Dec. 2, 1958 G. B. DOREY 2,862,460

LATCHING MECHANISM FOR HOPPER DOOR

Filed Feb. 25, 1952 6 Sheets-Sheet 1

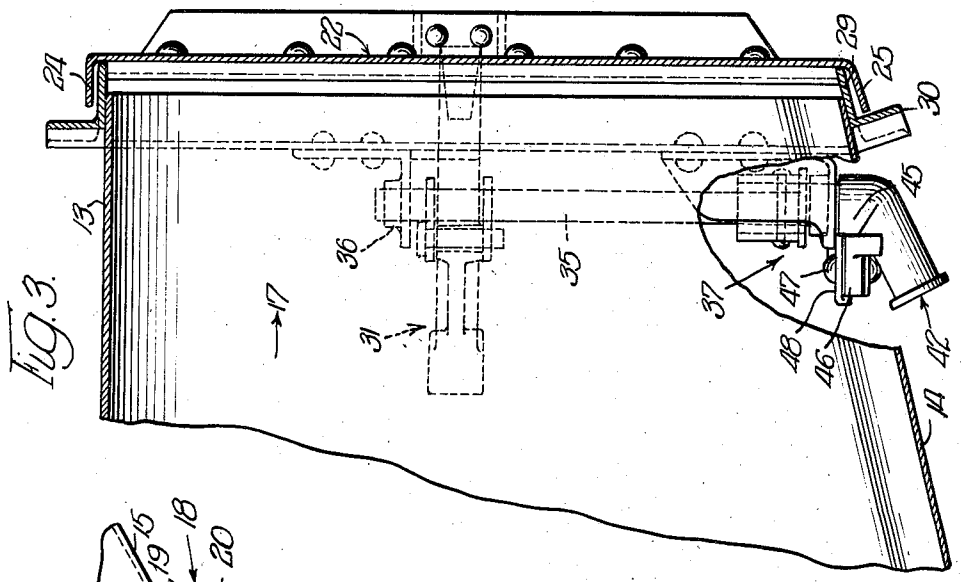


Fig. 3.

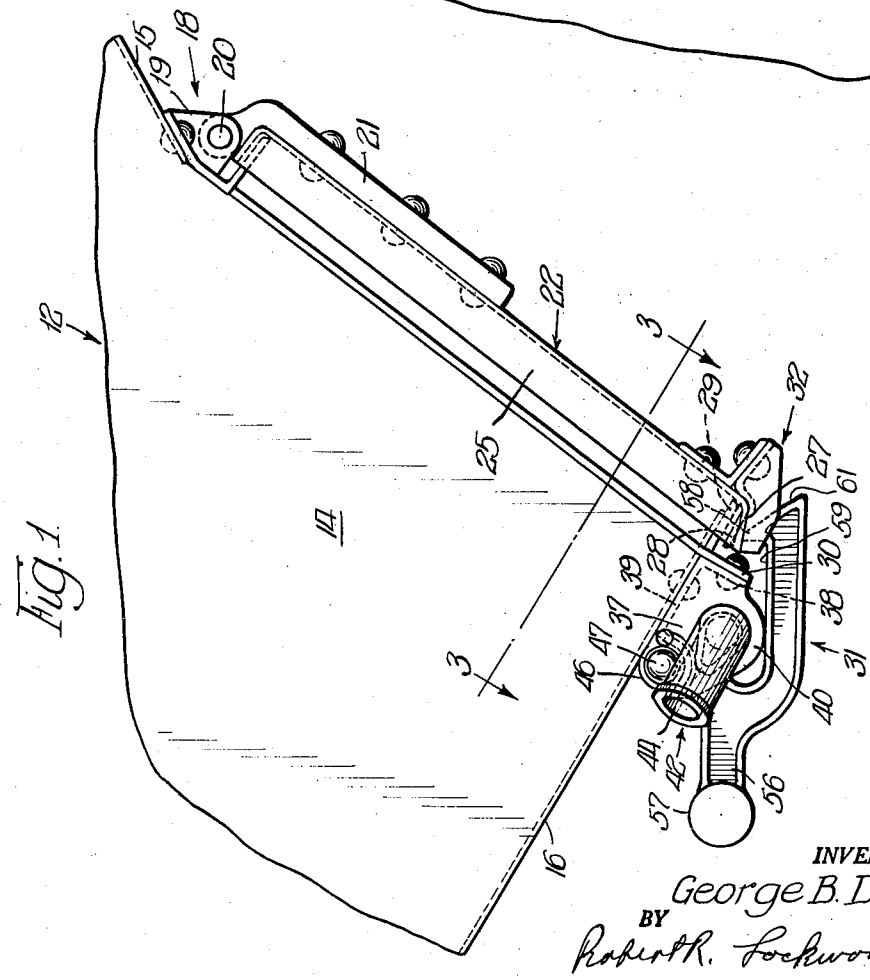


Fig. 1.

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LATCHING MECHANISM FOR HOPPER DOOR

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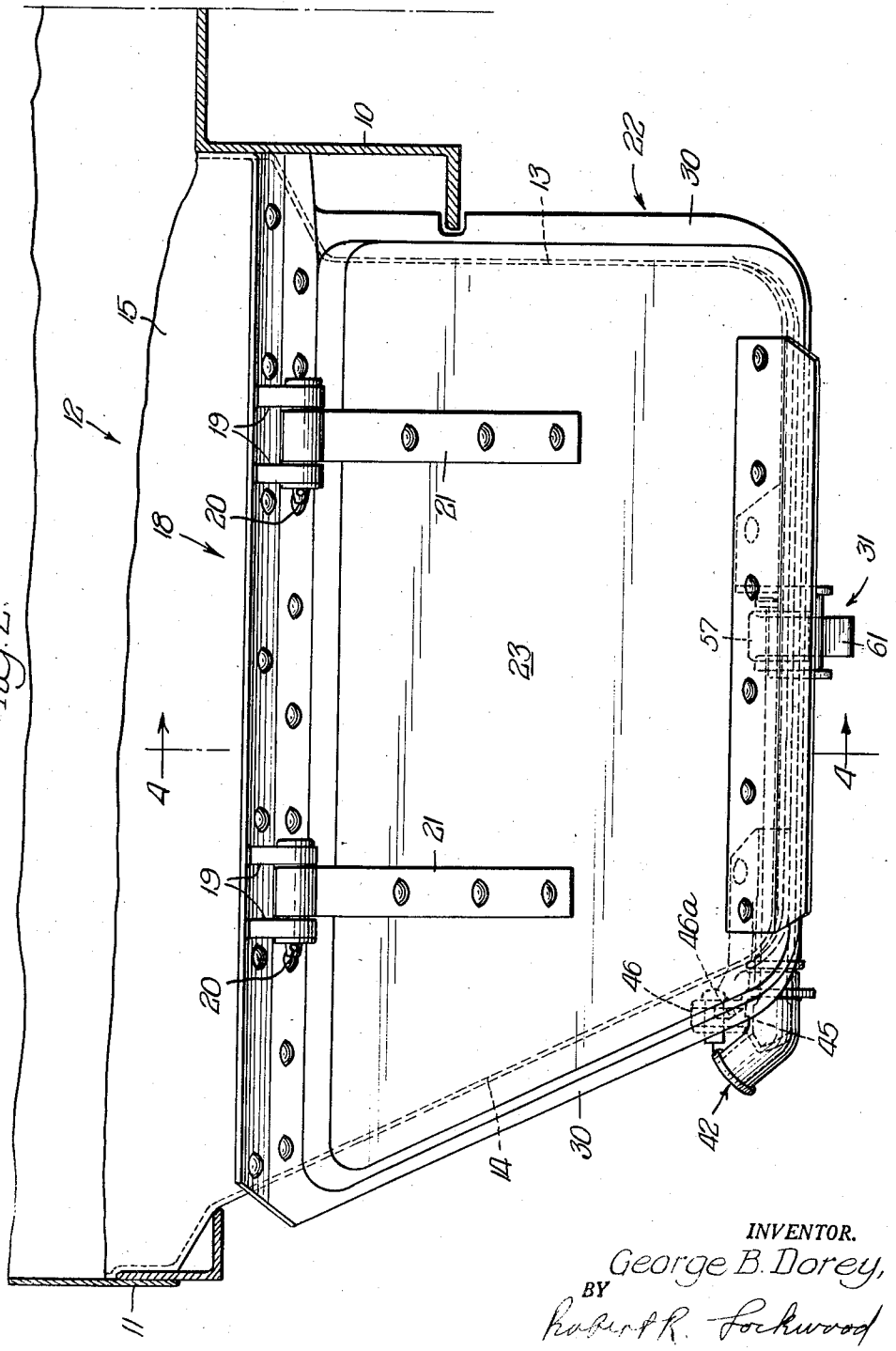


Fig. 2.

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LATCHING MECHANISM FOR HOPPER DOOR

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Fig. 5

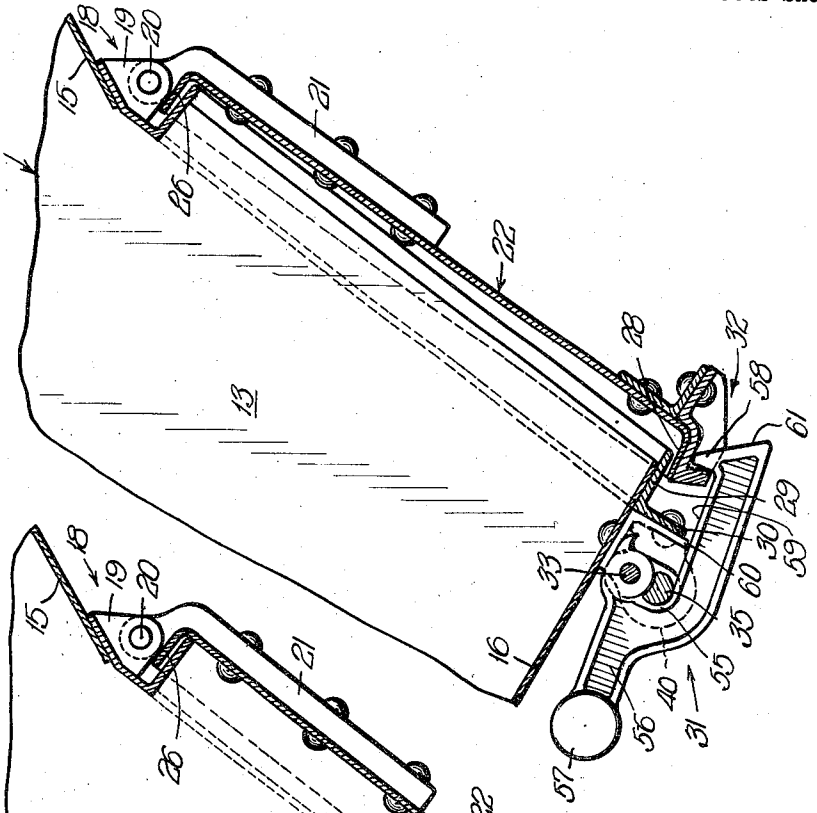
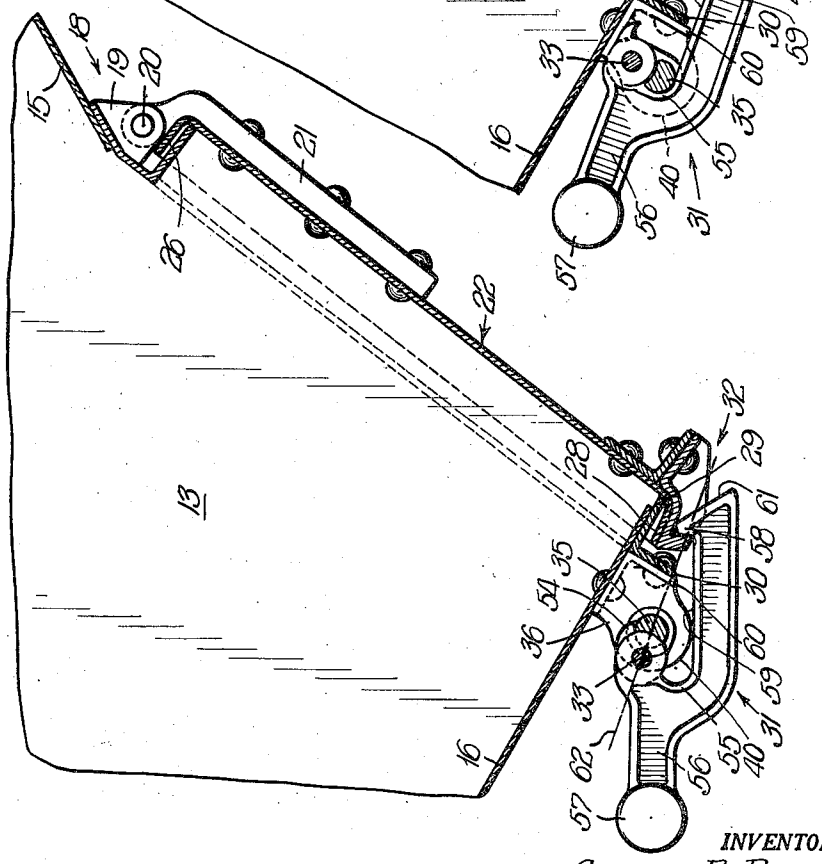


Fig. 4



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LATCHING MECHANISM FOR HOPPER DOOR

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Fig. 7

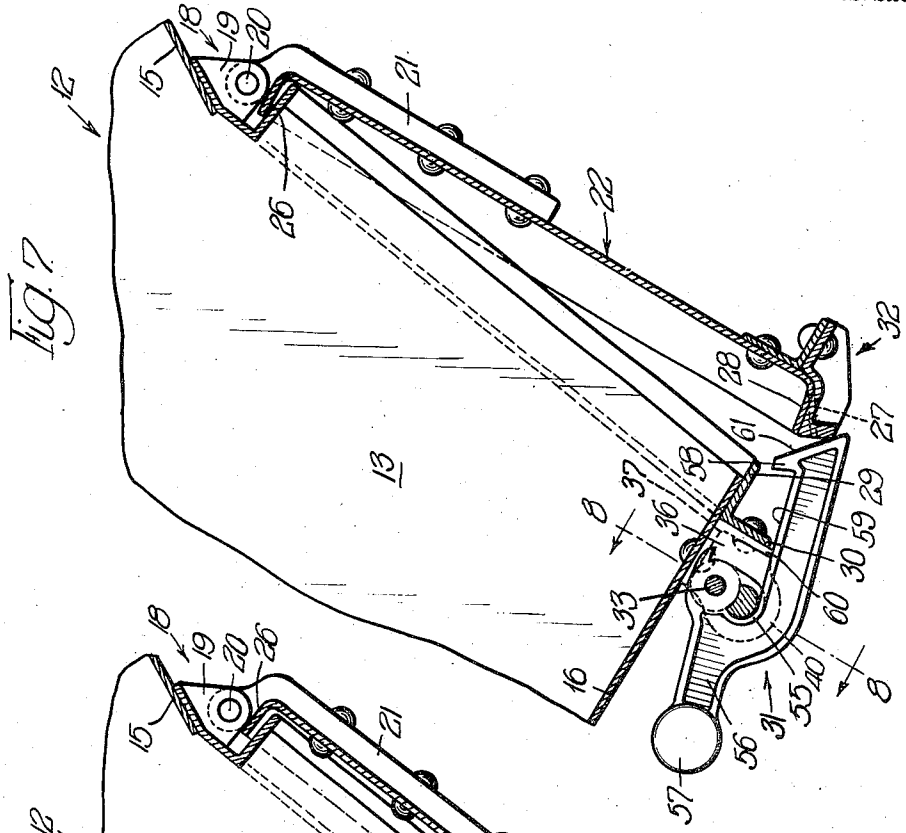
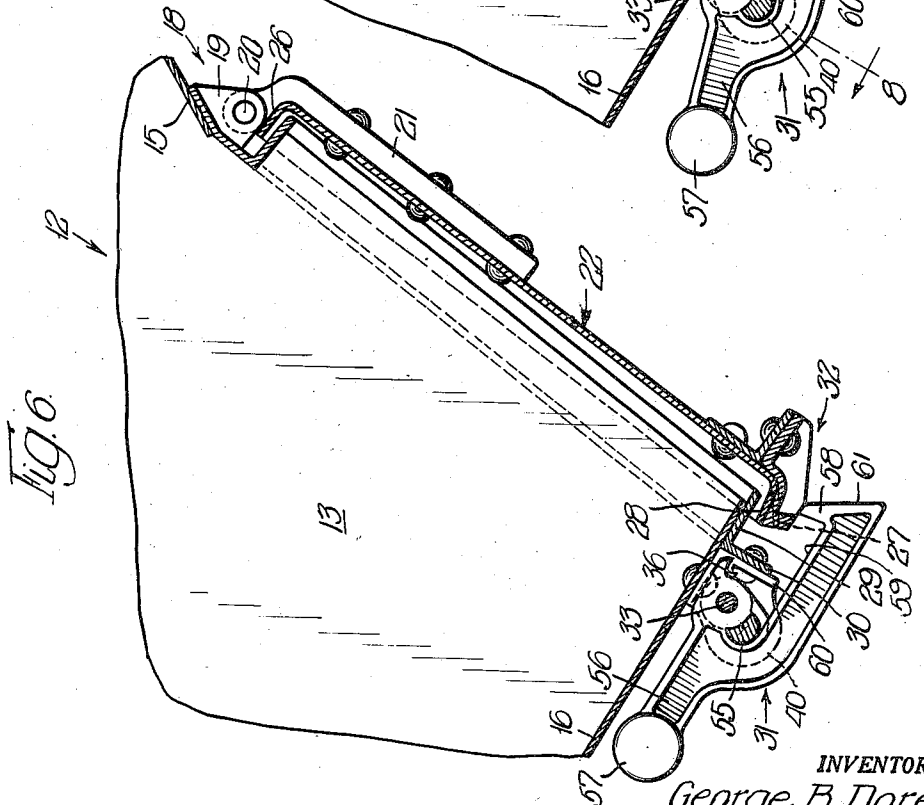


Fig. 6

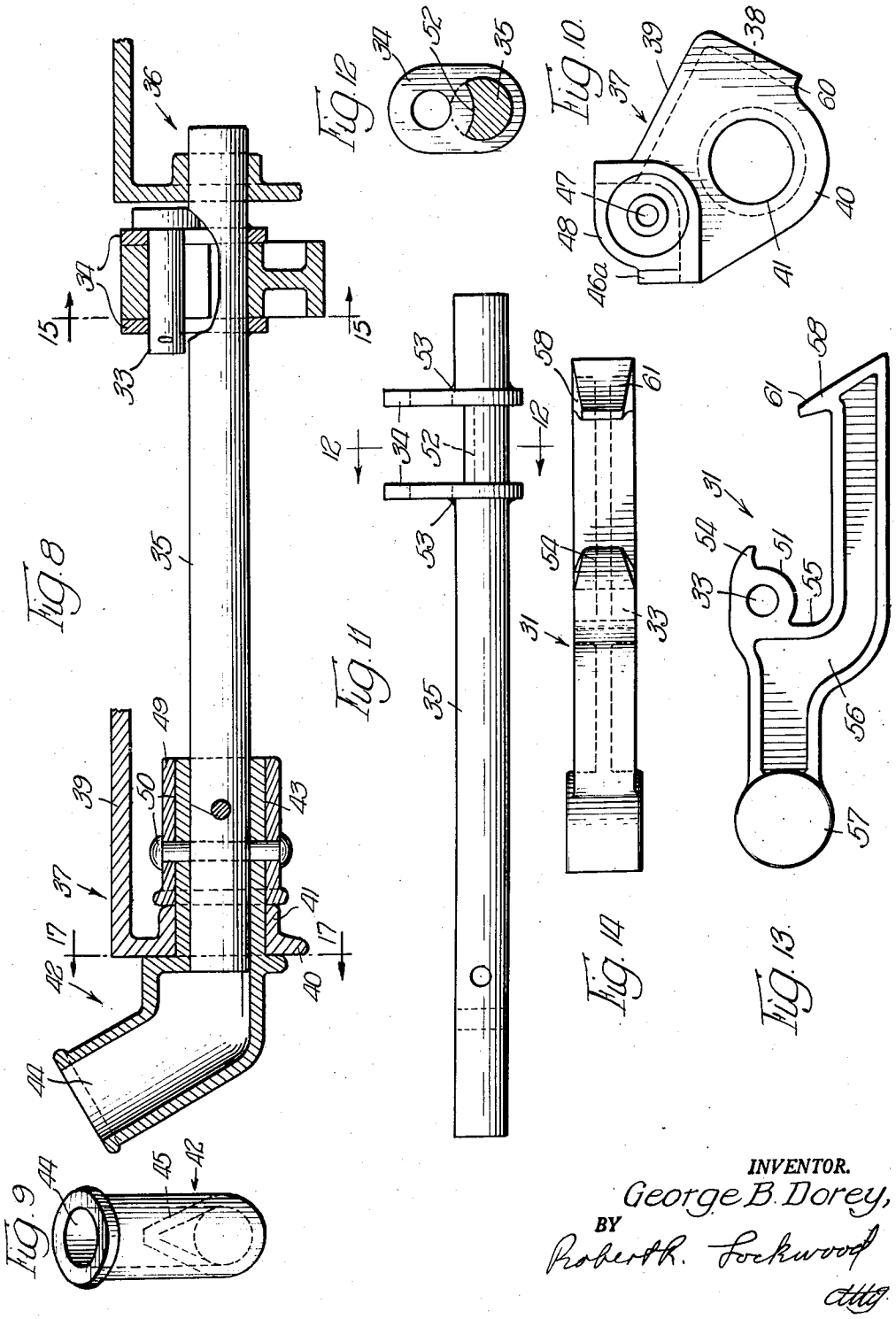


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LATCHING MECHANISM FOR HOPPER DOOR

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LATCHING MECHANISM FOR HOPPER DOOR

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Fig. 15.

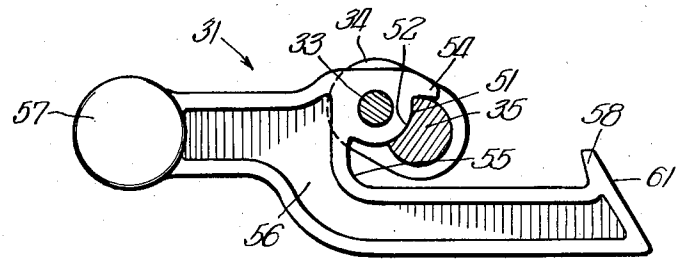


Fig. 16.

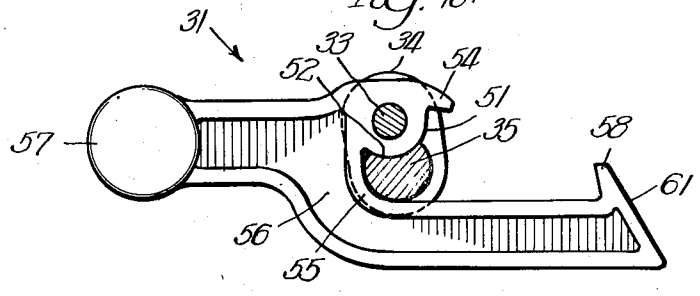
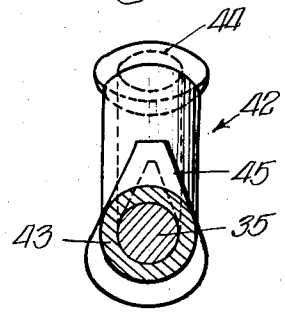


Fig. 17.



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LATCHING MECHANISM FOR HOPPER DOOR

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Application February 25, 1952, Serial No. 273,231

8 Claims. (Cl. 105—308)

This invention relates to an improved latching mechanism for a hopper door for use in connection with the retention of a hingedly mounted door in closed position and is of a type especially adapted to be used in connection with a vertically suspended pivotally mounted door such as employed in railway hopper cars and the like.

The objects of the invention, among others, are to provide a shouldered type of pivotally mounted latch which engages with the swinging edge of a vertically suspended door and provides for a limited amount of take up whereby the door is held in partially opened position and moved to fully closed position by movement of the pivotal axis of the latch hook, to provide a toggle action arm for drawing a latch hook into substantially dead center locking relation with respect to an engaging seat on a door; to provide a novel form of abutments for engagement between the latch and an operating shaft for limiting relative movement between the shaft and latch at the extremes of rotary movement of the shaft; and to provide a simplified toggle mechanism employing readily available materials for manufacturing a device of the character described.

For further comprehension of the invention reference may be had to the accompanying drawings wherein:

Figure 1 is a side elevational view of a portion of the side of a hopper car showing the improved construction applied thereto, said view showing the door in closed and locked position.

Figure 2 is a front elevational view of the structure shown in Figure 1 as viewed from right to left.

Figure 3 is a sectional plan view taken on a line corresponding substantially to line 3—3 of Figure 1 with certain parts being broken away to better illustrate the construction.

Figure 4 is a vetrical sectional view taken on a line corresponding substantially to line 4—4 of Figure 2 showing the door in closed and latched position.

Figure 5 is a view similar to Figure 4 except that the door is shown in partially opened position with the parts in position during the initial releasing movement of the door.

Figure 6 is another view similar to Figures 4 and 5 except that the latch is shown in position with the releasing rotary movement of the shaft continued to an extent sufficient to complete the releasing movement of the door.

Figure 7 is a vertical sectional view similar to Figure 4 showing latch returned to normal release position and biased to engage with the door.

Figure 8 is a sectional view taken through the toggle mechanism and showing on an enlarged scale the shaft in relation to the bearings, said view corresponding substantially to line 8—8 of Figure 7.

Figure 9 is an end elevational view of the operating handle for the toggle mechanism.

Figure 10 is an end elevational view of one of the bearings for the shaft of the toggle mechanism.

Figure 11 is a detached elevational view of the shaft.

Figure 12 is a vertical sectional view taken through the shaft substantially on line 12—12 of Figure 8.

Figure 13 is a side elevational view showing the latch hook in detached relation.

Figure 14 is a plan view of the hook shown in Figure 11.

Figure 15 is a vertical sectional view taken generally along the line 15—15 of Figure 8 and showing the closed and locked position of the latch.

Figure 16 is a view, similar to Figure 15, showing the latch in position for opening.

Figure 17 is a vertical sectional view taken generally along the line 17—17 of Figure 8 to show the arrangement of the socket and associated seat.

In the drawings wherein the invention is shown as applied in connection with the vertically suspended door of a railway hopper car, 10 indicates the center sill of the car and 11 the side wall, 12 a hopper structure including inner and outer side walls indicated at 13 and 14 respectively, the latter sloping downwardly inwardly and connecting with said inner and outer walls are upper and lower oppositely sloping floors indicated at 15 and 16 respectively, the edge portions of said respective side walls and upper and lower floors being spaced apart to define a discharge opening 17.

Surrounding the opening is a frame structure 18 having hinge butts 19—19 at the upper portion thereof and pivotally supported from said hinge butts at 20 are hinge straps 21—21 which in turn are secured to a door 22. The door 22 is generally of pan shape including a body portion 23 having upstanding side flanges 24 and 25 with upper and lower flanges 26 and 27, the latter being formed with a deformed portion 28 to accommodate the latch and cooperating bracket as will hereinafter be described. The frame 18 adjacent the side walls and bottom floor is generally of angle shape with one flange 29 overlying the bottom floor and side walls of the hopper and having the adjacent flange 30 outstanding therefrom.

For retaining the door 22 in preliminary partly closed position and drawing it to fully closed position and thereafter retaining the same in fully closed position there is provided a shouldered latching hook 31 carried by the hopper structure 12 for engagement with a bracket or keeper 32 carried by the door 22. The shouldered latching hook 31 is pivotally mounted on pivot 33 between a pair of arms 34—34 which in turn are fixedly mounted on an operating shaft 35, the latter being pivotally mounted in bearing brackets 36 and 37 as shown more clearly in Figure 8. The latch hook 31 is preferably disposed at a location centrally of the door 22 and the bearing bracket 36 is disposed adjacent thereto. The bearing bracket 37 is disposed adjacent the outer side wall 14 of the hopper structure 12 and the shaft 35 is supported in said respective bearing brackets 36 and 37. The bearing bracket 37, Figures 1, 8 and 10, is provided with a base portion including a wall 38 secured to the outstanding flange 30 of the frame and a wall 39 underlying the bottom floor sheet 16 of the hopper 12 and is secured thereto. Connecting with said walls 38 and 39 is a depending wall 40 disposed substantially at right angles to the axis of rotation of the shaft 35 and formed with a hub portion 41 in which the operating shaft is rotatably mounted.

Fixedly mounted on the outer end of the shaft 35 is an operating handle 42, Figures 8 and 9, having a hub portion 43 fitting over the shaft 35 and a hollow socket 44 extending outwardly at an angle for the accommodation of a removable operating lever. Extending between the angularly related socket portion 44 and the hub portion 43 is a seat 45. Cooperating with the seat 45 is

a latching dog **46**, Figure 3, which is pivotally mounted at **47** on a wall **48** which is offset laterally from the depending wall **40** of the bearing bracket **37**, Figure 10, a sufficient distance to permit the locking dog **46** to swing clear of the inclined side wall of the hopper **12** when it is swung to an overbalanced released position in engagement with a lug **46***a*. The seat **45** is limited in extent in order to swing past the latching dog **46** when the latter is moved to an unlocking position.

The hub portion **43** of the operating handle **42**, Figure 8, is extended axially beyond the hub portion **41** of the bearing bracket **37** and said projecting hub section **43** is encircled by a stop collar **49** which is secured in place by rivets **50** which also extend through the hub portion **43** and the shaft **35**. The shaft **35** is thus maintained in fixed axial relation to the bearing bracket **37** and is thereby maintained against longitudinal shifting.

The latching hook **31**, Figures **13** and **14**, is formed with an arcuate shaped seating surface **51** concentrically formed with respect to the axis of pivot **33** and said surface is adapted and arranged to seat in a similarly formed concave shaped seat **52**, Figure 12, formed in the shaft **35**, said concave shaped seat **52** extending lengthwise between the pair of arms **34—34** which are preferably secured to the shaft **35** by welding as indicated at **53**. The seating surface **51** of the latch **31** extends throughot an annular distance beyond the cooperating surface of seat **52** in order to provide for relative swinging movement of the latch **31** in relation to the shaft **35**. Stops are provided at **54** and **55** to limit the extent of such relative rotary movement.

In order to provide for an extensive lateral shift of the latch member **31** and operating within limited clearances a novel form of latch member is employed which consists of directing the latch member **31** rearwardly and upwardly on a generally ogee curve contour to present a hook shaped rearward extension of the latch as indicated at **56**, said extension in this embodiment of the invention forming part of a counterweight **57** for biasing the hook shaped end **58** of the latch **31** into engagement with the bracket **32** on the door **22**.

The operation of the device may be understood by following out the sequence of operations involved in opening and closing the door **22** as follows: Assuming the door **22** in closed and locked position, as shown in Figures 1, with the mechanism in toggle locked relation, as shown in Figure 4, the operator swings the latching dog **46** in an anticlockwise direction, as viewed in Figure 1, and thereafter inserts a bar in socket **44** of the handle **42** and rotates the latter in a clockwise direction. This releases the toggle lock and such rotation imparts a forward lateral bodily movement to the latch hook **31** to assume the position shown in Figure 5, whereupon the shaft **35** contacts the abutment **55** and continued rotary movement thereafter operates to rotate the latch hook **31** in unison with the shaft **35** thereby displacing the shouldered end **18** sufficiently to clear the bracket **32** of the door, Figure 6, and allow the latter to open as shown in Figure 7.

Upon release of the operating handle **42** the weighted end **56** of the latch hook **31** rotates the shaft **35** sufficiently to restore the shouldered end **58** of the latch hook **31** back to latching position as seen in Figure 7 with the upper surface **59** of the body of the latch hook **31** abutting a stop **60** on bearing bracket **37** in which position the latch hook **31** is readily displaced by impact on the inclined striker surface **61** thereof. The shaft **35** is then rotated in anticlockwise direction as viewed in Figure 1, which has the effect of drawing the door **22** to closed position. This rotation is continued until such time as abutment **54** contacts the shaft **35** whereupon the parts are locked in substantially dead center toggle relation as seen in Figure 4 where a broken line **62** through the axis of pivot **33** and through the axis of rotation of the shaft **35** intersects the juxtaposed latching surfaces of the bracket **32** and the shouldered end **58** of the hook **31**.

The toggle arrangement as provided by the improved construction is conducive to ease of operation as the final closed position of the door **22** is attained through the employment of a dead center toggle locking action providing tremendous drawing power to bring the door **22** to closed position with a comparatively small turning effort applied to the shaft **35**. The toggle arm action provides for a generous lateral shifting movement of the latch hook **31** so that preliminary engagement between it and the door **22** is effected to hold the latter in a preliminary position of closure, Figure 5, at a degree of opening sufficient to compensate for any possible warpage of the door **22**. Conversely the opening operation of the door **22** is easily effected without detracting from the positive latching action of the mechanism when in closed position.

What is claimed as new is:

1. In a railway car having a hopper with a 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 keeper mounted on said door adjacent the edge of said door furthest removed from the hinge axis of said door, a shaft rotatably mounted on the under side of said sloping floor adjacent the bottom of said discharge opening and parallel to said hinge axis, an arm extending radially from said shaft, a latch pivoted on said arm about an axis parallel to and spaced from the axis of rotation of said shaft and having a shoulder engaging said keeper and holding said door closed, the axis of rotation of said shaft being located between the pivot axis of said latch on said arm and said shoulder on said latch when said door is closed, and means for rotating said shaft.

2. In a railway car having a hopper with a 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 keeper mounted on said door adjacent the edge of said door furthest removed from the hinge axis of said door, a shaft rotatably mounted on the under side of said sloping floor adjacent the bottom of said discharge opening and parallel to said hinge axis, an arm extending radially from said shaft, a latch pivoted on said arm about an axis parallel to and spaced from the axis of rotation of said shaft and having a shoulder engaging said keeper and holding said door closed, the axis of rotation of said shaft being located between the pivot axis of said latch on said arm and said shoulder on said latch when said door is closed, a stop on said latch reacting against said shaft and limiting said latch movement in latched position when said door is closed, and means for rotating said shaft.

3. In a railway car having a hopper with a 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 keeper mounted on said door adjacent the edge of said door furthest removed from the hinge axis of said door, a shaft rotatably mounted on the under side of said sloping floor adjacent the bottom of said discharge opening and parallel to said hinge axis, an arm extending radially from said shaft, a latch pivoted on said arm about an axis parallel to and spaced from the axis of rotation of said shaft and having a shoulder engaging said keeper and holding said door closed, the axis of rotation of said shaft being located between the pivot axis of said latch on said arm and said shoulder on said latch when said door is closed, a pair of stops on said latch positioned to en-

gage different portions respectively of said shaft and spaced apart further than the diameter of said shaft and engaged by the respective portions of said shaft on rotation of said shaft to rotate said latch about the pivot axis of said latch on said arm, and means for rotating said shaft.

4. In a railway car having a hopper with a 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 keeper mounted on said door adjacent the edge of said door furthest removed from the hinge axis of said door, a shaft rotatably mounted on the under side of said sloping floor adjacent the bottom of said discharge opening and parallel to said hinge axis, an arm extending radially from said shaft, a latch pivoted on said arm about an axis parallel to and spaced from the axis of rotation of said shaft and having a shoulder engaging said keeper and holding said door closed, the axis of rotation of said shaft being located between the pivot axis of said latch on said arm and said shoulder on said latch when said door is closed, said latch extending underneath said shaft and having a cylindrical arcuate convex seating surface overly a cylindrical arcuate concave seating surface on said shaft with the center of the seating surfaces being the pivot axis of said latch on said arm, and means for rotating said shaft.

5. In a railway car having a hopper with a 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 keeper mounted on said door adjacent the edge of said door furthest removed from the hinge axis of said door, a shaft rotatably mounted on the under side of said sloping floor adjacent the bottom of said discharge opening and parallel to said hinge axis, an arm extending radially from said shaft, a latch pivoted on said arm about an axis parallel to and spaced from the axis of rotation of said shaft and having a shoulder engaging said keeper and holding said door closed, the axis of rotation of said shaft being located between the pivot axis of said latch on said arm and said shoulder on said latch when said door is closed, said latch extending underneath said shaft and having a cylindrical arcuate convex seating surface overlying a cylindrical arcuate concave seating surface on said shaft with the center of the seating surfaces being the pivot axis of said latch on said arm, the convex seating surface extending beyond the concave seating surface, a stop on said latch at each end of the convex seating surface and engaged by one side or the other side of said shaft on rotation of said shaft to rotate said latch about the pivot axis of said latch on said arm, and means for rotating said shaft.

6. In a railway car having a hopper with a 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 keeper mounted on said door adjacent the edge of said door furthest removed from the hinge axis of said door, a shaft rotatably mounted on the under side of said sloping floor adjacent the bottom of said discharge opening and parallel to said hinge axis, a pair of arms extending radially from said shaft, a latch between and pivoted to said arms about an axis parallel to and spaced from the axis of rotation of said shaft, said latch

being pivoted intermediate the ends of said latch and one end extending underneath said shaft and having a shoulder engaging said keeper and holding said door closed, the axis of rotation of said shaft being located between the pivot axis of said latch on said arms and said shoulder on said latch when said door is closed, the other end of said latch carrying a counterweight, and means for rotating said shaft.

7. In a railway car having a hopper with a 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 keeper mounted on said door adjacent the edge of said door furthest removed from the hinge axis of said door, a shaft rotatably mounted on the under side of said sloping floor adjacent the bottom of said discharge opening and parallel to said hinge axis, a pair of arms extending radially from said shaft, a latch between and pivoted to said arms about an axis parallel to and spaced from the axis of rotation of said shaft, said latch being pivoted intermediate the ends of said latch and one end extending underneath said shaft and having a shoulder engaging said keeper and holding said door closed, the axis of rotation of said shaft being located between the pivot axis of said latch on said arms and said shoulder on said latch when said door is closed, the other end of said latch carrying a counterweight, said latch having a cylindrical arcuate convex seating surface overlying a cylindrical arcuate concave seating surface on said shaft with the center of the seating surfaces being the pivot avis of said latch on arms, and means for rotating said shaft.

8. In a railway car having a hopper with a 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 keeper mounted on said door adjacent the edge of said door furthest removed from the hinge axis of said door, a shaft rotatably mounted on the under side of said sloping floor adjacent the bottom of said discharge opening and parallel to said hinge axis, a pair of arms extending radially from said shaft, a latch between and pivoted to said arms about an axis parallel to and spaced from the axis of rotation of said shaft, said latch being pivoted intermediate the ends of said latch and one end extending underneath said shaft and having a shoulder engaging said keeper and holding said door closed, the axis of rotation of said shaft being located between the pivot axis of said latch on said arms and said shoulder on said latch when said door is closed, the other end of said latch carrying a counterweight, said latch having a cylindrical arcuate convex seating surface overlying a cylindrical arcuate concave seating surface on said shaft with the center of the seating surfaces being the pivot axis of said latch on said arms, the convex seating surface extending beyond the concave seating surface, a stop on said latch at each end of the convex seating surface and engaged by one side or the other side of said shaft on rotation of said shaft to rotate said latch about the pivot axis of said latch on said arms, and means for rotating said shaft.

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