March 20, 1956 G. B. DOREY 2,738,736

FRAME STRUCTURE FOR DISCHARGE OPENING OF A RAILWAY CAR HOPPER

Filed Dec. 12, 1951 6 Sheets-Sheet 1

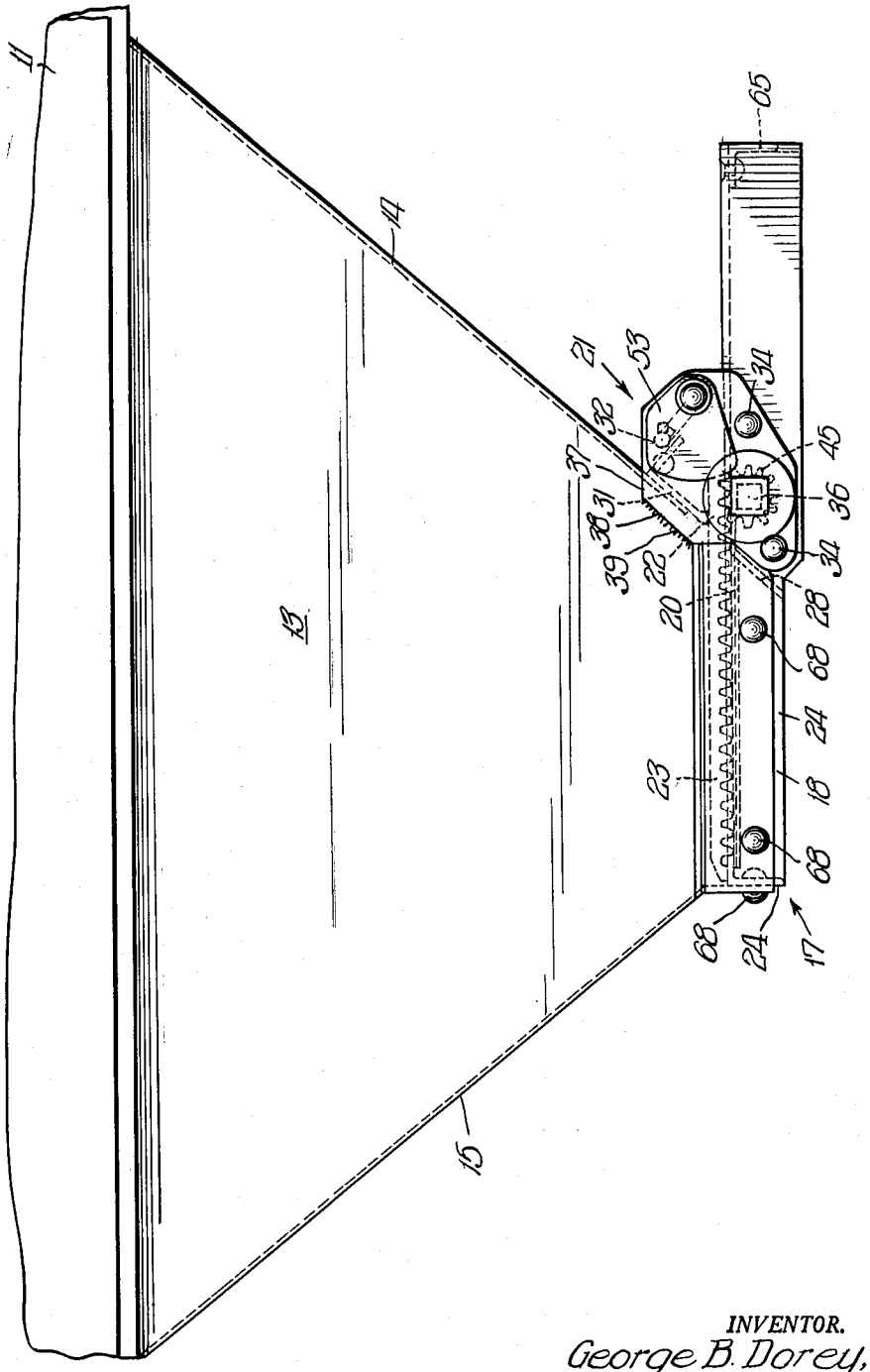


Fig. 1

INVENTOR.
George B. Dorey,
BY
Robert R. Lockwood
Atty

March 20, 1956 G. B. DOREY 2,738,736

FRAME STRUCTURE FOR DISCHARGE OPENING OF A RAILWAY CAR HOPPER

Filed Dec. 12, 1951 6 Sheets-Sheet 2

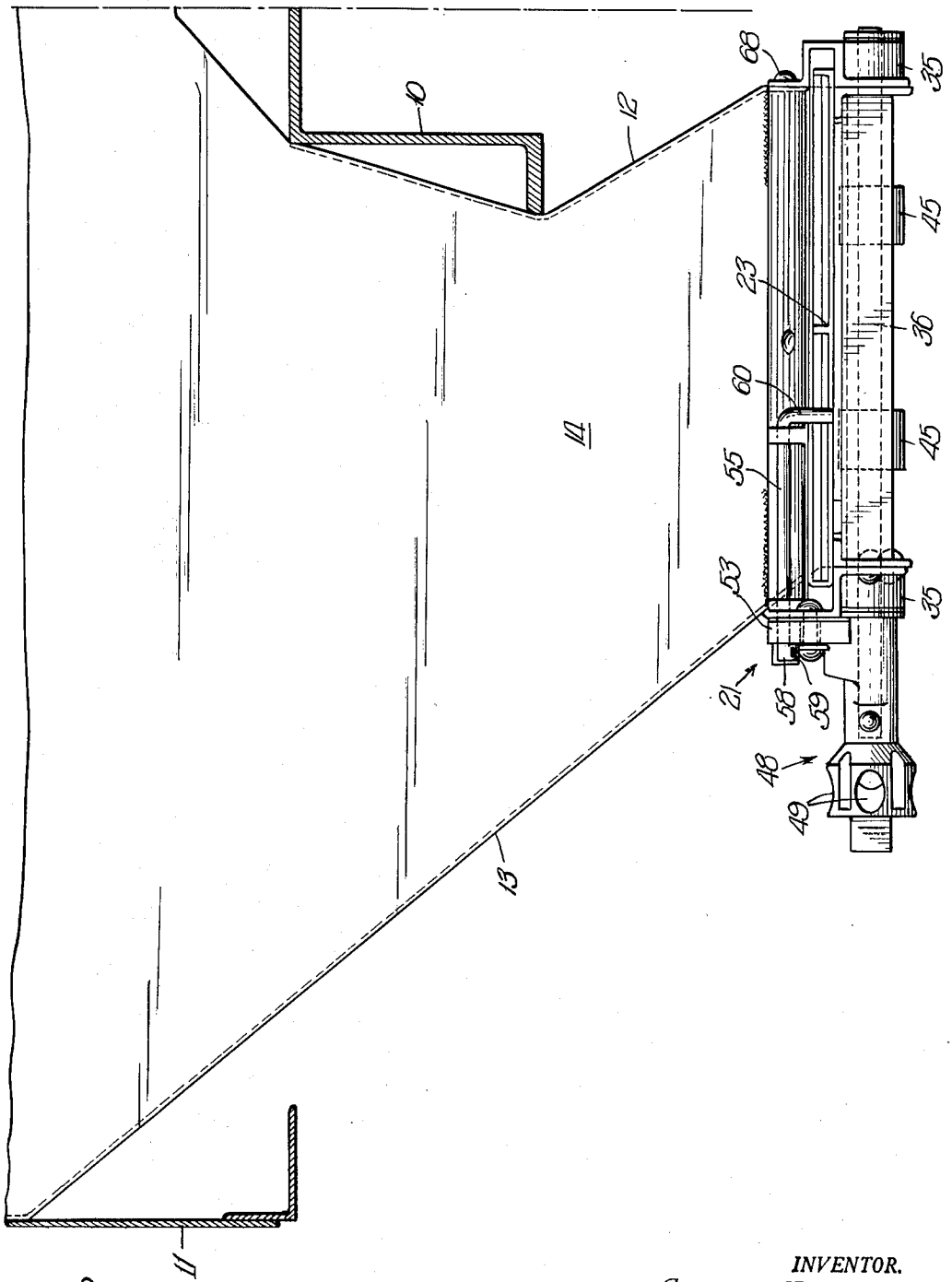


Fig. 2

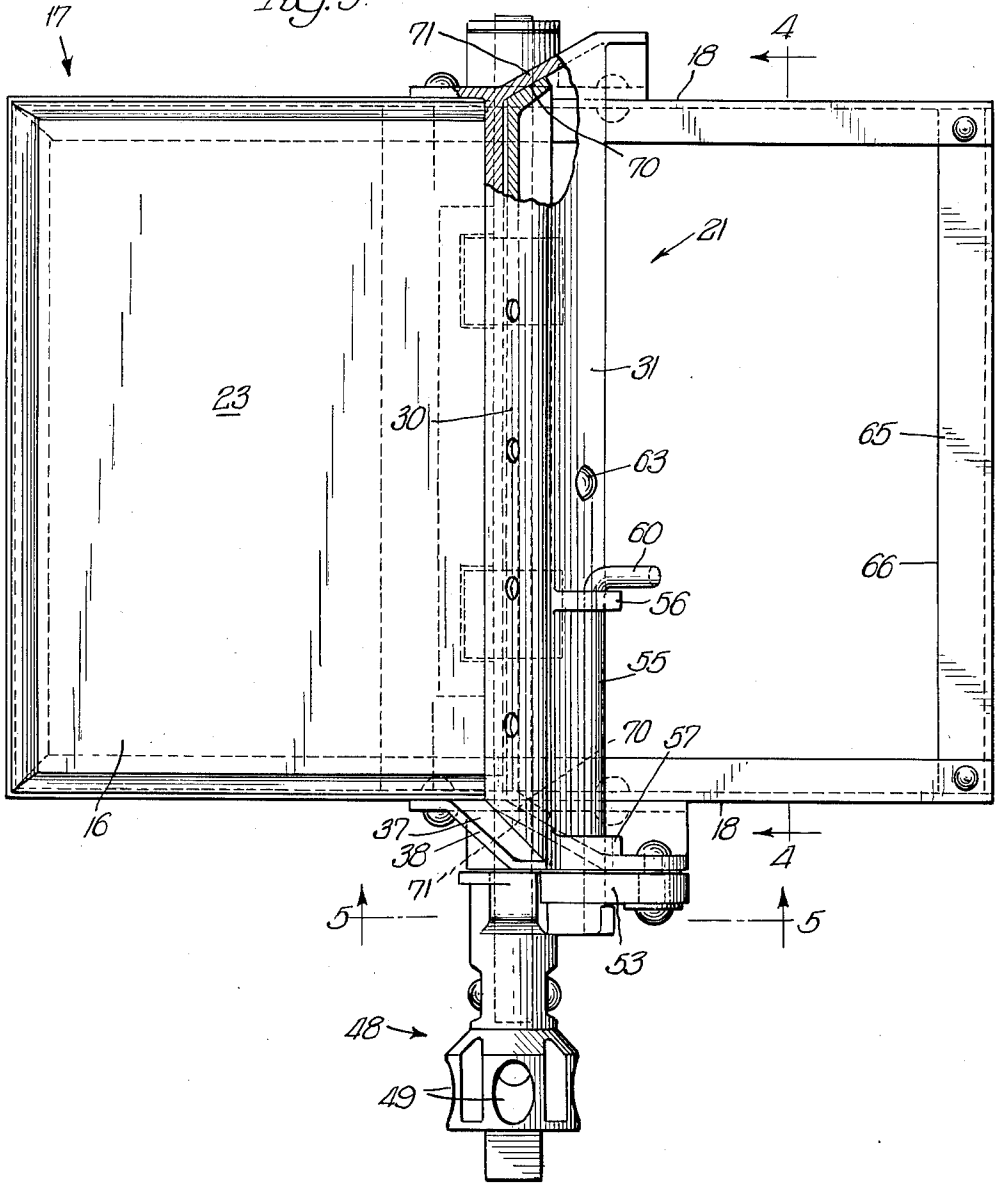
INVENTOR.
George B. Dorey,
BY
Robert R. Lockwood
Atty

March 20, 1956 G. B. DOREY 2,738,736

FRAME STRUCTURE FOR DISCHARGE OPENING OF A RAILWAY CAR HOPPER

Filed Dec. 12, 1951 6 Sheets-Sheet 3

Fig. 3.



INVENTOR.
George B. Dorey,
BY
Robert R. Lockwood
atty.

March 20, 1956 G. B. DOREY 2,738,736

FRAME STRUCTURE FOR DISCHARGE OPENING OF A RAILWAY CAR HOPPER

Filed Dec. 12, 1951 6 Sheets-Sheet 4

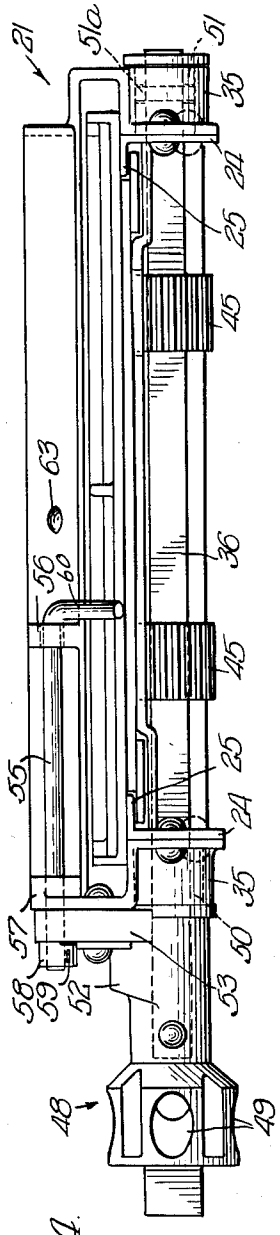


Fig. 4.

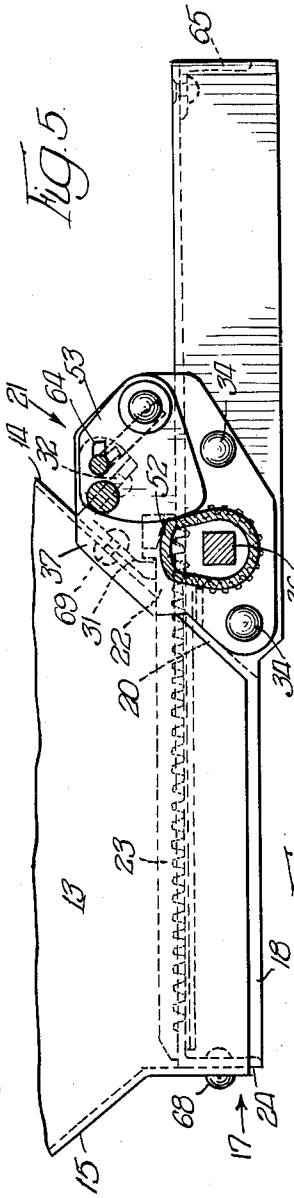


Fig. 5.

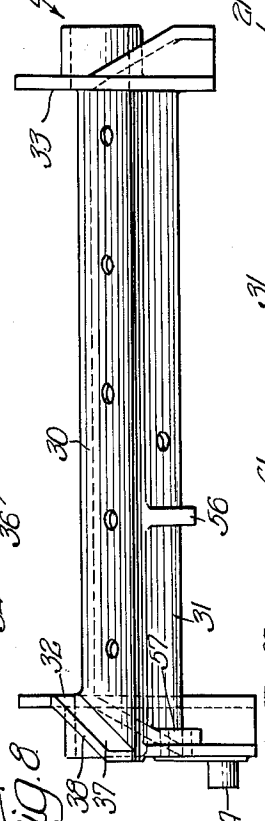


Fig. 8.

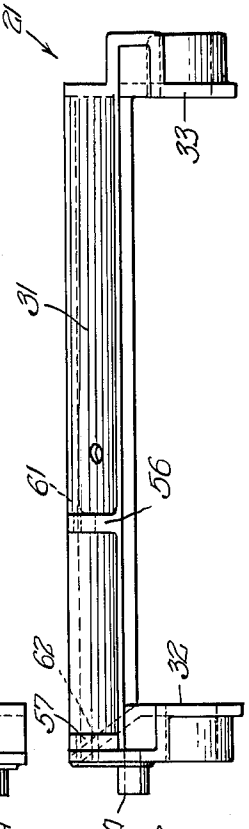


Fig. 7.

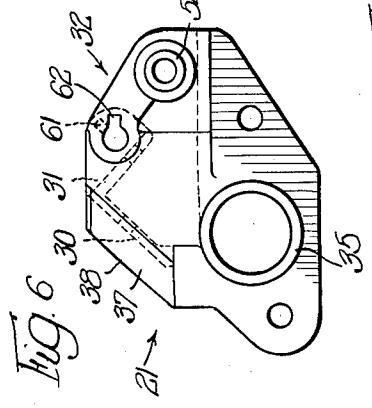


Fig. 6.

INVENTOR.
George B. Dorey,
BY
Robert R. Lockwood
Atty.

March 20, 1956 G. B. DOREY 2,738,736

FRAME STRUCTURE FOR DISCHARGE OPENING OF A RAILWAY CAR HOPPER

Filed Dec. 12, 1951 6 Sheets-Sheet 5

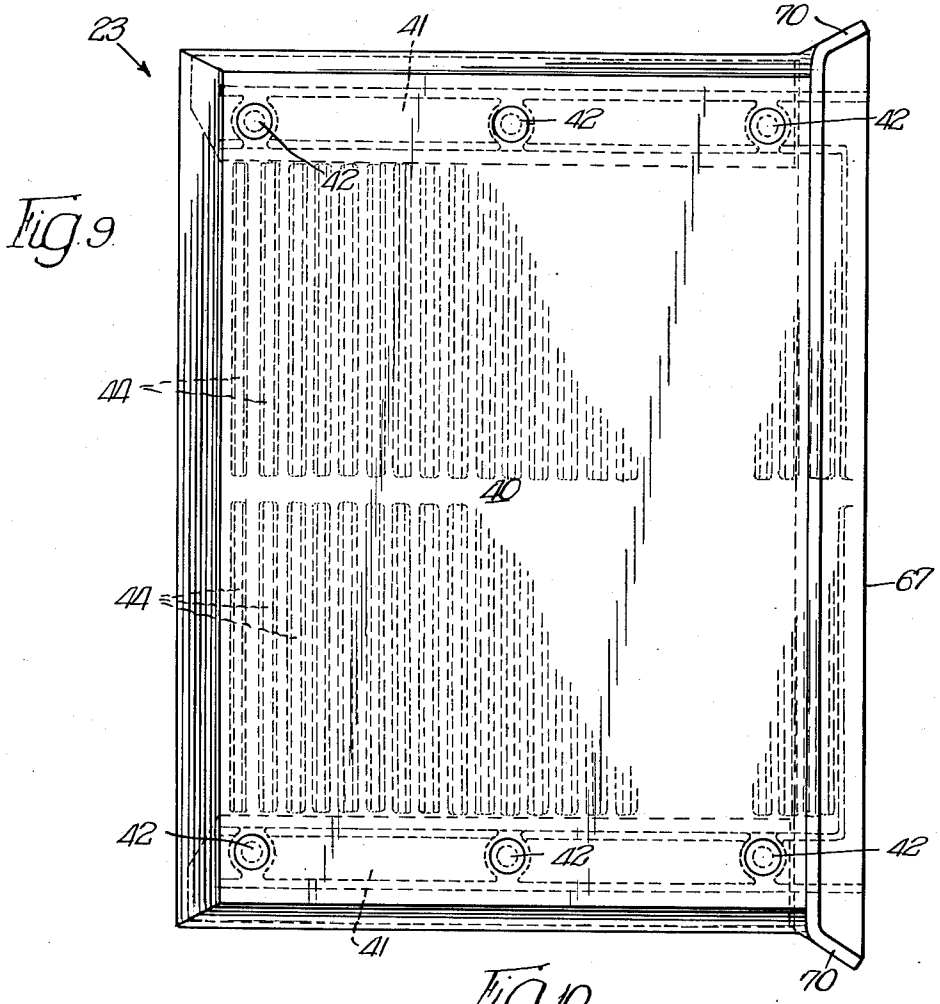


Fig. 9

Fig. 10

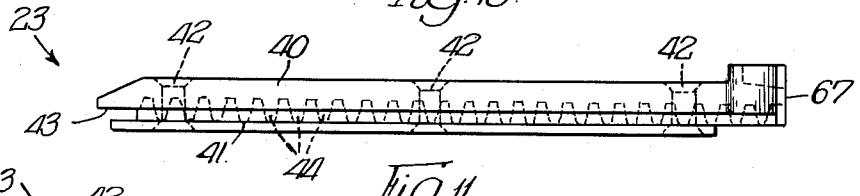
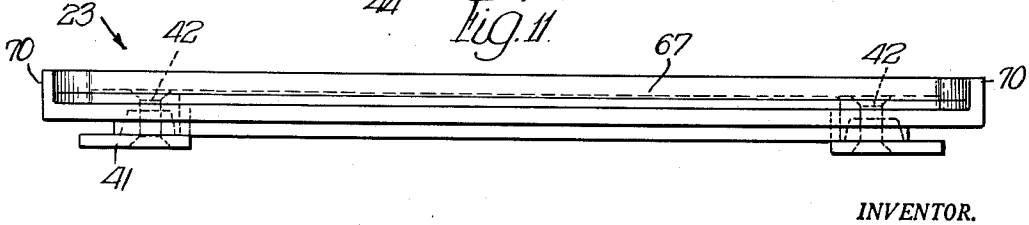


Fig. 11



INVENTOR.
George B. Dorey,
BY
Robert R. Lockwood
Atty.

March 20, 1956 G. B. DOREY 2,738,736

FRAME STRUCTURE FOR DISCHARGE OPENING OF A RAILWAY CAR HOPPER

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Fig. 12.

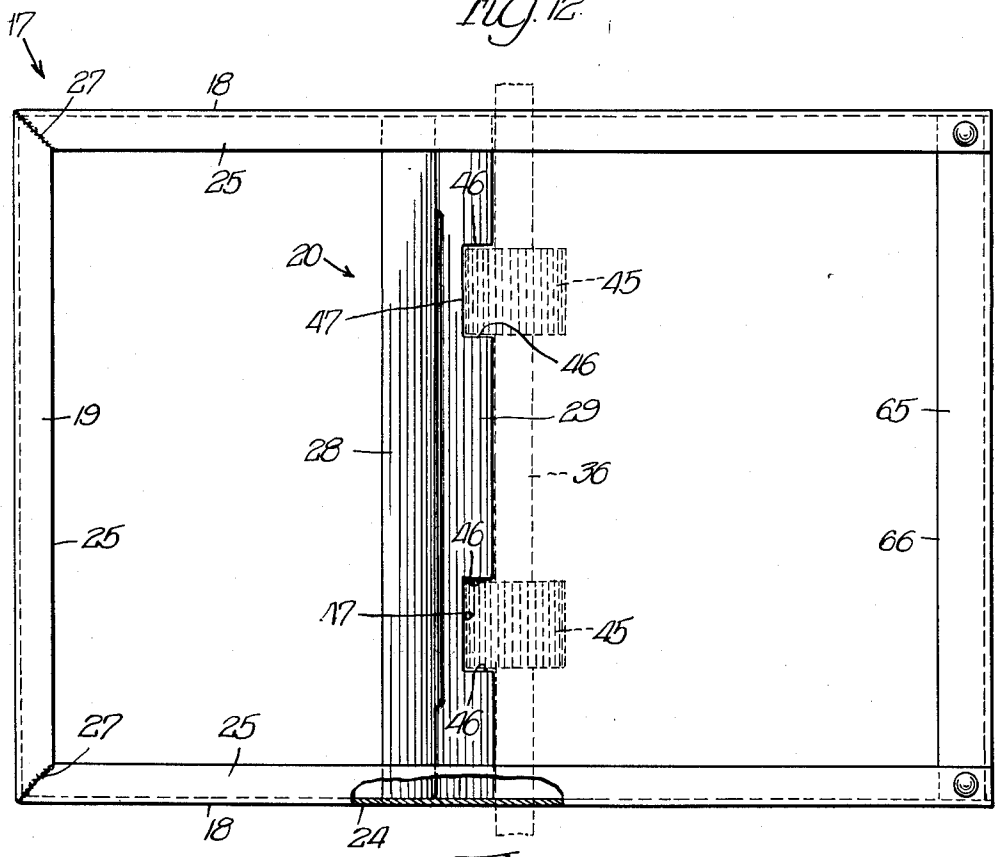


Fig. 13

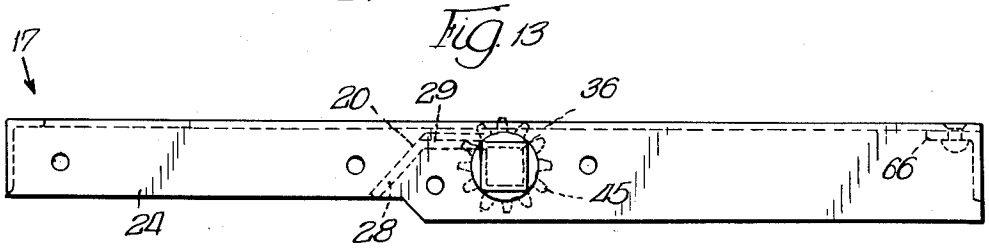
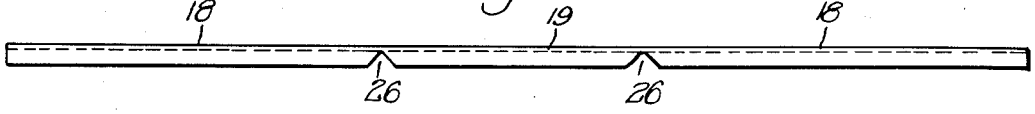


Fig. 14



INVENTOR.
George B Dorey,
BY
Robert R. Lockwood
Atty

United States Patent Office 2,738,736 Patented Mar. 20, 1956

2,738,736

FRAME STRUCTURE FOR DISCHARGE OPENING OF A RAILWAY CAR HOPPER

George B. Dorey, Westmount, Quebec, Canada, assignor to Enterprise Railway Equipment Company, Chicago, Ill., a corporation of Illinois

Application December 12, 1951, Serial No. 261,344

12 Claims. (Cl. 105—282)

The invention relates to an improved outlet framing structure for the discharge opening of a load containing hopper having a sliding gate for closing the opening.

The invention is particularly concerned with that type of discharge outlet commonly used in railway hopper cars for the handling of finely comminuted lading and where tightly closed discharge openings are necessary. In the identified type of hopper outlets it has been customary to employ heavy framing formed of a casting which is machined to provide a smooth seating surface on which a sliding gate rests but such a construction is cumbersome and expensive and also presents difficulties in handling and machining and is also subject to warping after machining and it is one of the objects of my invention to provide a built up structure for eliminating these objections.

Further objects of the invention among others are: To provide an outlet framing structure of composite construction which may be readily manufactured utilizing commercial structural steel members for supporting the gate thereby obviating the necessity of machining the bearing surfaces; to provide an improved tie member extending transversely of the frame from side to side of the outlet and operating as a tie member to maintain a pair of side rails in spaced relation; to provide a tie member across one side of the discharge opening having flared sides for cooperation with corresponding outwardly flared sides of the sliding gate; to provide a built up frame structure in which three sides are of commercial structural members and the fourth side includes a casting or frame tie member adapted to straddle the side members and wherein the casting incorporates bearings for supporting an operating shaft and also forms the support for a locking mechanism for the gate as well as providing for improved sealing engagement between the gate and frame; and to provide an improved construction for maintaining geared pinions in definite axial relation to the operating shaft on which said pinions are mounted.

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 as much as necessary of the car to illustrate the application of the improved construction.

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

Figure 3 is a detached plan view of the frame structure shown in assembled relation including the sliding gate shown but with the walls of the load containing hopper omitted and certain parts broken away to better illustrate the details of construction.

Figure 4 is a detailed and sectional elevational view of the structure shown in Figure 3 as seen on a line 4—4 of Figure 3.

Figure 5 is a sectional side elevational view of the structure shown in Figure 3 except that the hopper walls of the hopper are included, said view being taken on a line 5—5 of said Figure 3.

Figure 6 is a side elevational view of the transversely extending casting or frame tie member.

Figure 7 is a vertical end view of the frame tie member shown in Figure 6.

Figure 8 is a top plan view of the frame tie member shown in Figures 6 and 7.

Figure 9 is a plan view of the sliding gate assembly.

Figure 10 is a side elevational view of the gate assembly shown in Figure 9.

Figure 11 is a vertical view of the right end of the sliding gate shown in Figure 9.

Figure 12 is a plan view of the lower portion of the frame structure assembly with the shaft and pinion gears indicated in conventional dot and dash lines.

Figure 13 is a side elevational view of the frame structure assembly shown in Figure 12.

Figure 14 is a plan view of the structural member employed for the gate supporting ledges as seen prior to bending.

In Figures 1, 2 and 3 of the drawings illustrating the application of this invention to a railway hopper car there is shown at **10** the usual center sill of the car and spaced outwardly therefrom is one of the side walls of the car as shown at **11**. Interposed between the center sill **10** and the side wall **11** is a four sided hopper structure including inner and outer side walls as indicated at **12** and **13** respectively which meet with transversely extending front and rear walls indicated at **14** and **15** respectively to form a four sided load containing hopper having a discharge opening **16**.

The rear sloping wall **15** and the side walls **12** and **13** are extended downwardly vertically to overlie an outlet frame structure as generally indicated at **17**. The frame structure **17** includes a pair of longitudinally extending side rail framing members **18—18**, a rear connecting frame member **19** and lower and upper front frame tie members indicated at **20** and **21**, respectively, said upper and lower members being spaced vertically from each other a sufficient distance to provide a slotted aperture **22** through which a sliding gate **23** extends.

The side rail framing members **18** and rear connecting framing member **19** are preferably of angular shape with a vertically disposed web **24** and upper inwardly directed flange sections **25**. The flanges **25** constitute ledges for supporting the sliding gate **23**. As shown in Figure 14 the side and end members are preferably formed from a length of an angle member that may be a rolled structural steel section which is first notched as at **26—26** and then bent to a U-shape presenting spaced apart side rail members of a length to extend beyond the hopper for supporting the gate **23** in opened position and the meeting edges of the notched walls are welded as at **27**, Figure 12, and the welded joint ground to present a smooth surface.

The lower transversely extending frame tie member **20**, which extends between the vertical webs **24** of the rail framing members **18**, is of generally angular section with one wall as indicated at **28** in Figures 12 and 13 sloping downwardly and the adjacent wall **29** horizontally disposed. The wall **29** constitutes the lower margin of the aperture **22**. As shown in Figure 1, sloping wall **28** in combination with the vertical webs **24** of the frame members **18** and **19** forms a chute like structure of appreciable depth lying below the gate **23**.

The upper frame tie member **21**, Figures 6, 7 and 8, is a casting and includes a transversely extending body section of inverted V-shape forming angularly related walls **30** and **31**, the former, Figure 1, underlying the hopper front sloping wall **14** and the latter extending substantially normal to said sloping wall. Extending downwardly from and cast integrally with the respective ends of the frame tie member **21** are end walls, indicated

at 32 and 33 respectively, which lie outwardly of the side rail framing members 18—18 and are attached thereto by rivets 34. The said end walls 32 and 33 are provided with integrally formed hub bearings 35 for rotatably supporting an operating shaft 36 whereby movement of the gate 23 is effected as will be described. The outer wall 32 is formed with a flange 37 which in combination with wall 30 forms a V-shaped pocket in which the lower portions of the hopper walls 13 and 14 seat and the edge portion 38 of said flange 37 is welded at 39 to the hopper outer side wall 13.

The sliding gate 23, Figures 9, 10 and 11, includes a main body section 40 and lower guide plates 41—41, as described in application Serial No. 102,105, filed June 19, 1949, now Patent No. 2,638,060, issued May 12, 1953, secured to the underside thereof by rivets 42. The plates 41 are spaced away from the bearing surface 43 of the gate 23 to present grooved side recesses which embrace the upper flanges 25 of the side rail members 18. The gate 23 on its underside is provided with a series of rack teeth 44 and cooperable therewith are pinions 45, Figure 2, which are non-rotatably mounted on the operating shaft 36. The pinions 45 are located, as shown in Figure 12, between the edges 46 of rectangularly notched recesses 47 formed in the upper wall 29 of the lower frame tie member 20. The pinions 45 are thus maintained against axial displacement relatively to the shaft 36.

Rotation of the operating shaft 36 is effected through the medium of an operating head member 48, Figure 4, which is non-rotatably mounted on the shaft 36 and provided with a series of sockets 49 for receiving and holding a removable operating bar (not shown). The shaft 36 is preferably of non-circular section and in order to provide a circular bearing mounting for the shaft there is formed a circularly shaped hub 50, as disclosed in copending application Serial No. 150,662, filed March 20, 1950, on the operating head which fits within the correspondingly formed aperture in the adjacent bearing 35. At the end of the shaft 36 opposite to the operating head 48 there is provided a circularly shaped collar 51 to form the mounting for the shaft which is maintained in axial alignment on the shaft by a pin 51*a*.

A lug 52 is formed on the body of the operating head 48 with which a locking dog 53 is adapted to engage to maintain the shaft 36 against reverse rotation. The dog 53 is pivotally mounted on a trunnion 54 which is integrally formed with end wall 32 of the upper frame tie member 21. The dog 53 is maintained in operative latching position by means of a sealing pin 55 which is mounted for both axial and swinging movement in bearings 56 and 57. The bearings 56 and 57 are preferably cast integrally with wall 31 of the upper frame tie member 21. The sealing pin 55 is provided at its outer end with a key shaped portion 58 apertured at 59 for the reception of a sealing ribbon, not shown, and at its opposite end with a depending handle 60. The bearings 56 and 57 are provided with key shaped apertures indicated at 61 and 62 respectively, Figures 6 and 8, and the sealing pin 55 is threaded therethrough, after which a stop in the form of a rivet 63, Figure 4, is applied to prevent withdrawal of the pin. The aperture 62 in bearing 57 is located to register with a correspondingly formed aperture 64, Figure 5, in the locking dog 53 when the latter is in latching position, and is of sufficient length to accommodate the key shaped portion 58 of the pin 55 and maintain the handle 60 above the path of movement of the gate when the pin 55 is withdrawn and the handle 60 bears against the rivet 63.

As shown in Figures 3 and 12, the side rail members 18 are extended beyond the hopper opening to provide support for the gate 23 in opened position and the projecting ends of the said rail members are provided with a transversely extending tie member 65 which presents a limiting edge wall 66 to abut the outer edge 67 of the gate.

The frame structure 17 is well supported from the four sided hopper structure inasmuch as three of the walls indicated at 12, 13 and 15, in Figures 1 and 2, are extended downwardly vertically to connect with the vertical webs 24 of the framing member 18 by rivets 68 in shear. The fourth side of the frame structure, formed by the transversely extending upper frame tie member 21 which intersects the sides of the rail framing member 18 and connected therewith, is secured by rivets 69 to the front wall 14 and is adequately supported thereby. The end walls 32 and 33 are extended lengthwise beyond the hopper side walls 12 and 13 and connect with the sides of the rail framing member 18 at an appreciable distance below the gate 23 when in closed position, Figure 1, thus reducing the unsupported span of the projecting portions of the rail framing member 18.

The gate 23, when in closed position effectively seals the outer end of the slotted aperture 22 since there are provided on the gate flared outer side wall end portions 70, Figure 9, which register with correspondingly flared wall sections 71, Figure 3, on the inner sides of the end walls 32 and 33. When the gate 23 is forced home, there is provided a tapered plug effect which effectively prevents leakage of lading at the sides of the gate. The close fit between the flared wall portions 70 of the gate 23 and flared side wall sections 71 of the upper frame tie member 21 combined with the continuous flat bearing for the bearing surface 43 of the gate 23 provided by the flanges 25 of the side rail framing member 18 on which the gate 23 seats make for the attainment of exceptional sealing security.

What is claimed as new is:

1. In a four sided load containing hopper having a discharge opening and a hopper wall inclined to direct lading to the opening, a slotted aperture at the lower margin of said wall, a sliding gate extending through the aperture for closing the opening, means for moving the gate including an operating shaft and interengaging rack and pinion means carried by the gate and shaft respectively, an inverted V-shaped member positioned with one wall underlying the sloping floor of the hopper and having the adjacent wall projecting at an angle thereto, an end wall at each end of said V-shaped member, bearings for the shaft in the end walls; and means for preventing movement of the shaft in a gate opening direction, said means including a lug fixed with respect to the shaft and a dog pivotally mounted on the adjacent end wall to engage with the lug, and a sealing pin mounted on the projecting wall of the member for axial movement to extend through the locking dog, said pin having at one end a key shaped end and at the opposite end an operating handle, and a stop on the outstanding wall to limit axial movement of the pin in a withdrawal direction.

2. A frame for mounting inside of three of the four sides of a load containing hopper comprising, in combination, a rolled structural angle member formed into a U-shape with the top flange extending inwardly to provide a runway for the underside of a gate and the side flange depending from the outside of said top flange for fastening to said inside of said three sides, the arms of said angle member projecting underneath and beyond said fourth side to support said gate in open position, and a tie member extending between the side flanges of said arms below said fourth side to form therewith a four-sided discharge chute.

3. A frame for mounting inside of three of the four sides of a load containing hopper comprising, in combination, a rolled structural angle member formed into a U-shape with the top flange extending inwardly to provide a runway for the underside of a gate and the side flange depending from the outside of said top flange for fastening to said inside of said three sides, the arms of said angle member projecting underneath and beyond

said fourth side to support said gate in open position, a lower frame tie member extending between the side flanges of said arms below said fourth side to form therewith a four-sided discharge chute, and an upper frame tie member having depending wall sections overlying and secured to said side flanges and a transversely extending member between said depending wall sections for underlying said fourth wall and fastening thereto, said transversely extending member being spaced above said lower frame tie member and defining therewith an aperture through which said gate is movable.

4. A frame for mounting inside of three of the four sides of a load containing hopper comprising, in combination, a rolled structural angle member formed into a U-shape with the top flange extending inwardly to provide a runway for the underside of a gate and the side flange depending from the outside of said top flange for fastening to said inside of said three sides, the arms of said angle member projecting underneath and beyond said fourth side to support said gate in open position, a lower frame tie member extending between the side flanges of said arms below said fourth side to form therewith a four-sided discharge chute, an upper frame tie member having depending wall sections overlying and secured to said side flanges and a transversely extending member between said depending wall sections for underlying said fourth wall and fastening thereto, said transversely extending member being spaced above said lower frame tie member and defining therewith an aperture through which said gate is movable, and bearings carried by said depending wall sections for rotatably mounting an operating shaft extending transversely through said depending wall sections.

5. Means for controlling the flow of lading by gravity through the discharge opening of a foursided load containing hopper comprising, in combination, a horizontally slidable gate; and a framing structure for mounting around said discharge opening including longitudinally extending side members of rolled angular section with an inwardly extending flange forming a sliding support for said gate and having the other flange etxending downwardly from the outer edge of said inwardly extending flange for attachment to one end of said hopper, and a depending wall section at each end of said member overlying said downwardly extending flanges of said side members and secured thereto.

6. Means for controlling the flow of lading by gravity through the discharge opening of a foursided load containing hopper comprising, in combination, a horizontally slidable gate; a framing structure for mounting around said discharge opening including longitudinally extending side members of rolled angular section with an inwardly extending flange forming a sliding support for said gate and having the other flange extending downwardly from the outer edge of said inwardly extending flange for attachment to the sides of said hopper, a member extending above said gate and transversely of said side members intermediate their ends for attachment to one end of said hopper, and a depending wall section at each end of said member overlying said downwardly extending flanges of said side members and secured thereto; and means for moving said gate including a rotatable shaft, interengaging rack and pinion means carried by said gate and shaft respectively, and bearings in said depending wall sections for rotatably supporting said operating shaft.

7. Means for controlling the flow of lading by gravity through the discharge opening of a foursided load containing hopper comprising, in combination, a horizontally slidable gate having rack teeth on the underside thereof, a rotatable shaft, a pair of pinions endwise slidably and non-rotatably mounted on said shaft and engaging said rack teeth for sliding said gate on rotation of said shaft; and a frame structure for mounting around said discharge opening including a pair of side rail members having inwardly extending walls slidably supporting said gate and walls extending downwardly from the outer edges

of said inwardly extending walls below said gate for attachment to the inner sides of said hopper, and tying means above and below said gate defining an aperture through which said gate is slidable, said tying means above said gate having means for attachment to the outer side of an end wall of said hopper and having end walls overlying and secured to said rail members and carrying bearings rotatably supporting said shaft, said tying means below said gate being of angular section and secured at its ends to said rail members with one flange extending downwardly and the other flange defining the lower margin of said aperture and being notched for receiving said pinions with the end walls of said notches holding said pinions against axial movement on said shaft and in predetermined position with respect to said rack teeth.

8. Means for controlling the flow of lading by gravity through the discharge opening of a foursided load containing hopper comprising, in combination, a horizontally slidable gate having rack teeth on the underside thereof, a rotatable shaft, a pair of pinions endwise slidably and non-rotatably mounted on said shaft and engaging said rack teeth for sliding said gate on rotation of said shaft; a frame structure for mounting on said hopper including a pair of rail members for slidably mounting said gate, bearings carried by said rail member and rotatably mounting said shaft, and a plate-like section interconnecting said rail members adjacent said bearings and being notched for receiving said pinions with the end walls of said notches holding said pinions against axial movement on said shaft and in predetermined position with respect to said rack teeth.

9. Means for controlling the flow of lading by gravity through the discharge opening of a foursided load containing hopper comprising, in combination, a horizontally slidable gate having rack teeth on the underside thereof, a rotatable shaft, pinion means non-rotatably mounted on said shaft and engaging said rack teeth for sliding said gate on rotation of said shaft; a frame structure for mounting inside said hopper and around said discharge opening including supporting ledges for said gate formed of a rolled structural member having angularly related walls and a U-shape to define three sides of said opening; tying means extending between the longitudinally disposed spaced apart sides of said U-shape and intermediate the ends thereof to define the fourth side of said opening, said tying means including a lower member extending between and secured to said sides underneath said gate and an upper member above said gate having end walls overlying said sides and secured thereto; and bearings carried by said end walls and rotatably supporting said operating shaft.

10. Means for controlling the flow of lading by gravity through the discharge opening of a foursided load containing hopper comprising, in combination, a horizontally slidable gate, a pair of side rail members for mounting inside said hopper on opposite sides of said opening for slidably supporting said gate, a tie member extending transversely of said side rail members above said gate for mounting on the outside of said hopper, and end walls depending from said tie member and overlying and secured to said side rail members.

11. Means for controlling the flow of lading by gravity through the discharge opening of a foursided load containing hopper comprising, in combination, a horizontally slidable gate, a pair of side rail members for mounting inside said hopper on opposite sides of said opening for slidably supporting said gate, a tie member extending transversely of said side rail members above said gate for mounting on the outside of said hopper, and end walls depending from said tie member and overlying and secured to said side rail members, portions of said end walls coextensive with said gate being inclined to present a mouth gradually reducing in the direction of closing movement of said gate, said gate having correspondingly flared sides for wedgingly engaging said inclined portions of said end walls.

12. As an article of manufacture for a frame structure for the discharge outlet of a load containing hopper including a sliding gate and side rail members for supporting the gate, and having means for moving the gate including a shaft and interengaging rack and pinion means carried by the gate and shaft respectively; a hopper outlet tie member for extending transversely across the plane of the side rail members and having an inverted V-shaped cross-section with one wall adapted to be attached to a wall of said hopper and having depending end walls adapted to be attached to said side rail members and having bearings for rotatably mounting said shaft.

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