Dec. 13, 1966 G. B. DOREY 3,291,071

MULTIPLE CLOSURE TOGGLE ACTUATED HOPPER OUTLET ASSEMBLY

Filed Nov. 23, 1962 4 Sheets-Sheet 1

FIG. 1.

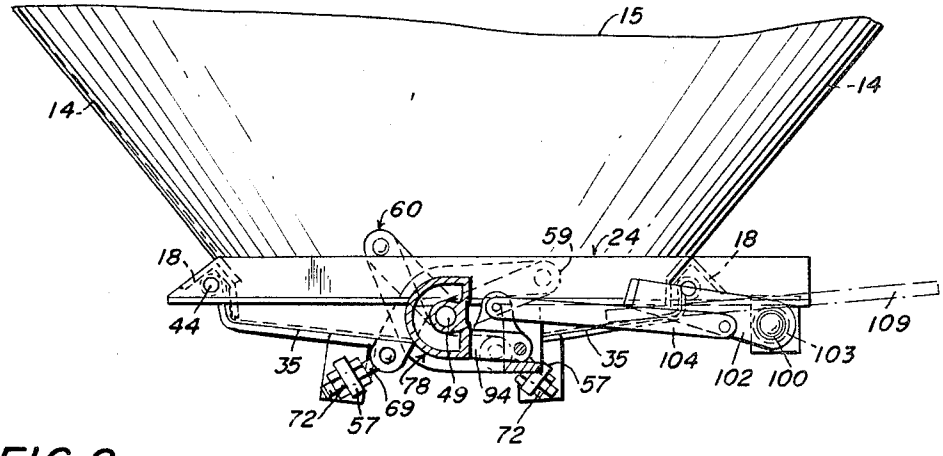
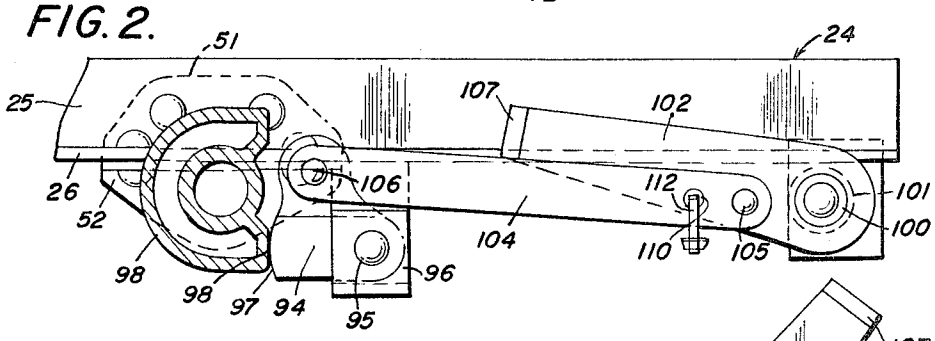


FIG. 2.



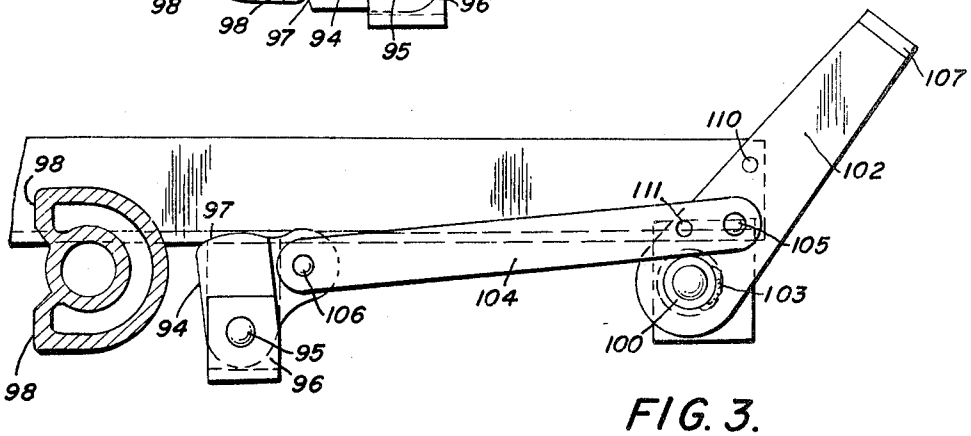


FIG. 3.

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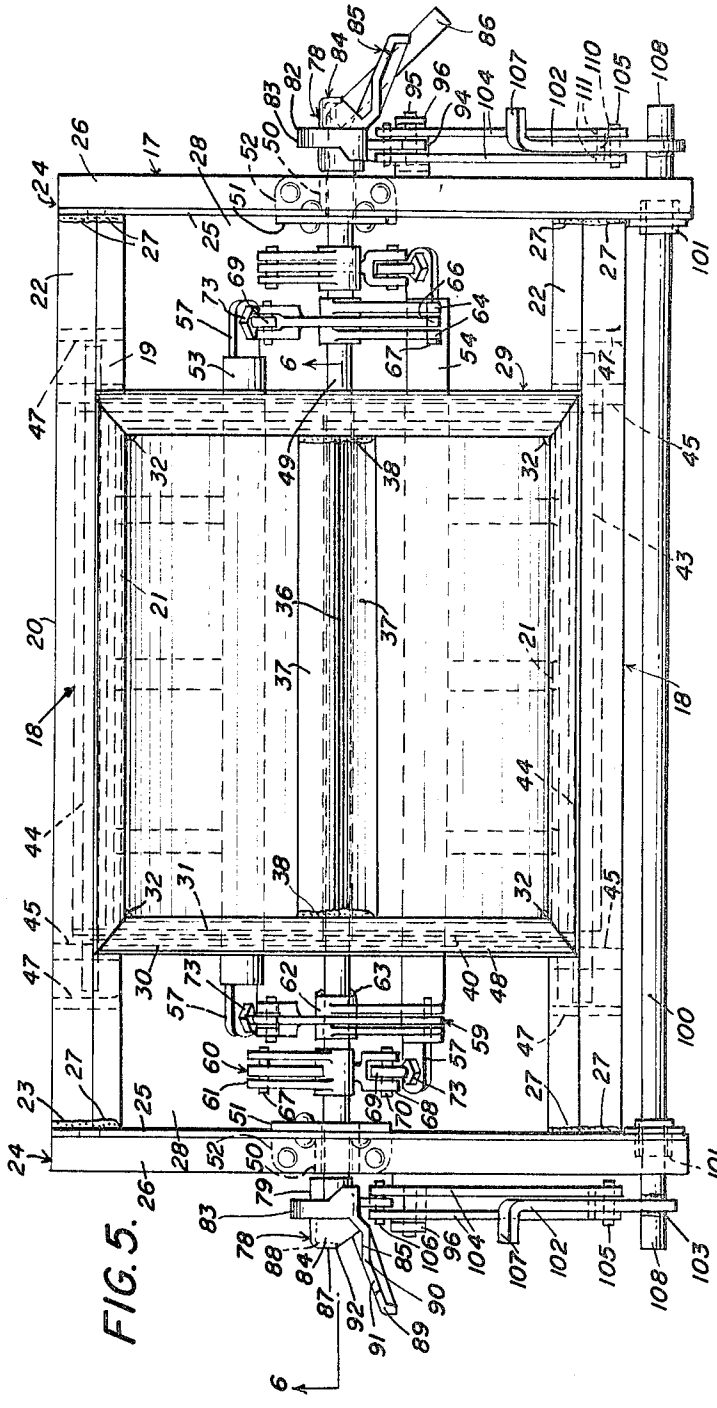


FIG. 5.

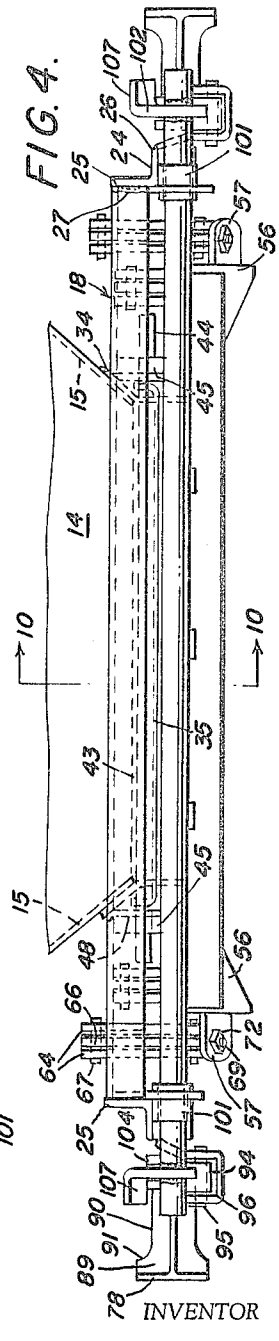


FIG. 4.

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MULTIPLE CLOSURE TOGGLE ACTUATED HOPPER OUTLET ASSEMBLY

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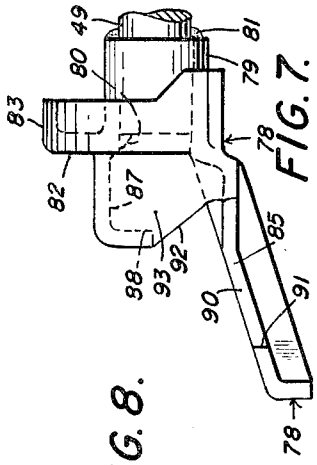


FIG. 7.

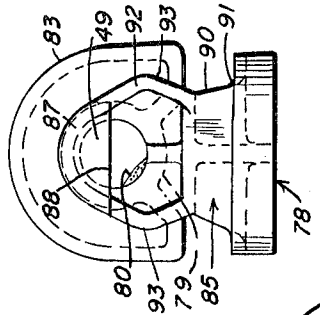


FIG. 8.

FIG. 6.

FIG. 9.

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MULTIPLE CLOSURE TOGGLE ACTUATED HOPPER OUTLET ASSEMBLY

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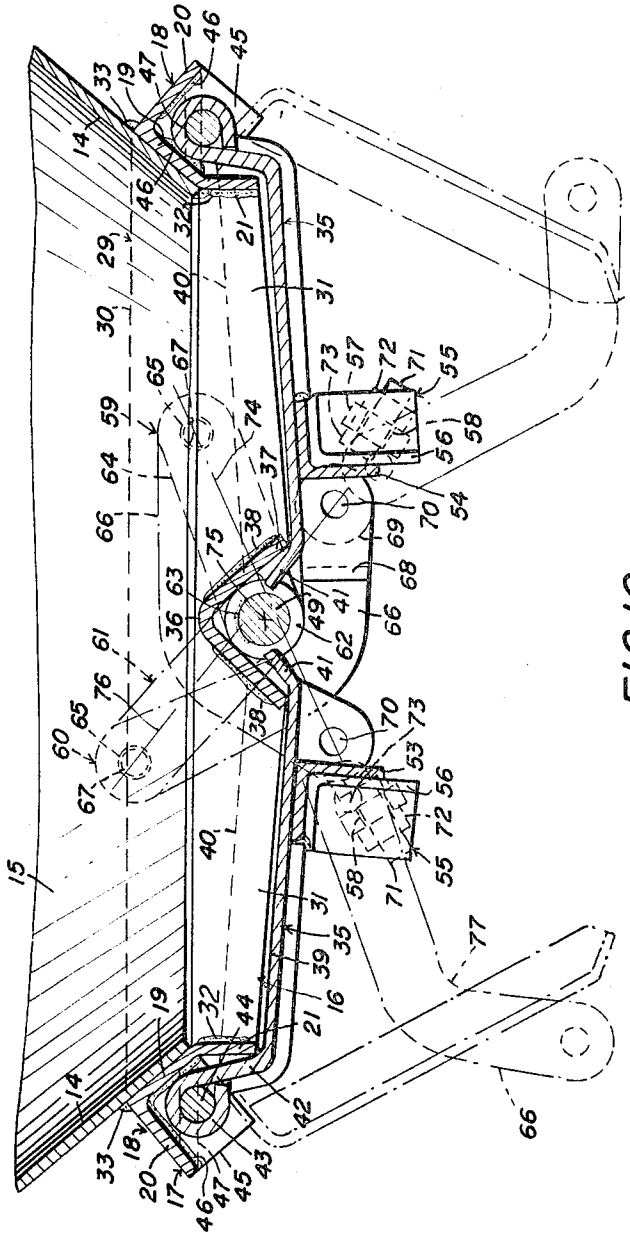


FIG. 10.

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MULTIPLE CLOSURE TOGGLE ACTUATED HOPPER OUTLET ASSEMBLY

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Filed Nov. 23, 1962, Ser. No. 239,692
7 Claims. (Cl. 105—253)

The invention relates to an improved Load Discharing Hopper Car of the type generally employed in railway operations and is of special importance in connection with a car having openings for discharge of lading centrally between the rails.

The disposition of hoppers for discharging centrally between the rails, especially when associated with closures operable by transversely extending shafts, renders operation of the closures inconvenient and even hazardous unless the operating shafts are extended well beyond the hoppers towards the car sides. Sufficient lengthwise extension of the shafts in this manner to provide the necessary convenience and safety of operation renders the long overhanging shaft portions vulnerable to bending and distortion.

This invention proposes a solution to this problem by means of a frame structure embodying outrigger frame members for directly supporting the shaft adjacent its operating locations and thus eliminating objectionable shaft overhang.

Objects of this invention among others are to provide a closure assembly incorporating framing members, closures and door operating mechanisms assembled in a single package applicable to the car as a self-contained unit; to provide a frame work structure surrounding a hopper and having outrigger frame members for rotatably supporting an operating shaft; to provide mechanisms for the complete operation of closing and sealing as well as opening and rupturing of the sealing ribbon of hopper closures from any one side of the car; to provide an improved safety operating head for operating quick discharge closures and to provide locking dogs on opposite sides of the car with toggle locking linkage mechanisms operable from either side of the car.

The invention further relates to the arrangement of the operating shaft and its associated linkage in relation to other parts of the car structure and in the novel frame structure for supporting the hopper closures and mechanisms therefor.

The invention further resides in details of construction and arrangement of parts such as shown in the drawings or described in the specification.

For further comprehension of the invention reference may be had to the accompanying drawings wherein an embodiment of the invention is shown as applied to a hopper of a railway car, said darwings showing only enough of the car structure as to show the application to one hopper, it being understood that a plurality of such hoppers is usually incorporated in a railway car of standard construction.

Referring now to the drawings, FIGURE 1 is a partial side elevational view of the lower portion of a hopper showing only as much of the hopper as necessary to show the application of the invention to one hopper, said view showing the outer portion of the operating head as well as the outer wall of the dog supporting bracket broken away to better illustrate the parts.

FIGURE 2 is a fractional side elevational view on an enlarged scale of the shaft locking and sealing mechanism as viewed with the parts in locked position and the sealing ribbon applied.

FIGURE 3 is a view similar to FIGURE 2 except that the locking dog and its associated linkage and operating mechanism is shown in overbalanced released position.

FIGURE 4 is a vertical elevational view of the structure shown in FIGURE 1 as viewed from right to left.

FIGURE 5 is a plan view of FIGURE 4 with the hopper walls eliminated to better illustrate the construction.

FIGURE 6 is a vertical sectional view taken transversely of the car and showing slightly more than one half of the width of the lower portion of the car embodying the invention, said view being taken on a line corresponding substantially to line 6—6 of FIGURE 5.

FIGURE 7 is a detached frontal elevational view on an enlarged scale of the operating head.

FIGURE 8 is a side elevational view of the operating head shown in FIGURE 7 as viewed from left to right.

FIGURE 9 is an elevational view of the operating head illustrating the relative position of the head and its operating bar as the shaft overruns the bar.

FIGURE 10 is a transverse vertical sectional view on an enlarged scale, as taken on a line 10—10 of FIGURE 4, showing by full lines the swinging doors in closed position and indicating by conventional dot and dash lines the same doors in open position.

Referring now to the drawings, the relation of the hopper to the rails and to the side of the car is well seen in FIGURE 6 where one of the rails is indicated at 10, one of the wheels of the car indicated by conventional dot and dash lines at 11, a side wall of the car at 12, a side sill 12*a*, and one of the hoppers at 13.

The hopper 13 is formed by oppositely sloping transverse walls 14—14 meeting with longitudinal oppositely sloping walls 15—15 to form an inverted four-sided truncate-like structure.

The sloping walls lead to an opening 16 which is located to discharge lading centrally between the rails. The discharge opening 16 is surrounded by a framing structure 17 which is preferably composed of transversely extending frame members 18—18, preferably of angle shape, with one wall 19 overlying the longitudinally sloping hopper walls 14—14 and having the adjacent wall 20 extending at a normal to the sloping wall 14. The walls 19 throughout the distance of the discharge opening are bent to present a substantially vertically downwardly extending wall section 21.

The said framing members 18—18 are extended well beyond the hopper opening to present cantilever extensions 22 of appreciable length lying beyond the hopper openings.

Connecting the distal ends 23—23 of the extensions 22 are beam members 24 which are preferably of angle shape with one wall 25 vertically disposed and the adjacent wall 26 extending laterally outwardly. The said members 24—24 are welded to the members 18—18 as indicated at 27 (FIG. 5) and function as outrigger frame members for supporting co-operation with an operating shaft and closure operating mechanisms as will be described. The space intermediate the hopper walls and the outwardly spaced outrigger frame members provide wells 28 for the accommodation of door connecting linkages.

The pair of framing members 18—18 are further united together by longitudinally extending members 29—29 which each include a sloping wall 30 overlying the lower portion of sloping hopper wall 15 and depending from said sloping wall 30 is a vertically disposed wall section 31.

The said depending wall sections 21 and 31 thus provide a four-sided opening having substantially vertical walls on all sides. The said longitudinal members 29—29 are welded to transverse frame 18—18 at 32 (FIG. 5).

The frame as composed of transverse members **18** and longitudinal members **24** and **29** thus forms a well integrated frame structure.

The frame structure is further strengthened against and maintained against racking by reason of the fact that the overlying walls of transverse members **18** and longitudinal members **29** are welded to the underside of the hopper walls as indicated at **33** and **34** respectively.

Positioned to close the discharge area defined by walls **21** and **31** are oppositely swinging doors **35—35** and a transversely extending ridge member **36** disposed midway of the opening area. The ridge member **36** is of generally inverted V shape presenting oppositely downwardly sloping walls **37—37** which overlie the swinging edges of the doors when in closed position.

The said ridge member extends between the depending wall sections **31** and is welded thereto at **38**. Each door includes a flat plate body member **39** having upwardly extending side walls **40—40** and front and rear upwardly extending walls **41** and **42**, the latter merging into a hollow tubular formation **43**. The said tubular formation **43** is adapted to be positioned in the angle formed by angularly related walls **19** and **20** of framing member **18** and is hingedly retained by a continuously extending rod **44** which is inserted therethrough and held at each end in bearing plates **45**. The plates **45** are fitted edgewise in the angle presented by walls **19** and **20** of member **18** and welded thereto as shown at **46**. The said rods **44** are maintained against axial displacement by means of stops **47** welded to the respective walls **19** and **20**.

The doors when in closed position enclose the longitudinal depending side walls **31** and the transversely extending walls **21** and **37** thus providing leak proof seals completely around the discharge opening. Outwardly of the side walls **31** are shield plates **48** which effectively guard the lading against adverse weather conditions.

The operation of the doors is effected through the medium of a transversely extending rotatable shaft **49** journalled in bearings **50** carried by the outrigger frame members **24**. The bearings **50** are located midway of the members **24** which allows the shaft to extend beneath the centrally located ridge **36**. The said bearings **50** preferably include vertical and horizontal walls **51** and **52** for attachment to the respective walls **25** and **26** of the frame members **24**.

The respective doors are reinforced on the underside by angle shaped members as indicated at **53** and **54** respectively and said members are fitted at each end with end brackets **55** each having a body portion **56** received in the angle presented by the angled walls of the reinforcements. Lugs **57** extending lengthwise from the body portion **56** are apertured at **58** for connection with door mechanisms.

Disposed to extend within the wells **28** between the hopper walls and outrigger frame members are door linkage connections **59** and **60**. The said linkage connections **59** and **60** are of similar construction except that linkage **59** approaches its final locking position from an overhead direction, whereas linkage **60** approaches its locking position from an underhead direction. For each hopper there are two overhead linkages **59** and two underhead ones **60** but inasmuch as the construction of the individual linkage assemblies is similar the description herein will be confined to only one of such linkage assemblies. Each linkage assembly includes a radially extending arm **61** having a hub **62** encircling the shaft **49** and fastened therto by welding as indicated at **63**. The arm **61** includes a pair of walls **64—64** spaced apart and apertured at **65** (FIG. 10). A link member **66** is sandwiched between the walls **64—64** and pivotally united therewith by a pivot **67** extending through the aperture **65** (FIGS. 4 and 5). The opposite end of the link member **66** is forked to present spaced walls

68—68 which straddle an eyebolt **69** and is pivotally connected therewith by a pivot **70**. The eyebolt **69** includes a screwthreaded bolt portion **71** which extends through aperture **58** of the lug **57**. The screwthreaded portion **71** is fitted with a complementary screwthreaded nut **72** whereby adjustment may be effected to obtain tightly closed doors. A locknut **73** is applied to the bolt on the opposite face of the lug **57**.

As will be observed by reference to FIGURE 10, the linkage connections when in closed position assume an overcenter toggle locked position with the direction of pull for the overhead linkage **59** extending along a line **74** lying below the axis **75** of the shaft **49** whereas this direction of pull for underhead linkage **60** extends above the axis **75** of the shaft on a line **76**. The link members are concaved at **77** to permit the overcenter locking action described.

Rotation of the shaft **49** is effected from either side of the car and to this end an operating head **78** is non-rotatably mounted on each end of the shaft outwardly of the outrigger frame members. The operating head includes a hub portion **79** encircling the shaft and welded thereto at **80** and **81** and outwardly of said hub there is a cam-like body portion **82** having a rim face **83** specially contoured for co-operation with locking means as will be hereinafter described.

Outwardly of the body portion **82** the head is provided with spaced bar gripping means **84** and **85** for holding a removable operating bar **86** therebetween. The gripping means **84** is in the form of an opensided pocket **87** axially aligned with the shaft **49** and having a partially closed outer end **88** for retaining the end of the bar against unwarranted slippage.

The companion gripping means **85** includes a laterally outwardly extending wall **89** spaced lengthwise from the pocket **87**. The side edges **90** of the wall **89** constitute bearing seats for the operating bar **86**. The seating edges **90** flare outwardly towards the outer end of the wall to form stops **91** for preventing outward slippage of the operating bar.

The gripping means **84** and **85** are so disposed as to release the operating bar **86** upon overrunning of the shaft as the doors suddenly drop. The release of the bar **86** is effected in part by an outward sidewise movement imparted thereto by inclined edge surfaces **92** of the walls **93** leading to the pocket **87**. The inclined walls **93** merge into the gripping wall **89** and the latter extends from said merging location at an acute angle to the shaft thereby adequately spacing the gripping locations to provide a secure hold on the operating bar. The shaft is locked against reverse rotation by locking dogs **94** disposed on opposite sides of the car in alignment with the rim face **83** of the operating heads. Each locking dog **94** is pivotally mounted at **95** on a bracket **96** and is formed with an arcuately shaped locking face **97** adapted to register with an abutment wall **98** of the rim face **83** of the head. The locking dogs are swingable to an overbalanced released position out of the path of the abutment wall **98** and in order to guard against accidental return of the dogs to locking position, unless the doors are fully closed, the rim face **83** of each head includes an arcuately shaped section **99** concentrically related to the axis **75** of the shaft **49** and adapted to bar return of the dogs as seen in FIGURE 3.

Co-ordinated movement of the locking dogs on opposite sides of the car is effected through the agency of a transversely disposed locking shaft **100** rotatably mounted in bearings **101** which in turn are mounted on the outrigger beams **24**. Lever arms **102** which are non-rotatably secured to the shaft **100** by welding as at **103** are aligned with the respective dogs **94** and connected therewith by pairs of elongated links **104—104** through the medium of pivots **105** and **106**. The lever arms **102** are provided with outwardly laterally extending handle portions **107** and the shaft **100** is likewise provided with outwardly

laterally extending hub portions **108** aligned with said handle portions thereby permitting insertion of a removable bar **109** therebetween for prolongation of leverage.

The lever arms **102** and links **104** operate as a jackknife mechanism moving to closed position in toggle-locked relation as seen in FIGURE 2. The handle **107** limits over center knuckling movement of the parts by resting on the center of the links **104**. Similarly the opening movement of the links **104** and levers **102** is limited by contact between the links and the shaft **100** as seen in FIGURE 3. The lever arms **102** and links **104** are provided with apertures **110** and **111** respectively which are arranged to lie in registering alignment when the parts are in full locking arrangement for the accommodation of a sealing ribbon **112** as seen in FIGURE 2. It is to be noted that the sealing ribbon may be applied on either side of the car and rupturing effected from either side.

Assuming the doors in closed position and the seal in position as seen in FIGURE 2, the unloading operation is effected by swinging the lever arms **102** to position as seen in FIGURE 3 thereby rupturing the sealing ribbon **112**. Thereafter the removable bar is positioned as indicated by full lnes in FIGURE 9 and sufficient upward movement imparted to the bar to release the mechanism whereupon the doors open and the operating head overruns the bar as indicated by conventional dot and dash lines displacing the bar sidewise outwardly and at the same time the gripping wall **89** swings beyond the end of the bar thereby assuring complete disengagement of the latter.

What is claimed as new is:

1. In combination, a railway hopper car having side and end walls and a centrally disposed hopper including an opening for downward discharge of lading centrally between the rails comprising:

(a) transversely extending frame members adjacent opposite sides of the opening,

(b) oppositely swinging doors for the opening pivotally mounted on said transverse members,

(c) said transverse frame members having projecting portions extending appreciably beyond the hopper toward the sides of the car,

(d) beam members extending between and connecting the distal ends of the projecting members to provide an open well between each beam and the facing hopper wall,

(e) bearings disposed midway of the beam members and carried thereby,

(f) a shaft journalled in said bearings to extend transversely of the car between the swinging edges of the doors and

(g) linkage mechanisms extending between the shaft and the ends of the doors and being disposed in the open wells.

2. The invention set forth in claim **1** wherein the shafts are extended outwardly of the bearins and are there provided with operating heads arranged to releasably hold a removable bar at an acute angle to the shaft.

3. In a railway car having a hopper and an opening for the downward discharge of lading and a pivotally mounted door for the opening, in combination,

(a) an operating shaft,

(b) winding linkage mechanism connecting the shaft and door for lifting the latter from open to closed position by rotation of the shaft and holding the door in closed position;

(c) said shaft upon initial rotation in an unwinding direction effecting release of the door and allowing said door to drop to the open position,

(d) said dropping door effecting unwinding of the linkage and causing rotation of the shaft,

(e) means on the shaft for releasably accommodating a removable operating bar including:

(f) an operating head having

(g) spaced gripping seats for seating the bar therebetween,

(h) one of said seats comprising a pocket axially aligned with the shaft for holding an end of the bar and

(i) the other of said seats including a wall extending outwardly laterally beyond the shaft at an acute angle to the axis of the shaft and having the edges of said wall forming seats for the bar,

(j) said wall upon overrunning movement of the shaft under the influence of the dropping door being adapted to circle beyond the pocketed end of the bar during opening of the door and releasably displace the latter by imparting an outward sidewise movement thereto.

4. As an article of manufacture, a discharge outlet and doors therefor with door operating mechanism assembled in a self contained package for application as a unit to the downwardly inwardly converging walls of a four sided hopper of a railway car of the type adapted for discharge centrally between the rails with operation of the doors available from either side of the car, said assembly including:

(a) a frame structure for bordering the hopper formed in part by

(b) transversely and longitudinally extending frame members disposed to overlie the hopper sloping walls and arranged for attachment thereto,

(c) said transverse members being extended beyond the overlying longitudinal members to present overhanging extensions,

(d) outwardly spaced beams extending longitudinally between and connecting the distal ends of the overhanging portions of the transverse beams,

(e) oppositely swinging doors hinged to the transverse overlying frame members,

(f) bearings carried by the outwardly spaced longitudinal beam members at a midway location thereof,

(g) a rotatable shaft journalled in the bearings and extending transversely through the hopper above the meeting edges of the swinging doors when closed,

(h) an inverted V shaped ridge extending transversely between the longitudinal overlying members and secured thereto,

(i) said ridge being disposed above the shaft and above the swinging edges of the doors when in closed position,

(j) self locking linkage mechanisms connecting the shaft and the ends of the doors and disposed between the hopper and the outwardly spaced longitudinal beams,

(k) means on opposite ends of the shaft and disposed outwardly of the bearings for rotating the shaft and thus actuating the doors from either side of the assembly,

(l) a radially extending lug on each of said rotating means,

(m) a pivotally mounted locking dog at each side of the assembly and aligned with said lugs for engagement therewith for preventing rotation of the shaft,

(n) means for moving the respective dogs in unison from either side of the assembly including:

(o) a rotatable locking shaft juxtaposed to the operating shaft,

(p) radially extending lever arms fast on the locking shaft in alignment with each dog and

(q) linkage pivotally connected to the lever arms and to the dogs for moving the latter by rotation of the locking shaft.

5. The invention set forth in claim **4** wherein the radial arms include an outwardly laterally extending handle

adapted to rest on the linkages to thereby limit overcenter knuckling movement of the arms and linkages.

6. The invention set forth in claim 5 wherein the locking dogs are swung to released position by opening the angle between the linkages and arms and limiting such opening movement by contact between the linkages and the locking shaft.

7. The invention set forth in claim 6 wherein the locking shaft is provided with hub portions disposed outwardly of the arms and in alignment with the handles of the radial arms whereby a removable operating bar may be positioned between the handle and hub portion for prolongation of operating leverage.

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