May 12, 1970 W. M. DANIELSON 3,511,188

HOPPER OUTLET ASSEMBLY

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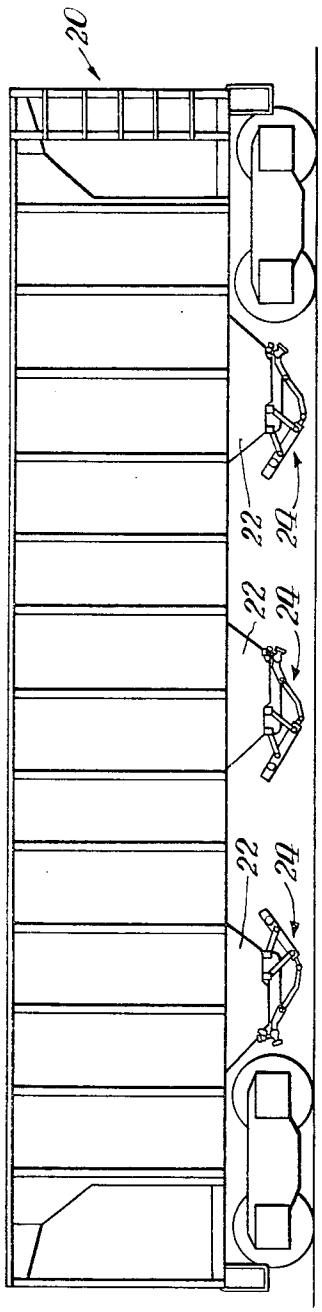


Fig. 1.

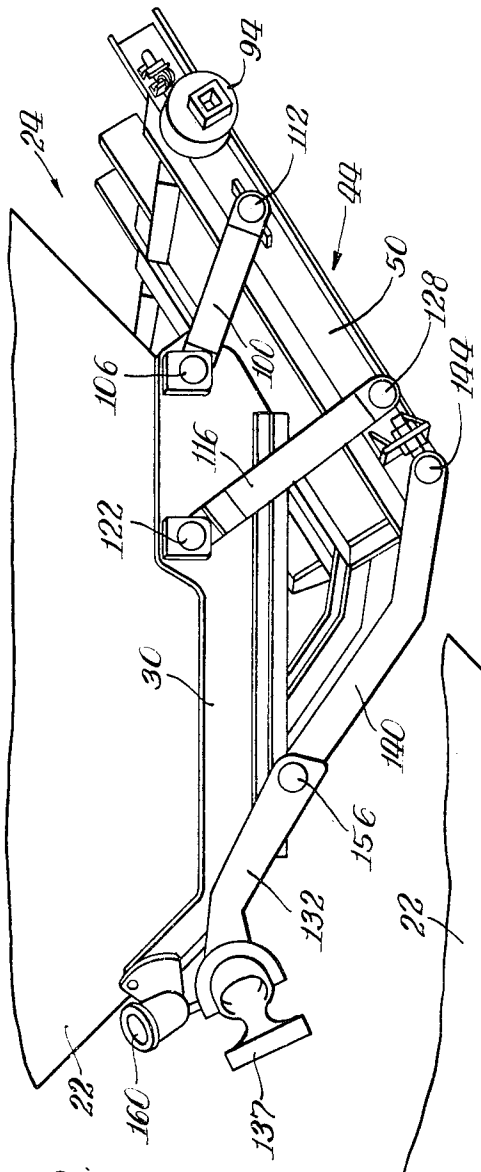


Fig. 2.

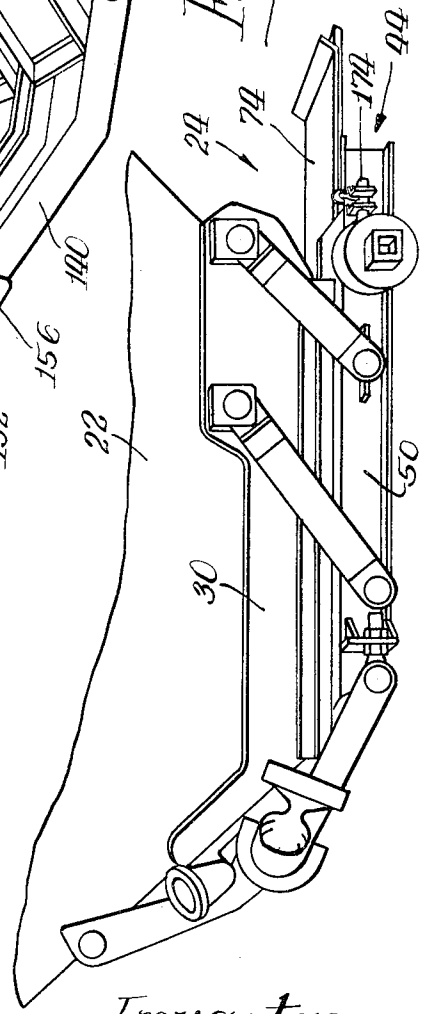


Fig. 3.

Inventor:-
Worrell M. Danielson
By Edward F. Jurow Atty.

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Fig. 4.

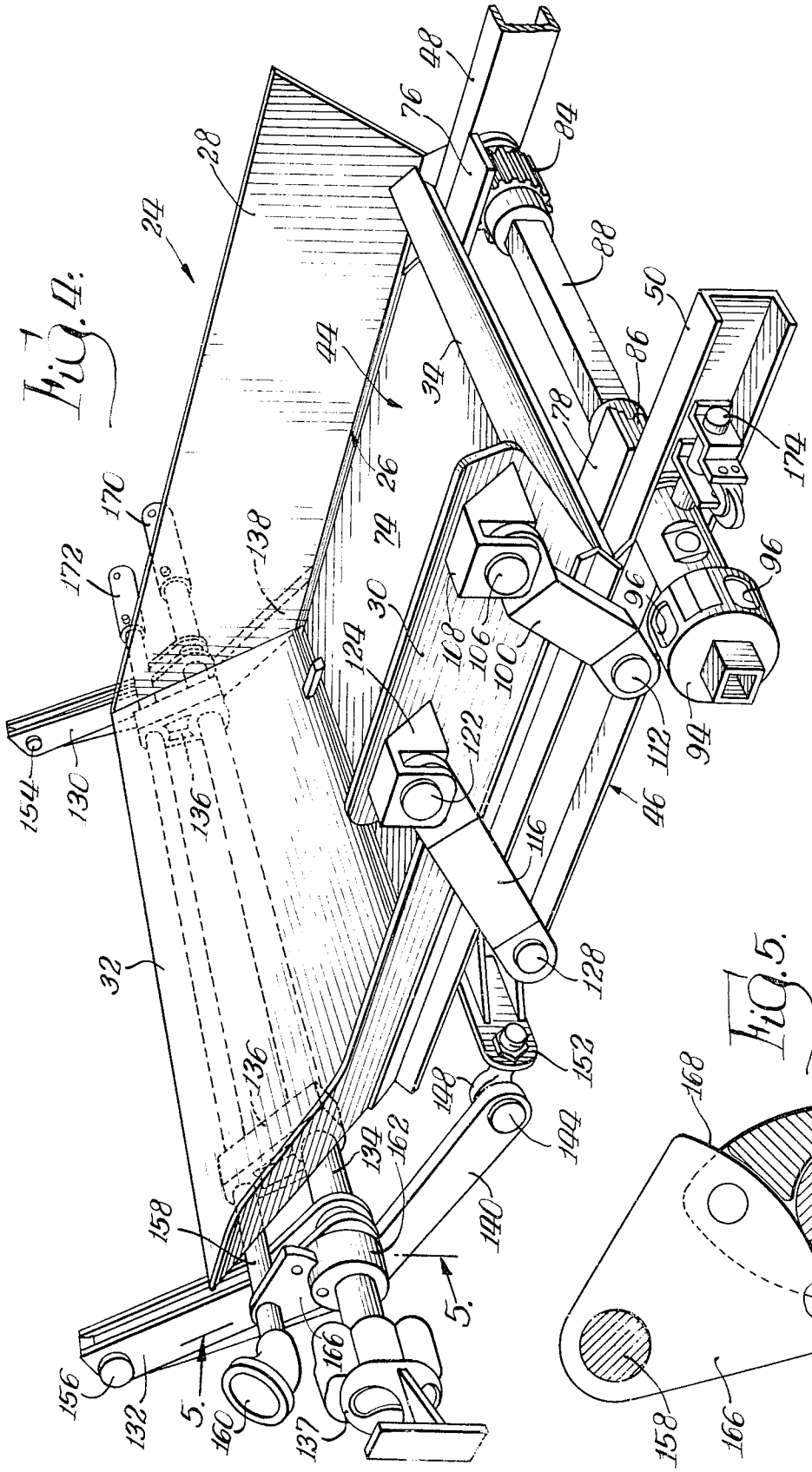


Fig. 5.

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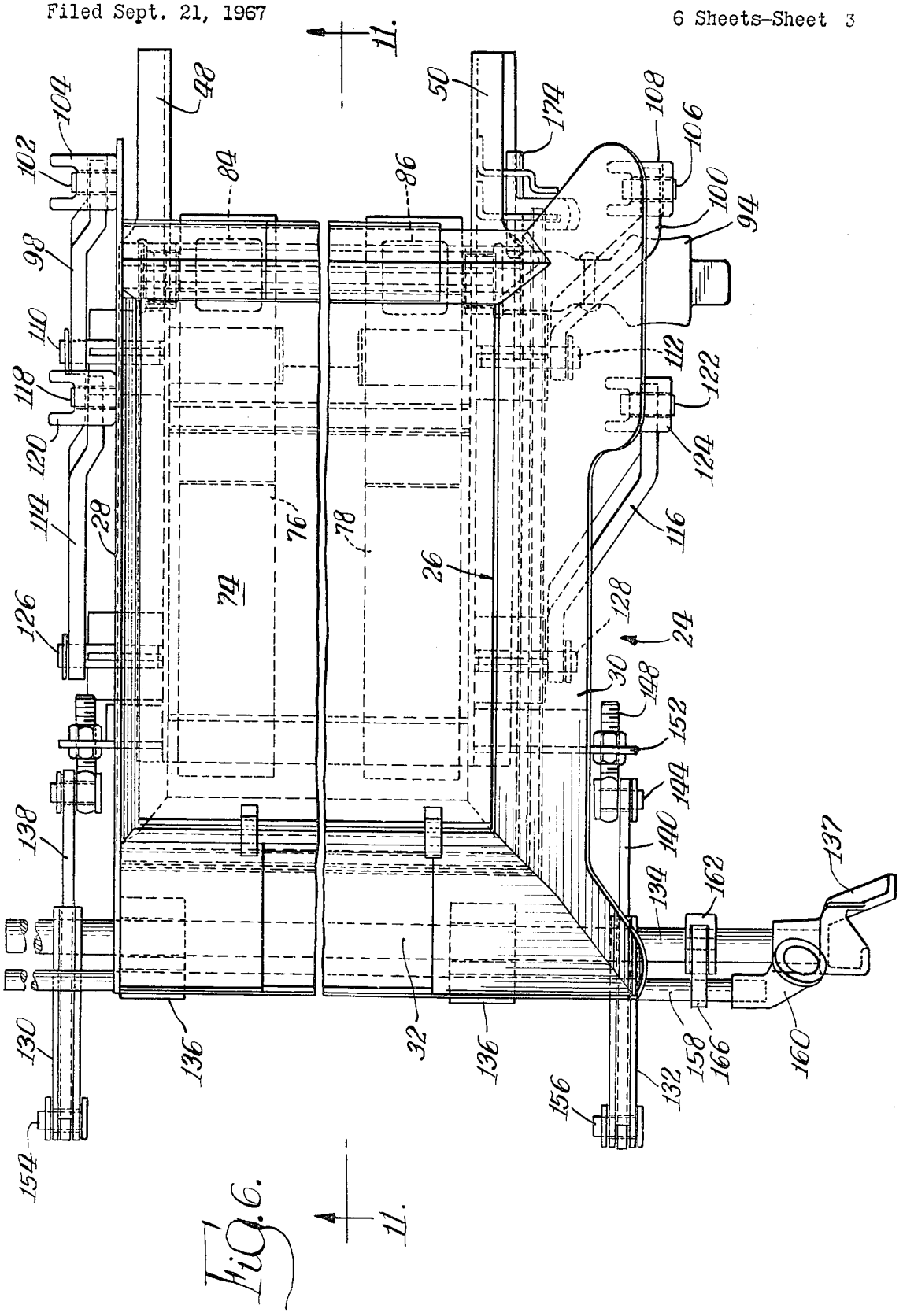


FIG. 6.

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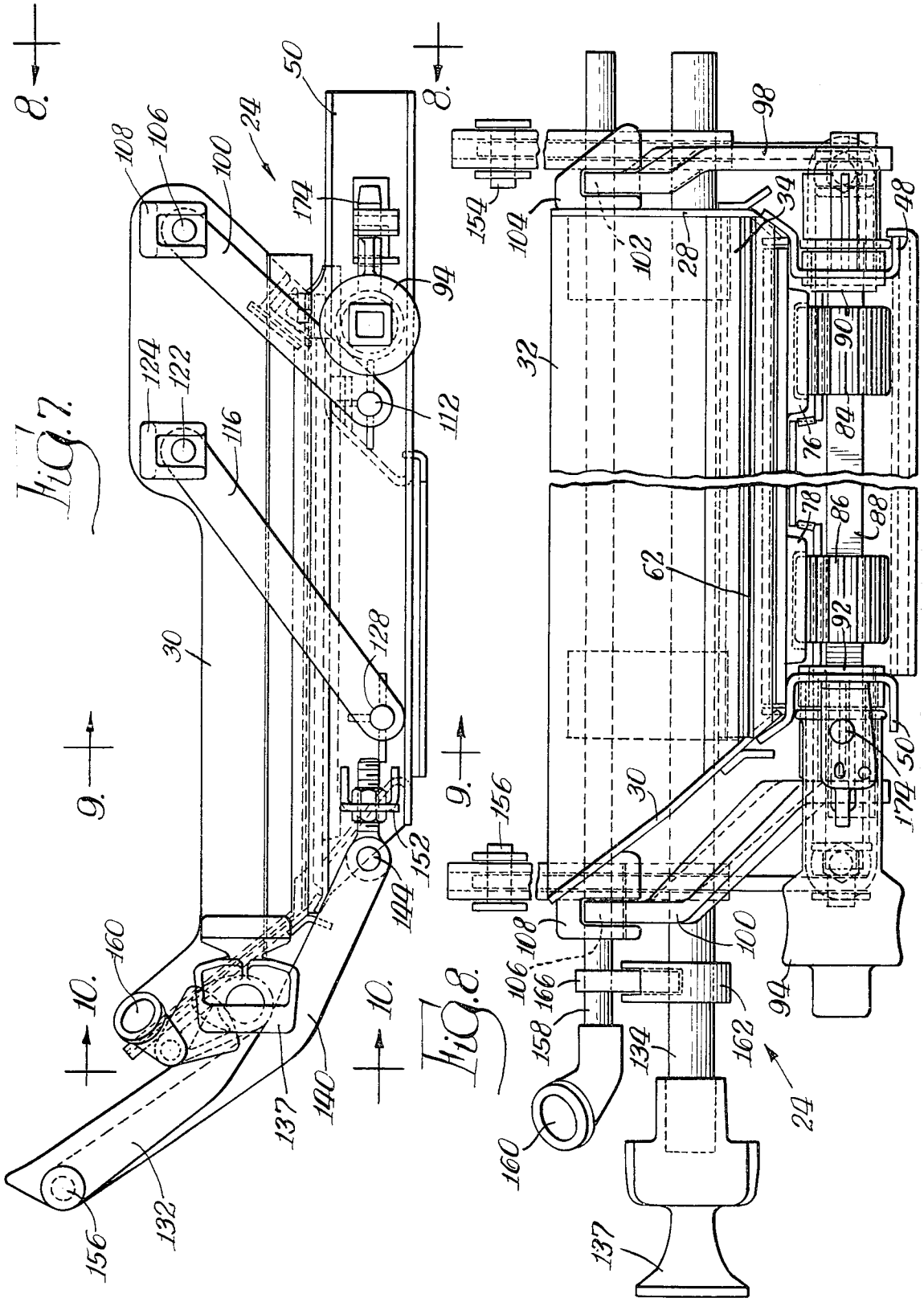


FIG. 7.

FIG. 8.

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HOPPER OUTLET ASSEMBLY

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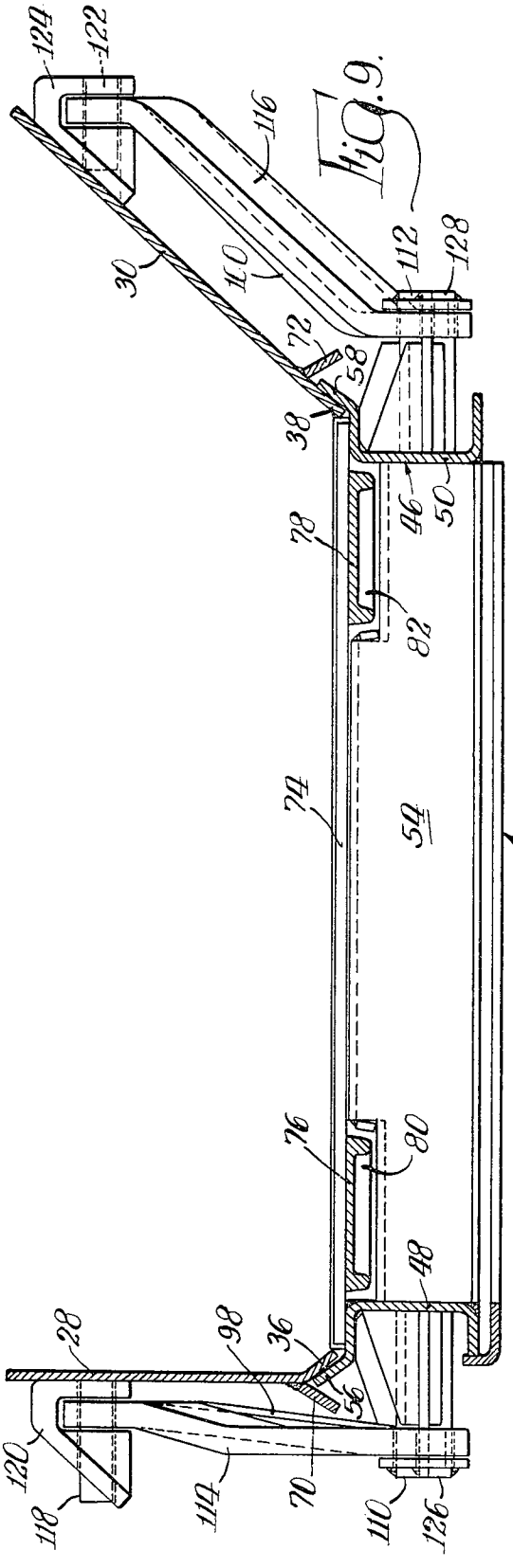


FIG. 9.

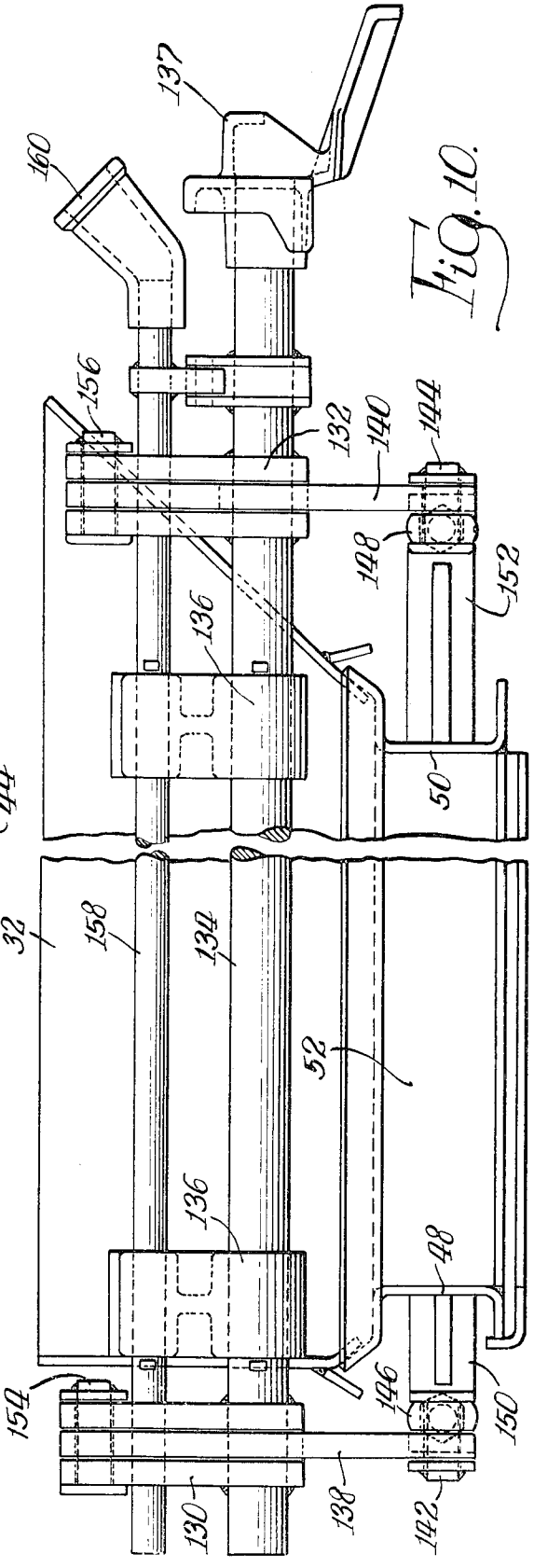


FIG. 10.

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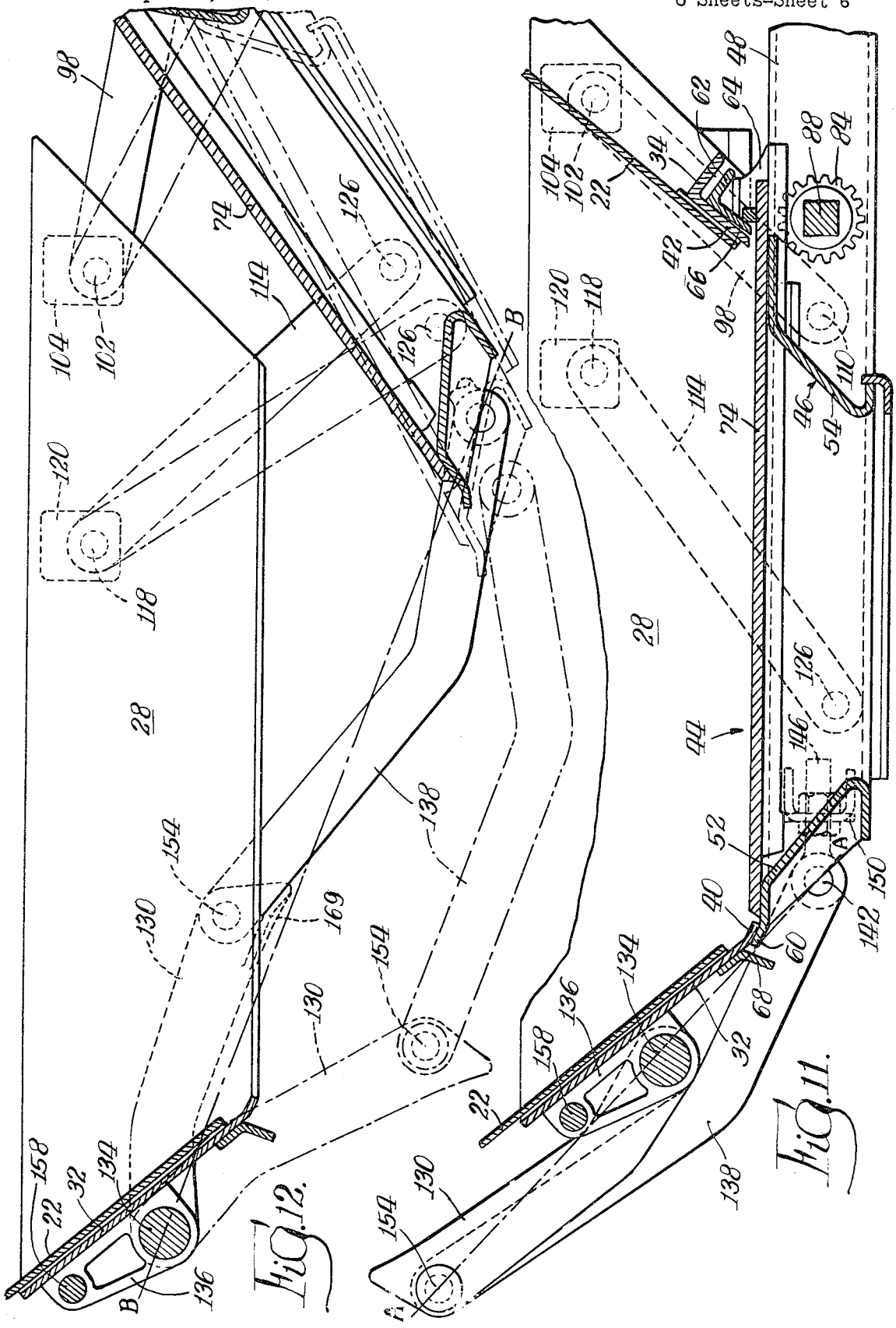


FIG. 12.

FIG. 11.

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HOPPER OUTLET ASSEMBLY

Worrell M. Danielson, Evergreen Park, Ill., assignor to Enterprise Railway Equipment Company, Chicago, Ill., a corporation of Illinois

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Int. Cl. B61d 7/00
U.S. Cl. 105—280 10 Claims

ABSTRACT OF THE DISCLOSURE

A railroad car hopper outlet assembly having a main frame with a discharge opening through which lading can flow. Closure means is positionable across the discharge opening to close the same for retaining lading within the hopper. The closure means includes a gate selectively slidable to open the discharge opening for controlled discharge of lading. Support linkage means is pivotally connected to the main frame and to the closure means to accommodate quick drop swinging movement of the latter away from the discharge opening to open the same for rapid discharge of lading.

My present invention relates generally to a hopper outlet assembly and more particularly to a combination rapid discharge and controlled discharge hopper outlet assembly which is adapted for use, for example, in connection with railroad hopper cars.

It is an object of my present invention to provide a hopper outlet assembly comprising a main frame having a discharge opening through which lading can flow by gravity, closure means positionable across the discharge opening to close the same for retaining the lading within the hopper, and support linkage means swingably connecting the closure means to the main frame to accommodate quick drop swinging movement of the closure means away from the discharge opening to open the same for rapid discharge of the lading.

It is another object of my present invention to provide a hopper outlet assembly, as described, wherein the support linkage means includes link members disposable in generally overcenter overlapping relation to position the closure means across the discharge opening.

It is another object of my present invention to provide a hopper outlet assembly, as described, wherein lock means are provided to lock the closure means across the discharge opening when the link members are disposed in generally overcenter overlapping relation.

It is another object of my present invention to provide a hopper outlet assembly, as described, wherein the link members are disposable generally in-line and overcenter to hold the closure means in a full open position.

It is a further object of my present invention to provide a hopper outlet assembly, as described, wherein the closure means is arranged to establish line contact with the main frame about the discharge opening when the closure means is positioned across the discharge opening to provide an effective seal therebetween.

It is a still further object of my present invention to provide a hopper outlet assembly, as described, wherein the closure means is comprised of a generally rectangular secondary frame, a gate slidably supported in the secondary frame, and means for selectively moving the gate relative to the secondary frame when the closure means is positioned across the discharge opening to open the latter for controlled discharge of the lading.

Now in order to acquaint those skilled in the art with the manner of constructing and using hopper outlet assemblies in accordance with the principles of my present invention, I shall describe in connection with the accompanying drawing a preferred embodiment of my invention.

In the drawings:

FIG. 1 is a side elevational view of a railway hopper car incorporating hopper outlet assemblies in accordance with the principles of my present invention;

FIG. 2 is a perspective view, on an enlarged scale, of a portion of one of the hoppers of FIG. 1 and the associated hopper outlet assembly of my present invention, with the closure means thereof being shown in a full open position for rapid discharge;

FIG. 3 is a perspective view corresponding generally to FIG. 2, but showing the closure means in a position for controlled discharge;

FIG. 4 is a perspective view, on a further enlarged scale of the hopper outlet assembly of my present invention disassociated from a railroad hopper car, with the closure means thereof being shown in a full closed position;

FIG. 5 is a sectional view, taken substantially along the line 5—5 in FIG. 4, looking in the direction indicated by the arrows;

FIG. 6 is a plan view, foreshortened transversely, of the hopper outlet assembly of FIG. 4;

FIG. 7 is a side elevational view of the hopper outlet assembly of FIG. 4;

FIG. 8 is an end elevational view, foreshortened transversely, of my hopper outlet assembly, as seen on line 8—8 of FIG. 7, looking in the direction indicated by the arrows;

FIG. 9 is a sectional view, taken substantially along the line 9—9 of FIG. 7, looking in the direction indicated by the arrows;

FIG. 10 is an end elevational view, foreshortened transversely, of my hopper outlet assembly, as seen on line 10—10 of FIG. 7, looking in the direction indicated by the arrows;

FIG. 11 is a sectional view, taken substantially along the line 11—11 of FIG. 6, looking in the direction indicated by the arrows, with the closure means being shown in a full closed position; and

FIG. 12 is a sectional view corresponding generally to FIG. 11, but showing the closure means in intermediate and full open positions for rapid discharge.

Referring now to FIG. 1, there is indicated generally by the reference numeral 20 a railroad hopper car of the type having six load containing hopper sections 22 arranged in transversely spaced pairs. Since the hoppers themselves are conventional, only the lower portions of the three hoppers on the near side of the car 20 are shown. Associated with the lower open end of each hopper 22 is a hopper outlet assembly 24 incorporating the principles of my present invention. The several hopper outlet assemblies 24 are the same in construction and operation except for a reversal of certain parts in the case of the assemblies of each pair located on opposite sides of the car 20. Therefore, the following description will be confined in general to only one of the hopper assemblies 24. As will be appreciated by those skilled in the art, the hopper outlet assemblies 24 may be incorporated in a side pocket car 20 as shown, or, if desired, in a center-flow car.

The hopper outlet assembly 24, as shown in FIG. 4, is comprised of a generally rectangular main frame 26 which includes a generally straight side wall 28, an inclined side wall 30, an inclined end wall 32 and an end wall structural member 34 in the form of an angle bar. The wall members 28, 30, 32 and 34, which are rigidly joined at the corners of the frame 26, are adapted to be suitably secured, as by welding, to the lower portion of the hopper 22. As shown in FIG. 9, the lower edge of the

side wall **28** is formed with a downwardly and inwardly inclined marginal portion **36**, and the lower edge portion of the side wall **30** presents a downwardly and inwardly inclined marginal portion **38**; as shown in FIG. 11, the lower edge portion of the end wall **32** is formed with a downwardly and inwardly inclined marginal portion **40**, and the end angle bar **34** is positioned so that the one side thereof presents a downwardly and inwardly inclined marginal portion **42**. The marginal portions **36**, **38**, **40** and **42** define the perimeter of a discharge opening in the hopper outlet assembly **24**.

Positionable across the discharge opening of the hopper outlet assembly **24**, as shown in FIGS. 4, 9 and 11, is closure means indicated generally by the reference numeral **44**. The closure means **44** comprises a generally rectangular secondary frame **46** which includes generally C-shaped side channel bars **48** and **50**, and transverse C-type end channel bars **52** and **54**. The side channel bars **48** and **50** extend beyond the end channel bar **54** and, intermediate of the end channel bars **52** and **54**, are provided with upwardly and outwardly inclined marginal portions **56** and **58**. The web portions of the end channel bars **52** and **54** are inclined downwardly and inwardly, the upper leg portion of the end channel bar **52** is formed with an upwardly and outwardly inclined marginal portion **60**, and a transverse angle bar **62** is secured at its ends by flange means **64** to the side channel bars **48** and **50**. The angle bar **62** is so arranged that the one side thereof presents an upwardly and outwardly inclined marginal portion **66**.

A difference of approxiamtely three degrees is maintained between the angle of inclination of the main frame marginal portions **36**, **38**, **40** and **42**, and the angle of inclination of the secondary frame marginal portions **56**, **58**, **60**, and **66**. By reason of this arrangement, the secondary frame marginal portions **56**, **58**, **60** and **66** establish line contact with the main frame marginal portions **36**, **38**, **40** and **42**, when the secondary frame **46** is positioned across the discharge opening of the hopper outlet assembly **24**, to provide an effective seal therebetween. In this connection, the end angle bar **34** serves as a rain shield for the seal between the marginal portions **42** and **66**, a bent plate **68** secured to the outboard side of the end wall **32** serves as a rain shield for the seal between the marginal portions **40** and **60**, a flat bar **70** secured to the outboard side of the side wall **28** serves as a rain shield for the seal between the marginal portions **36** and **56**, and a flat bar **72** secured to the outboard side of the side wall **30** serves as a rain shield for the seal between the marginal portions **38** and **58**.

The closure means **44** further comprises a gate **74** in the form of a generally rectangular flat plate slidably supported in the secondary frame **46** on the upper horizontal leg portions of the channel bars **48**, **50**, **52** and **54**. As shown in FIGS. 4, 9 and 11, a pair of transversely spaced rack members **76** and **78** are secured to the underside of the gate **74**. The downwardly facing teeth **80** and **82** of the rack members **76** and **78** have meshing engagement with a pair of pinions **84** and **86** secured to a transverse operating shaft **88** rotatably mounted in bearings **90** and **92** (FIG. 8) secured in the web portions of the side channel bars **48** and **50**. The rack members **76** and **78**, which constitute rack means, and the pinions **84** and **86**, which constitute rotatable pinion means, cooperatively serve as means for selectively moving the gate **74** relative to the secondary frame **46**. The operating shaft **88** extends beyond the side channel bar **50** and is provided with a suitable socket member **94** formed with a plurality of radial openings **96** for the reception of a removable bar, whereby the shaft **88** may be rotated and the gate **74** moved.

I shall now describe the linkage means that serves to support the closure means **44** from the main frame **26**. The support linkage means comprises a first pair of support links **98** and **100** (FIGS. 6, 8, and 9) which are pivotally connected at their upper ends to the main frame **26** on opposite sides thereof adjacent one end thereof. More particularly, the support link **98** is pivotally connected by means of a pin **102** and a bracket **104** to the outboard side of the main frame side wall **28**, while the uppper end of the support link **100** is pivotally connected by means of a pin **106** and a bracket **108** to the outboard side of the main frame side wall **30**. The lower ends of the support links **98** and **100** are pivotally connected to the closure means **44** on opposite sides thereof by means of pin members **110** and **112** secured to the outboard sides of the web portions of the secondary frame side channel bars **48** and **50**.

The support linkage means further comprises a second pair of support links **114** and **116** which pivotally interconnect the main frame **26** intermediate of the ends thereof and the secondary frame **46** in a manner similar to the first pair of support links **98** and **100**. That is, the upper end of the support link **114** is pivotally connected by means of a pin **118** and a bracket **120** to the outboard side of the main frame side wall **28**, while the upper end of the support link **116** is pivotally connected by a pin **122** and a bracket **124** to the outboard side of the main frame side wall **30**. The lower ends of the support links **114** and **116** are pivotally connected to the closure means **44** by pin members **126** and **128** secured to the outboard sides of the web portions of the secondary frame side channel bars **48** and **50**. It will be observed, that the axes of the pins **102**, **106**, **118** and **122** lie in a common horizontal plane, and that the second pair of support links **114** and **116** are of greater length than the first pair of support links **98** and **100**. By using support links of unequal length, the rear end of the closure means **44** can be elevated higher in a full open position than would be possible if the pairs of support links were of the same length. In these circumstances, lading will flow freely off the inclined surface of the gate **74** and the closure means **44** thus has self-cleaning and improved discharging characteristics.

The support linkage means still further comprises (FIGS. 4 and 10) a first pair of transversely spaced dual link members **130** and **132** which are secured at their one ends to a transverse shaft **134** journalled in brackets **136** secured to the outboard side of the main frame end wall **32**. Thus, the first pair of link members **130** and **132** are pivotally connected at their one ends to the main frame **26** on opposite sides thereof adjacent the other end thereof. Mounted on the end of the shaft **134** is a socket member **137** adapted to receive a removable bar whereby the shaft **134** may be rotated. A second pair of link members **138** and **140** are pivotally mounted on pins **142** and **144** carried by eye bolts **146** and **148** adjustably secured in flanges **150** and **152** extending from the secondary frame side channels **48** and **50**. Thus, the one ends of the second pair of link members **138** and **140** are pivotally connected to the closure means **44** on opposite sides thereof. The other ends of the first and second pairs of link members **130**, **138** and **132**, **140** are pivotally interconnected respectively by pins **154** and **156**. As will be explained in greater detail hereinafter, the first and second pairs of link members **130**, **132**, **138** and **140** serve to guide movement of the closure means **44** away from the discharge opening in the main frame **26** and further cooperate in holding the closure means **44** in a full closed position or in a full open position.

Also journalled in the brackets **136** and extending parallel to the transverse shaft **134** is a second transverse shaft **158** which is provided at its one end with a socket member **160** adapted to receive a removable bar whereby the shaft **158** may be rotated. As shown in FIGS. 4 and 5, a locking hub **162** is secured to the transverse shaft **134** and is formed with a central arcuate cut-out **164**. A cooperating locking dog sector **166** is secured to the transverse shaft **158** for rotatable mounting on the main frame **26** and is formed with arcuate cam edge **168**. Rotation of the transverse shaft **158** and the locking dog **166** serves to

move the arcuate cam edge **168** into and out of engagement with the arcuate cut-out **164** of the locking hub **162**. As will be explained further hereinafter, when the locking dog **166** is in engagement with the locking hub **162**, the closure means **44** is locked in closed position across the discharge opening in the main frame **26**.

When the closure means **44** is positioned across the discharge opening of the main frame **26** as shown in FIGS. 4, 6, 7 and 11, the discharge opening is closed thereby for retaining the lading within the hopper **22**. To so position the closure means **44**, the first and second pairs of link members **130, 132, 138** and **140** are disposable in generally overcenter overlapping relation, as shown in FIG. 11, with the plane A—A passing through the axes of the pins **142, 144, 154** and **156** being offset above and to the right of the axis of the shaft **134**. The secondary frame **46** of the closure means **44** can be locked in this position by engaging the locking dog **166** with the locking hub **162** (FIGS. 4 and 5).

If it should be desired to slowly discharge lading from the hopper **22**, the operating shaft **88** is rotated clockwise as viewed in FIG. 11. Such rotation of the shaft **88**, through the pinions **84** and **86** and the rack members **76** and **78**, causes the gate **74** to move toward the position shown in FIG. 3 whereupon the closure means **44** is partially opened for the discharge of lading. The extent of opening of the gate **74** may be readily adjusted through rotation of the operating shaft **88** and thus controlled discharge of the lading may be conveniently effected. Upon completion of the desired discharge of lading, the operating shaft **88** is rotated counterclockwise, as viewed in FIG. 11, until the gate **74** is returned from the position shown in FIG. 3 to the full closed position shown in FIG. 11. A conventional locking bolt **174** is provided for locking the slide gate **74** in closed position.

If a rapid discharge of the lading from the hopper **22** is desired, the transverse shaft **158** is first rotated to remove the locking dog **166** from engagement with the locking hub **162**. Thereupon, the first and second pairs of link members **130, 132, 138** and **140** are caused to swing downwardly toward the broken line position shown in FIG. 12 to effect quick drop swinging movement of the closure means **44** away from the discharge opening in the main frame **26**. Next, to position and hold the closure means **44** fully open for rapid discharge of the lading, the transverse shaft **134** is rotated until the first and second pairs of link members **130, 132, 138** and **140** are disposed generally in-line and overcenter, as shown in solid and dotted lines in FIG. 12 (also see FIG. 2), with the axis of the pins **154** and **156** being offset above and to the right of the plane B—B passing through the axes of the shaft **134** and the pins **142** and **144**. To limit overcenter movement, the link members **130** and **132** are provided with lateral stop flanges **169** that are engageable by the adjacent end portions of the link members **138** and **140**. Upon completion of discharge of lading from the hopper **22**, the transverse shaft **134** is reversely rotated to return the first and second pairs of link members **130, 132, 138** and **140** from the in-line overcenter position shown in FIG. 12 to the overlapping overcenter position shown in FIGS. 4 and 11. The closure means **44** is thus returned to a full closed position. Finally, the locking dog **166** is rotated back into engagement with the locking hub **162** whereupon the closure means **44** is locked in closed position across the discharge opening in the main frame **26**. When a pair of hopper outlet assemblies **24** are mounted on opposite sides of a car **20**, the inner ends of the transverse shafts **134** and **158** of one assembly may be joined by coupling sleeves **170** and **172** (FIG. 4) to the inner ends of the corresponding shafts of the other assembly whereby to permit conjoint rapid discharge operation of both assemblies from one side of the car.

While I have shown and described what I believe to be a preferred embodiment of my present invention, it will be understood by those skilled in the art that various

rearrangements and modifications may be made therein without departing from the spirit and scope of my invention.

I claim:

1. For use with a load containing hopper, a hopper outlet assembly comprising a main frame having a discharge opening through which lading can flow by gravity, closure means positionable across said discharge opening to close the same for retaining the lading within the hopper, support linkage means pivotally connecting said closure means to said main frame to accommodate quick drop swinging movement of said closure means away from said discharge opening to open the same for rapid discharge of the lading, and slidably openable means carried by said closure means, and adapted when said closure means is positioned across said discharge opening to be slidably opened to provide controlled discharge of the lading.

2. The hopper outlet assembly of claim **1** wherein said support linkage means comprises a first pair of support links at their upper ends being pivotally connected to said main frame on opposite sides thereof adjacent one end thereof and at their lower ends being pivotally connected to said closure means on opposite sides thereof, and a second pair of support links at their upper ends being pivotally connected to said main frame on opposite sides thereof intermediate of the ends thereof and at their lower ends being pivotally connected to said closure means on oposite sides thereof.

3. The hopper outlet assembly of claim **2** wherein said upper ends of said first and second pairs of support links are pivotally connected to said main frame on axes lying in a common horizontal plane, and wherein said second pair of support links are of greater length than said first pair of support links.

4. The hopper outlet assembly of claim **2** wherein said support linkage means further comprises a first pair of link members pivotally connected at their one ends to said main frame on opposite sides thereof adjacent the other end thereof, a second pair of link members pivotally connected at their one ends to said closure means on opposite sides thereof, and said first and second pairs of link members being pivotally interconnected at their other ends and being disposable in generally overcenter overlapping relation to position said closure means across said discharge opening.

5. The hopper outlet assembly of claim **4** wherein said first and second pairs of link members are disposable generally in-line and overcenter to hold said closure means in a full open position.

6. The hopper outlet assembly of claim **5** wherein said first pair of link members are secured at their one ends to a transverse shaft rotatably mounted in said main frame, a locking hub with an arcuate cut-out is secured to said transverse shaft, and a locking dog sector having an arcuate cam edge is rotatably mounted on said main frame with said arcuate cam edge being movable into engagement with said arcuate cut-out of said locking hub when said first and second pairs of link members are disposed in generally overcenter overlapping relation to lock said closure means across said discharge opening.

7. The hopper outlet assembly of claim **1** wherein said closure means comprises a generally rectangular secondary frame, a gate slidably supported in said secondary frame, and means for selectively moving said gate relative to said secondary frame when said closure means is positioned across said discharge opening to open the latter for controlled discharge of the lading.

8. The hopper outlet assembly of claim **7** wherein said means for moving said gate comprises rack means secured to said gate, and rotatable pinion means carried by said secondary frame and engaging said rack means for moving the latter and said gate when rotated.

9. The hopper outlet assembly of claim **1** wherein said main frame has downwardly and inwardly inclined

marginal portions about said discharge opening, and said closure means has upwardly and outwardly inclined marginal portions that establish line contact with said main frame marginal portions when said closure means is positioned across said discharge opening to provide an effective seal therebetween.

10. For use with a load containing hopper, a hopper outlet assembly comprising a main frame having downwardly and inwardly inclined marginal portions defining a discharge opening through which lading can flow by gravity, a generally rectangular secondary frame, a gate slidably supported in said secondary frame, said secondary frame and said gate being positionable across said discharge opening to close the same for retaining the lading within the hopper, said secondary frame having upwardly and outwardly inclined marginal portions that establish line contact with said main frame marginal portions when said secondary frame is positioned across said discharge opening to provide an effective seal therebetween, a first pair of support links at their upper ends being pivotally connected to said main frame on opposite sides thereof adjacent one end thereof and at their lower ends being pivotally connected to said secondary frame on opposite sides thereof, a second pair of support links at their upper ends being pivotally connected to said main frame on opposite sides thereof intermediate of the ends thereof and at their lower ends being pivotally connected to said secondary frame on opposite sides thereof, said upper ends of said first and second pairs of support links being pivotally connected to said main frame on axes lying in a common horizontal plane, said second pair of support links being of greater length than said first pair of support links, a first pair of link members secured at their one ends to a transverse shaft rotatably mounted in said main frame adjacent the other end thereof, a second pair of link members pivotally connected at their one ends to said secondary frame, said first and second pairs of link members being pivotally interconnected at their other ends and being disposable in generally overcenter overlapping relation to position said secondary frame and said gate across said discharge opening, a locking hub with an arcuate cut-out secured to said transverse shaft, a locking dog sector having an arcuate cam edge rotatably mounted on said main frame with said arcuate cam edge being movable into engagement with said arcuate cut-out of said locking hub when said first and second pairs of link members are disposed in generally overcenter overlapping relation to lock said secondary frame across said discharge opening, rack means secured to said gate, rotatable pinion means carried by said secondary frame and engaging said rack means for moving the latter and said gate when rotated to open said discharge opening for controlled discharge of the lading, said first and second pairs of support links and said first and second pairs of link members sreving when said locking dog sector is disengaged from said locking hub to accommodate quick drop swinging movement of said secondary frame and said gate away form said discharge opening to open the same for rapid discharge of the lading, and said first and second pairs of link members being disposable generally in-line and over-center to hold said secondary frame and said gate in a full open position.

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SAMUEL F. COLEMAN, Primary Examiner

N. L. STACK, JR., Assistant Examiner

U.S. Cl. X.R.

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