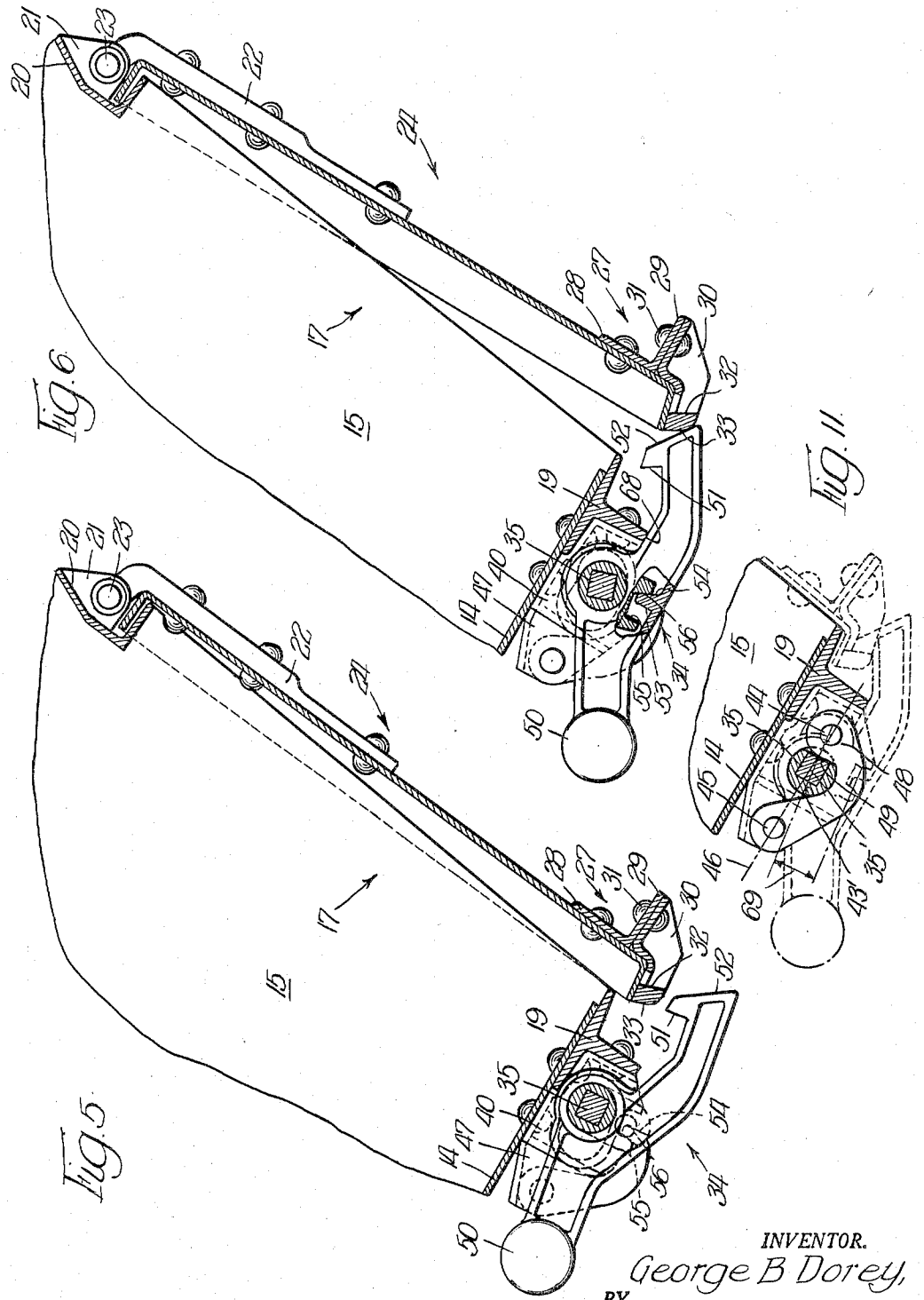


Fig. 6

Fig. 5

Fig. 11

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HOPPER DOOR LATCHING MECHANISM

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Application October 23, 1952, Serial No. 316,390

2 Claims. (Cl. 105—308)

The invention relates to a hopper door latching mechanism for application to a railway hopper car structure and the like wherein a pivotally mounted door is arranged to have its swinging edge maintained in latched position relatively to the hopper structure.

The objects of the invention, among others, are: To provide a bodily movable latch and toggle acting linkage for moving the latch and also for positively moving the latch from a state of release to a fully closed position through the medium of said linkage whereby the greatly multiplied mechanical advantage of the toggle action is employed for rotating the latch; and to provide interengaging shouldered means between a pivoted latch and its supporting bracket for effecting rotation of the latch by a bodily movement of the latch pivot.

In the drawings the improved latching mechanism is shown as applied to the hopper of a so-called W-type hopper car wherein the doors are mounted to swing on axes disposed transversely of the car.

In said drawings:

Figure 1 shows a vertical side elevational view of a portion of a hopper car with the door shown by full lines in closed position and shown by conventional broken lines in the open pendant position;

Figure 2 is a frontal elevational view of the structure shown in Figure 1 as viewed from right to left, said view showing approximately one-half the width of the lower portion of the car;

Figure 3 is a sectional plan view on an enlarged scale taken through the door and hopper on a line 3—3 of Figure 1, certain parts being broken away to better illustrate the construction;

Figure 4 is a vertical sectional view taken through the door generally on a line 4—4 of Figure 3, with the latch in latching position;

Figure 5 is a view similar to Figure 4 except that the latch is shown in completely released position;

Figure 6 is a view similar to Figures 4 and 5 except that the latch is shown as having returned to the door holding position from the completely released position shown in Figure 5;

Figure 7 is a detached side elevational view of the inner shaft supporting bracket;

Figure 8 is a plan view of the bracket shown in Figure 7;

Figure 9 is a detached side elevational view of the latch;

Figure 10 is a plan view of the latch shown in Figure 9; and

Figure 11 is a diagrammatic view of the toggle locking mechanism showing the relation of the same to the latch and abutments with the mechanism in toggle locked position.

Referring to the drawings the usual center sill of the car is shown at 10 and one of the outwardly spaced side walls is shown at 11. Interposed between the center sill 10 and side wall 11 is a hopper 12 including upper and lower sloping floors indicated at 13 and 14, respectively,

which in combination with inner and outer side walls as indicated at 15 and 16, respectively, define the hopper structure having a discharge opening 17. A frame 18, which borders the discharge opening 17 includes a lower stirrup portion 19 extending around the bottom and sides of the hopper 12 and an upper beam portion 20 underlies the upper floor 13 of the hopper.

The beam portion 20 is provided with hinge butts 21—21 which pivotally support door hinge straps 22 by means of pintles 23. Secured to the hinge straps 22 is a door 24 which is provided with upturned marginal flanges 25 thereby providing a pan shaped construction. The pan shaped door 24 when in closed position extends at an incline, as shown in Figure 1, to meet with the frame 18 and the flanges 25 enclose a forwardly projecting chutelike portion 26 of the frame 18, as shown in Figure 3. The door 24 when open hangs in a substantially vertical pendant position, as shown in Figure 1, and is arranged to be manually swung or slammed to closed position.

The door 24 is reinforced adjacent its swinging edge by means of an angle shaped member 27 having one flange 28 secured to the door 24 and the adjacent flange 29 outstanding from the door 24. A bracket 30, which is secured to the flange 29 as indicated at 31 in Figure 3, is provided with a shoulder 32 and a convex shaped nose portion 33 as shown in Figures 4 and 5.

Cooperating with the shoulder 32 for retaining the door 24 in closed position is a shouldered latch 34 which is rockably mounted on a shaft 35, the latter being disposed beneath the lower sloping floor 14 and extending substantially in parallelism with the hinge axis of the door 24. The shaft 35 is preferably of rectangular cross-section and adjacent each end is provided with circularly shaped hub portions 36 and 37, the former being disposed centrally of the door 24 and 25 and the latter adjacent the outer side wall 16 of the hopper 12. The shaft 35 extends through elongated slotted bearings 38 and 39, respectively, formed in brackets 40 and 41 which in turn are secured to the frame 18.

The circularly shaped hub portions 36 and 37 are each formed with pairs of toggle arms 42 spaced apart to receive toggle links 43 which are pivoted at one end to the arms 42 as indicated at 44 and at the opposite end are pivotally connected to the brackets 40 and 41 at 45. The links 43 are indented at 43', Figure 1, to straddle the hub portions 36 and 37 and allow the axes of pivots 44 and 45 to lie on a straight line 46 extending slightly to one side and beyond the axis 35' of the shaft 35 to provide an overcenter toggle locking relation when the mechanism is in latched position.

The brackets 40 and 41 include double walls 47—47 between which the links 43 are received and said walls form the supports for pivot 45. The circularly shaped hubs 36 and 37 are each provided with a cutaway portion between the pair of arms 42—42, Figure 11, to allow for direct seating contact between the adjacent flat sides of the shaft 35 and the links 43 which latter are each formed with a hook shaped end 48 having a flat seating face 49 which registers directly with the adjacent flat side of the shaft 35.

The latch 34 is provided with a rearwardly extending counterweighted end 50 which operates to bias a shouldered portion 51 of the latch 34 into engagement with the shoulder 32 of the bracket 30. The outer end of the latch 34 is provided with a beveled approach to the shoulder 51 by means of an inclined striker surface 52 which is adapted to be contacted by nose portion 33 of the bracket 30 to displace the latch 34 from its normal latching position.

The latch 34, as will be understood, is rockably mounted on the shaft 35. In order to insure the correct angular relation of the latch 34 to the door 24 in the various oper-

ating positions of the latch **34** which include the fully closed position, Figure 4, fully released position, Figure 5, and intermediate position, Figure 6, there are provided interengaging abutment faces on the latch **34** and bracket **30**, respectively, said abutment faces on the latch **34** being indicated at **53** and **54**, respectively, Figures 9 and 10, and the cooperating abutment faces on the bracket **40** are respectively indicated at **55** and **56**, Figure 7. The abutment faces **53** and **54** are the opposite faces of a lateral projection **57** which extends beneath the bearing **38** of bracket **40** and lies between walls **58** and **59** formed integrally with the bracket **40** and the inner faces of which constitute faces **55** and **56**.

A socket handle **60** is formed integrally with hub **37** whereby rotation of the shaft **35** is effected. Adjacent the handle **60** there is provided a bracket extension **61**, Figure 1, having a face **62** with which a locking cam **63** engages to maintain the mechanism in latched position.

The shaft **35** is restrained against axial displacement by means of flanged collars **64** and **65** which are rigidly mounted on the shaft **35** by means of pins or rivets as indicated at **66** and **67**.

The operation of the latching device disclosed herein is as follows:

Assuming the door **24** in latched position as shown in Figure 1, the operator first releases the latching cam **63** and thereafter by a partial rotation of the shaft **35** in a clockwise direction as viewed in Figure 1, the toggle joint is broken and the shaft **35** and latch **34** move bodily in slots **38** and **39** in unison with the door **24** in an opening direction until contact is established between abutment face **54** of the latch **34** and face **56** of the bracket **40**. Upon continued rotation of the shaft **35** in the indicated direction, the forward motion of the shaft **35** and latch **34** is continued with the latter tilting about the interengaging face **56** of the abutment to assume a release position as shown in Figure 5. Upon release of the handle **60** the counterweight **50** operates to return the latch **34** to the holding position shown in Figure 6, the latch **34** being held in such position by reason of contact between its upper surface and the edge of the frame **18** as indicated at **68** in Figure 6. The door **24** is then moved to closed position and the curved nose **33** contacts the striker surface **52** of the latch **34**, displacing the latter and allowing the shouldered portion **51** to engage the shoulder **32** of the bracket **30** and hold the door in partially closed position. Rotation of the shaft **35** in a counterclockwise direction moves it in a door closing direction and the abutment face **53** of the latch **34** contacts abutment face **55** of the bracket **40**. Upon continued rotation of the shaft **35**, the latch **34** then effects a turning movement about this abutment and the engaging shoulder **51** is urged in an upward direction against the door **24** by the greatly multiplied advantage of the toggle mechanism.

The drawing up of the latch **34** to closed position by the closure of the toggle mechanism thus makes use of the toggle feature in a twofold relation in that the shaft **35** is moved bodily and the toggle is locked in closed position simultaneously with the rocking of the latch **34** to closed position through the medium of the said toggle agency. The action of the toggle is illustrated in Figure 11 wherein it will be noted that the latch **34** during the final latching action rocks about a lever arm **64** around axis **35'** and the force applied to effect this rocking movement is through the toggle mechanism which culminates in an overcenter locking action along line **46**.

Upon completion of the rotary movement of the shaft **35** in the closing direction culminating in the closure of the toggle joint, the cam **63** is swung into engagement with the locking face **62** of the bracket **61** and the hopper **12** is again ready for service.

What is claimed as new is:

1. In a hopper structure having a discharge opening, a sloping floor for directing lading to the opening, and a door hinged adjacent the upper portion of said opening to assume a pendant open position and swingable to an inclined closed position; in combination, inner and outer brackets on the underside of said sloping floor having aligned slotted openings extending generally parallel to the movement of the swinging edge of said door, a shaft extending through said openings in said brackets, inner and outer hubs fast on the ends of said shaft and rockable and translatorily movable in said slots, aligned crank arms on said hubs, generally U-shaped links pivotally connected at one end to the crank arm on the respective hub and at the other end to the respective bracket whereby rotation of said shaft causes transverse movement thereof in said slots, said shaft in retracted position lying between the arms of said U-shaped links with the longitudinal axis of the shaft in over center position with respect to a line through the pivot axes of each link, that portion of each hub in alignment with the respective link being removed to expose a flat side of said shaft for engagement by a corresponding flat surface on each link in over center position, a latch rockably mounted on said inner hub and biased to engage said door to move it to closed position and hold it closed, means cooperating with said shaft and latch to limit the extent of rocking movement of the latter with respect to the former whereby they are cause to rock in unison during a portion of the rocking movement of said shaft, and a handle integral with said outer hub for rocking said shaft.

2. In a hopper structure having a discharge opening, a sloping floor for directing lading to the opening, and a door hinged adjacent the upper portion of said opening to assume a pendant open position and swingable to an inclined closed position; in combination, inner and outer brackets on the underside of said sloping floor having aligned slotted openings extending generally parallel to the movement of the swinging edge of said door, a shaft extending through said openings in said brackets, inner and outer hubs fast on the ends of said shaft and rockable and translatorily movable in said slots, aligned crank arms on said hubs, generally U-shaped links pivotally connected at one end to the crank arm on the respective hub and at the other end to the respective bracket whereby rotation of said shaft causes transverse movement thereof in said slots, said shaft in retracted position lying between the arms of said U-shaped links with the longitudinal axis of the shaft in over center position with respect to a line through the pivot axes of each link, that portion of each hub in alignment with the respective link being removed to expose a flat side of said shaft for engagement by a corresponding flat surface on each link in over center position, a latch rockably mounted on said inner hub and biased to engage said door to move it to closed position and hold it closed, abutments disposed on said latch and on said inner bracket including two abutments on the latter spaced lengthwise from each other in the direction of movement of said shaft in said slots to engage with the abutment on said latch therebetween at each end of said slots to hold said latch in a predetermined position at each end, and a handle integral with said outer hub for rocking said shaft.

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