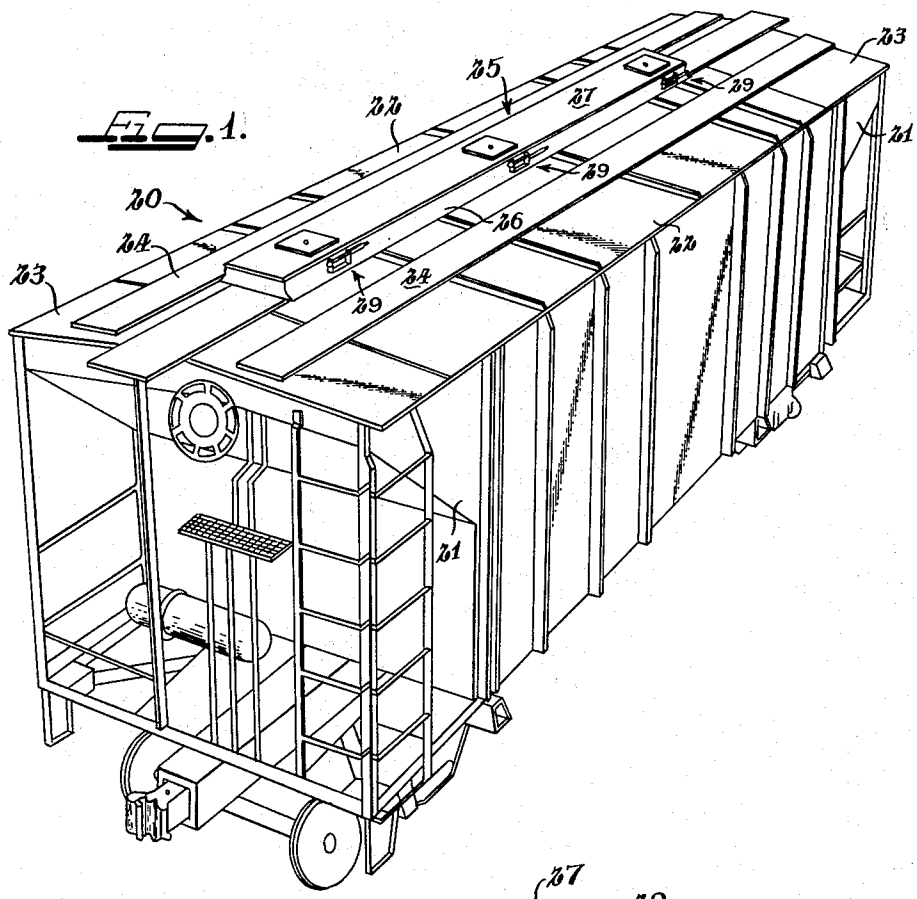
March 30, 1965 W. A. WARHEIT 3,175,519

TROUGH HATCH ARRANGEMENT

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FIG. 1.



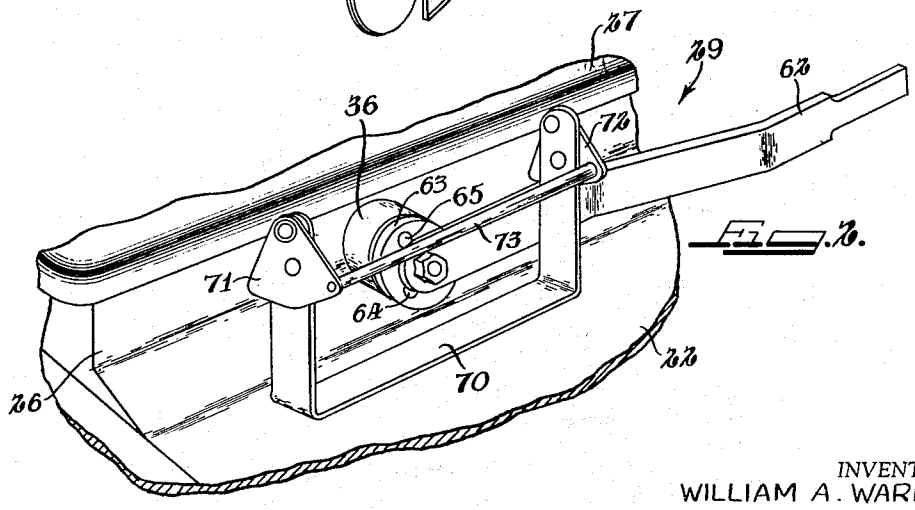


FIG. 2.

INVENTOR.
WILLIAM A. WARHEIT

BY
Greist, Lockwood, Greenawalt & Dewey
Attys.

March 30, 1965 W. A. WARHEIT 3,175,519

TROUGH HATCH ARRANGEMENT

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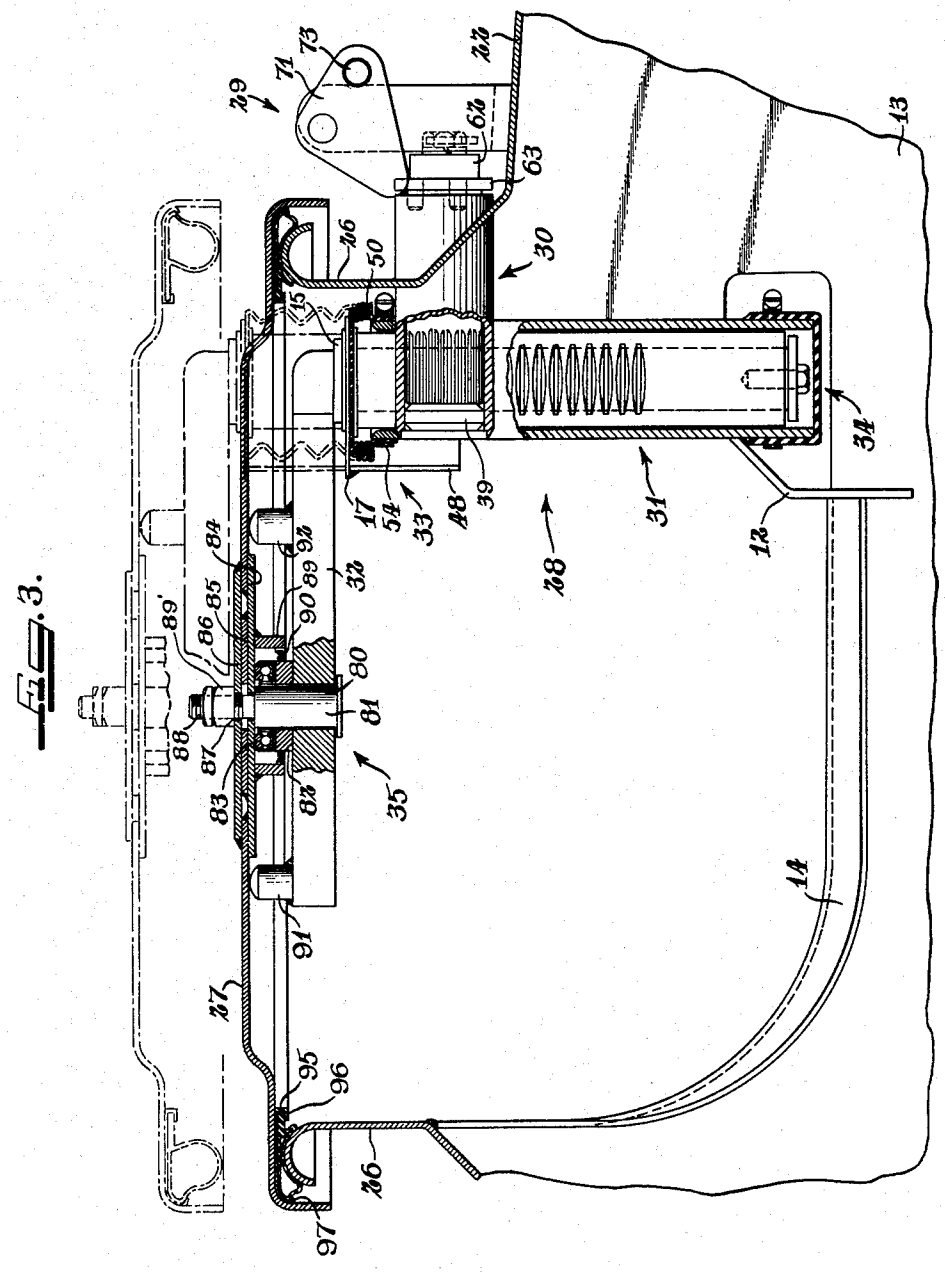


FIG. 3.

INVENTOR.
WILLIAM A. WARHEIT

BY
Greist, Lockwood, Greenawalt & Dewey
Attys.

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TROUGH HATCH ARRANGEMENT

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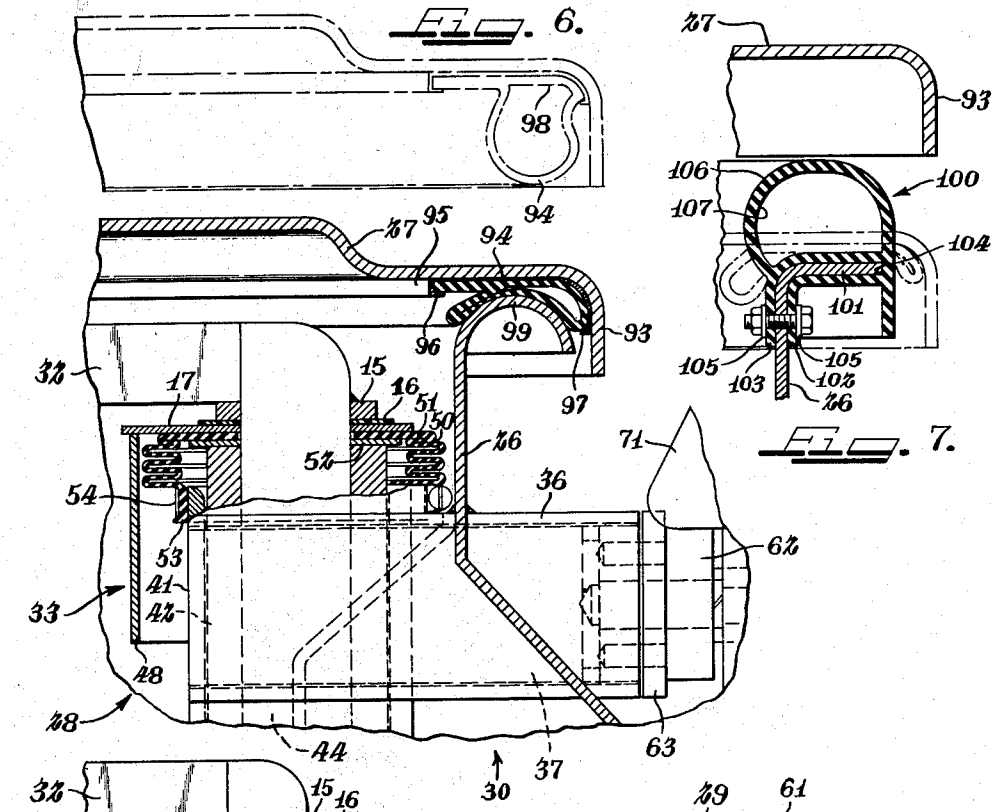


FIG. 6.

FIG. 7.

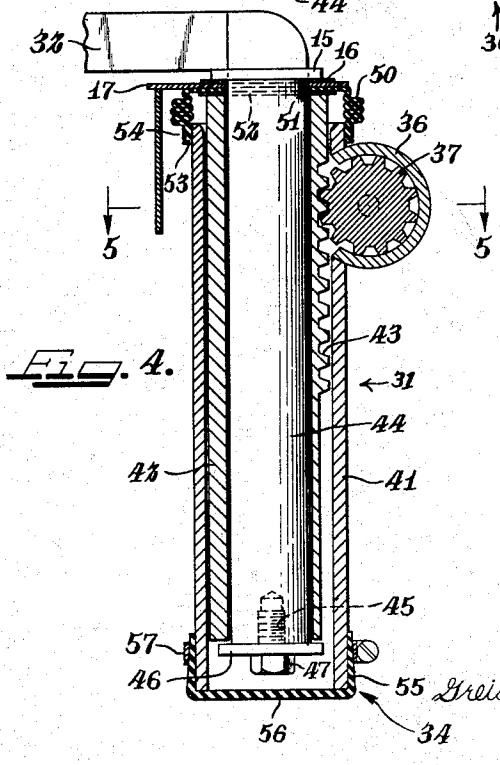


FIG. 4.

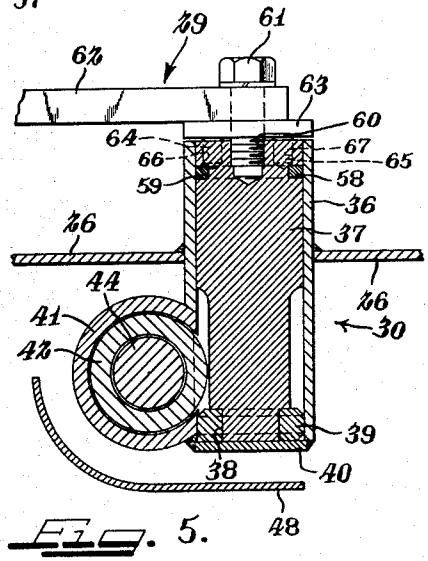


FIG. 5.

INVENTOR.
WILLIAM A. WARHEIT

BY
Greist, Lockwood, Greenawalt & Dewey
Attys.

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3,175,519

TROUGH HATCH ARRANGEMENT

William A. Warheit, Butler, Pa., assignor to Pullman Incorporated, Chicago, Ill., a corporation of Delaware

Filed Feb. 20, 1964, Ser. No. 346,151
15 Claims. (Cl. 105—377)

This invention is directed to improvements in hopper cars particularly those of the type provided with elongated hatch openings and cover plates permitting simultaneous exposure of a plurality of aligned hoppers for simultaneous or continuous progressive material filling thereof. More specifically, the present invention is a continuation-in-part of my co-pending application entitled Trough Type Hatch Operating Arrangement, Serial No. 285,274, filed on June 4, 1963, and deals with improvements of the arrangement set forth therein.

It is an object of the invention to provide new and improved operating means for a trough type hatch arrangement, the operating means permitting efficient hatch cover application and removal.

Another object is to provide a new and improved hopper car having a longitudinally continuous trough type hatch arrangement, including hatch cover plate operating means mounted within the hatch opening along the marginal edges thereof for raising said hatch cover vertically and thereafter permitting movement laterally of the hatch opening.

It is a further object of this invention to provide an operating means for lifting a hatch cover plate and including means to maintain the operating means in hermetically sealed relation with respect to the ambient hatch opening and also against the interior contents of the hopper car while permitting relative movement between the components during hatch cover plate movement.

It is a further object of this invention to provide a hatch cover for co-operation with a rim portion defining an opening in a hopper car including gasket means mounted between the underside of said hatch cover and a rim portion defining the opening thereby sealing the hatch cover to the hopper car to protect the contents.

Further and fuller objects not specifically stated will become apparent from the following detailed description of the invention made in conjunction with the accompanying drawings wherein:

FIG. 1 is a perspective view of a hopper car including an elongated trough type hatch arrangement with the operating means of the invention;

FIG. 2 is an enlarged fragmentary perspective view of the handle and lock arrangement of the present invention;

FIG. 3 is a fragmentary sectional view taken transversely of the hopper car in the region of the operating means and having portions thereof broken away, as well as parts in section to illustrate the details of the present invention and including phantom lines to illustrate the position assumed when the cover plate is in the raised position;

FIG. 4 is an enlarged longitudinal sectional view taken through the operating means of FIG. 3;

FIG. 5 is a cross sectional view taken along the lines 5—5 of FIG. 4;

FIG. 6 is an enlarged elevational view of the upper portion of the operating means and hatch cover plate illustrating the co-operative relationship of the gasket means with the rim defining the hatch opening and phantom lines illustrating the cross sectional configuration assumed by the seal in the absence of external forces; and

FIG. 7 is an enlarged fragmentary cross section of a modified form of rim and gasket with phantom lines to indicate the approximate gasket configuration when the hatch cover is in contact therewith.

A hopper car 20 is illustrated in FIG. 1 including a plurality of longitudinally aligned hoppers 21, only the end ones of which are shown. The hoppers within the car 20 are of known configuration including converging wall sections terminating at the bottom thereof in a materially discharge device which may be of any suitable type for example, gravity feed, pneumatic suction tube or the like. The hoppers are closed off at their tops by side roof sheets 22 and end roof sheets 23 of any suitable arrangement thereby covering the top of the car. Longitudinally extending running boards or catwalks 24 may be located along opposite sides of a trough type hatch arrangement generally designated by the numeral 25 to accommodate workmen during hatch filling operations.

The trough type hatch arrangement 25 includes an elongated, generally rectangular hatch opening defined by a peripherally continuous upstanding rim portion 26 and closed off by a hatch cover plate 27 of a configuration conforming to the opening defined by the sealing rim 26. At spaced intervals along the trough hatch arrangement 25, special operating means 28 is provided which will be specifically described hereinafter in conjunction with FIGS. 2, 3 and 6. Suitable handle and lock assemblies 29 are included in the operating means 28, being mounted for use in controlling the operational positioning of the cover plate 27 between the position shown in FIGS. 1 and 2 in sealed relation with the upstanding rim 26, to the position shown in phantom in FIG. 3 wherein the hatch cover plate 27 is raised vertically to permit horizontal translation thereby providing access through the hatch opening into the tops of each of the hoppers 21.

FIG. 3 illustrates the relationship of the basic components of each operating means 28 including a horizontally disposed drive or gear means indicated generally at 30 which intersects a vertically disposed rack assembly 31 mounted along the interior marginal edge of the opening. A hatch cover support means, in the form of a horizontally extending pivot arm 32, extends transversely or diagonally across the undersurface of the hatch cover 27 to pivotally support the same through a pivoting arrangement provided by the pivot assembly 35, portions of which are illustrated in section.

In the car illustrated in FIG. 1, three operating means 28 are utilized for vertical movement of the hatch cover plate 27. Each operating means 28 is best illustrated in FIG. 3 being mounted in association with a transversely extending stiffener plate 13 having the top marginal edge covered by a baffle plate 14. The operating means is fixed to the stiffener plate 13 adjacent the hatch opening. An angle plate 12 straddles the horizontal portion of the stiffener plate 13 and aids to stabilize the mounting for the operating means 28.

Fluidtight integrity between the moving and stationary components of the rack assembly 31 is maintained by an upper seal and shield assembly indicated generally at 33. The lower end portion of the rack assembly 31 is sealed off by a lower seal assembly indicated generally at 34. The specific details of the upper and lower seal assemblies 34 and 33 will be discussed more completely hereinafter in conjunction with the enlarged views of FIGS. 4–6.

FIGS. 3–6 also illustrate the basic components of the operating means 28 in greater detail. The gear means 30 includes a tubular gear housing or sleeve 36 suitably attached to the rim 26 and rotatably receiving a special pinion gear 37 therein. The inner end of the tubular housing 36 may be capped off or closed by means of a cover plate 40 joined thereto by welding or the equivalent. The inner end of the pinion gear 37 is provided with gear teeth adjacent an inner end portion 38 of reduced diam-

eter. A bearing collar 39 having an outside diameter equal to or slightly greater than the major diameter of the gear teeth is received over the portion 38 of reduced diameter with a press fit and co-operates with the internal walls of the tubular housing 36 to provide a bearing for smooth rotation of the pinion gear 37. In addition the collar prevents withdrawal of the pinion gear 37 from the housing 36 while in operative engagement with the co-operating rack member.

As best seen in FIG. 4, the teeth on the pinion gear 37 project into a tubular housing 41 forming a part of the rack assembly 31. The tubular housing 41 intersects the tubular pinion gear housing 36 at right angles, and mounts therein a tubular rack member 42 having a plurality of transversely disposed teeth 43 in meshing engagement with the teeth provided on the pinion gear 37. Spur gear teeth of the type illustrated are preferably used for smooth operation of the rack and pinion members. It is obvious on inspection of FIG. 4 that rotation of the pinion gear 37 in a clockwise direction causes the tubular rack member 42 to move in a vertically upward direction.

While the rack member 42 is vertically slidable in the tubular housing 41, rotation of the rack 42 is prevented by the use of horizontally straight teeth 43 in meshing engagement with the teeth on the pinion gear 37. The tubular rack member 42 receives a vertically extending pivot shaft 44 having a lower end which is drilled and tapped as at 45. A bearing plate 46 of greater diameter than the pivot shaft 44 but less diameter than the outside diameter of the tubular rack 42 is joined to the lower end of the pivot shaft 44 by means of a bolt 47. Relative movement between the pivot shaft 44 and the tubular rack member 42 in a vertically upward direction is prevented by the collar 46 engaging the lower end of the rack member 42.

The upper end of the pivot shaft 44 is provided with a collar 15 adjacent the horizontal pivot arm 32 which may be formed integral with the shaft 44 or attached thereto by suitable means such as welding or the like. Interposed between the collar 15 and the upper end of the rack member 42 is provided a washer 16 formed of Teflon or like material to provide a good bearing surface readily permitting movement of the collar 15 relative to the washer. The upper seal and shield assembly 33, in addition to the washer 16 disposed immediately below the collar 15, includes a plate 17 disposed below the washer 16. The plate 17 is provided with a depending flange 48 which is spaced from the housing 41 and as seen in FIG. 6 extends from adjacent the rim 26 in an arcuate manner to a point slightly beyond the longitudinal axis of the pinion gear 37. The depending flange or skirt 48 serves to provide a guard for a flexible boot 50 having a thickened upper end portion 51 which is cemented or bonded to the underside of the plate 17. A washer 52 protects the underside of the thickened portion 51 of the boot 50 from being damaged by the end of the tubular rack member 42. The construction described forms a fluidtight joint preventing ingress of foreign materials past the pivot shaft 44 into the rack housing 41.

The flexible boot 50 is provided with multiple folds to accommodate relative movement between the pivot shaft, rack and housing, with the lower fold terminating in a thickened axially projecting end portion 53 which is received over the outer circumferential portion of the rack housing 41. Suitable means such as a stainless steel worm driven hose type clamp 54 may be provided to constrict the thickened portion 53 into fluidtight engagement with the rack housing 41 and maintain the lower end of the boot joined thereto.

The lower end of the rack housing 41 is capped off by means of an annular seal means 34 having an upstanding circumferential portion 55 joined to a continuous bottom portion 56. A radially constricting clamp member 57 of the type described in connection with the upper seal assembly 33 is used to maintain the circumferential portion 55 in fluidtight engagement with the rack housing 41.

The upper and lower seal assemblies serve to protect the working parts of the operating means 28 from the ingress of foreign materials. As is often the case, gritty powdery substances such as cement, grain, fertilizer and the like are carried in the hopper car. In transit as well as in loading and unloading operation, dust from the lading, if permitted to enter the housings carrying the working parts of the operating means, could have an injurious effect thereon in the form of abrading the parts and or attacking the metals. The seal assemblies prevent this while maintaining lubricant within the housings to enhance the smooth operation of the working components. The shield 48 prevents materials being loaded from impinging directly on the rather fragile flexible boot 50.

The pinion gears 37 is provided with an outer end portion which terminates adjacent the outer end of the tubular housing 36 exteriorily of the rim 26. An annular gasket 58 is received in a circumferential groove 59 provided adjacent the outer end portion of the pinion gear 37. A central bore 60 is formed coaxial with the axis of the pinion gear 37 and is tapped to receive a bolt member 61 mounting an operating handle 62. An annular drive collar 63 is interposed between the end of the pinion gear 37 and the handle 62 to provide a driving connection which is readily adjustable. The annular collar 63 is formed with a plurality of apertures which receive dowel pins 64 and 65. Suitable bores 66 and 67 are formed about the axis of the central bore 60 in the end of the pinion gear 37 to receive the dowel pins 64 and 65 respectively in order to provide good driving engagement. An arrangement having a three pin drive has been found to be satisfactory in practice. The handle construction illustrated may be readily adjusted to obtain the best locking and sealing action by backing off the bolt 61 a slight amount, permitting the handle to be moved angularly to the appropriate position and the bolt 61 tightened with the handle positioned to co-operate with locking means indicated generally at 29 in FIG. 2.

Locking means 29 includes a U-shaped bracket 70 welded or otherwise suitably attached to the roof sheet 23. On each of the upstanding leg portions of the U-shaped bracket 70 is mounted a cam locking member 71 and 72. A cam operating handle 73 joins the two cam locking members 71 and 72, and as illustrated in FIG. 2 cam member 72 is in engagement with the operating handle 62 to maintain it downwardly disposed when the hatch covers the hatch opening. In this position, the hatch cover is pulled downwardly onto the rim 26 to maintain it tightly disposed thereon throughout transit. The cam locking member 71 comes into use after the trough hatch has been raised, serving to maintain the trough hatch in the raised position, as will be described more completely hereinafter.

The pivot assembly 35 mounting the hatch cover for swinging movement on the pivot arm 32 is shown in FIG. 3 with portions broken away to illustrate the details thereof. A central bore 80 is provided intermediate the end portions of the pivot arm 32 and receives a bearing bolt 81 extending through an annular bearing block 82 which is provided with a shouldered portion for supporting the lower race of a thrust bearing 83. The upper race of the thrust bearing assembly 83 is in engagement with the underside of a lower reinforcing plate 84 welded at its marginal edges to the underside of the hatch cover 27. A central reinforcing plate 85 and top reinforcing plate 86 form a sandwich being welded to the lower reinforcing plate 85 and hatch cover 27 respectively, forming an integral assembly. A central aperture 87 is provided centrally of the reinforcing plates to receive the threaded end portion 88 of the bearing bolt 81. A lock nut arrangement 89' joins the bearing bolt to the hatch cover with a liberal application of suitable gasket or caulking mate-

rial therebetween to prevent entry of foreign material into the bearing 83.

A tubular sleeve 89 is welded to the underside of the plate 84, and projects downwardly surrounding the bearing 83 and a portion of the bearing block 82. Suitable annular seal means 90 is interposed between the tubular sleeve 89 and the outer circumferential surface of the bearing block 82 to prevent the ingress of foreign material into the bearing 83.

A pair of outrigger bearing members 91 and 92 are provided on the pivot arm 32 on opposite sides of the bearing bolt 35 being adapted to engage the underside of the hatch cover plate 27 should the cover plate be unequally loaded. As illustrated, the hatch cover is in a balanced condition with the upper ends of the pin-like bearing members 91 and 92 slightly spaced from the underside of the hatch cover. The central thrust bearing 83 transfers the vertical load due to the weight of the cover plate 27 to the arm 32 which is supported by the operating means 28. This arrangement permits free transverse movement of the cover plate after it has been raised.

As best seen in FIG. 6, the outer marginal edge of the hatch cover plate 27 is curled downwardly to provide a depending flange or skirt portion 93. Adjacent the depending flange portion 93 is provided a gasket 94, which may be joined to the underside of the hatch cover 27 by means of a gasket retainer 95. It is contemplated that the gasket retainer may be welded or suitably joined to the underside of the hatch cover, and the gasket inserted thereafter to be held by the retainer lug portions 96 and 97. As illustrated in the phantom view of FIG. 6, the gasket 94 in cross section assumes a bag-like configuration, having a hollow interior portion 98 which expands when the trough hatch cover plate 27 is raised away from the rim 26. The upper marginal portion of the rim 26 is formed with a curled or arcuate surface 99 for providing a substantial smooth co-operating gasket area when the hatch cover is lowered into sealing engagement. The novel hollow gasket design readily accommodates any irregularities in the co-operating rim to provide excellent sealing action against the ingress of foreign material which might have an injurious effect on the hopper car contents.

A similar but modified form of gasket is illustrated at 100 in the fragmentary view of FIG. 7. In this design, the rim portion 26 is formed with an outwardly projecting flange 101 which is substantially at right angles to the vertically extending portion of the rim 26. A pair of spaced generally L-shaped leg members 102 and 103 form an L-shaped channel 104 to receive the horizoztnal flange 101 of the rim and extend downwardly along a portion of the vertically disposed section of the rim portion 26. A series of fastener assemblies having washers on opposite sides as at 105, extend through the rim and pierced portions of the legs 103 and 102 to maintain the gasket joined to the rim 26. A continuous strip may be substituted in lieu of the washers if desired.

The upper or sealing portion of the gasket 106 is similar to the embodiment of FIG. 6 having a hollow interior as at 107 to provide good flexibility for conforming with any irregularities in the underside of the hatch cover 27. When the hatch cover is moved to the closed position as illustrated in phantom, the gasket assumes the configuration illustrated in phantom, providing a weather tight seal against the elements to protect the container contents. Either of the novel gasket constructions illustrated is suitable to provide excellent gasketing when used in conjunction with co-operating surfaces which may have slight irregularities therein.

A brief description of the operation of the novel hatch cover and sealing arrangement will now be given. In order to raise the hatch cover 27 and move it transversely to expose the hoppers 21 for loading, the cam operator handle 73 is pulled upwardly moving the cam lock 72 away from the handle 62 to release the same. The handle 62 is pulled upwardly and rotated through 180°, resulting in rotation of like magnitude of the pinion gear 37, causing the rack member 42 to move to the extended position illustrated in phantom in FIG. 3. The pivot arm 32 rises with the sleeve rack member 42 and operates to lift the cover plate 27 to an extent that the depending flange 93 or depending flange or skirt 93 of the cover plate clears the rim 26.

When all of the external handle and lock assemblies 29 have been thus operated, a single operator can push the hatch cover plate laterally of the hatch opening in the manner fully shown and described in my co-pending application alluded to above. With the cover plate in this position the entire hatch opening is available for material loading in a continuous manner to fill each of the individual hoppers of the car. When the cover plate is raised initially, the cam lock 71 is swung inwardly to maintain the handle 62 held downwardly against the roof sheet 23 to maintain the hatch cover in the raised position.

Upon completion of the loading operation the hatch cover is moved into vertically aligned relation with the hatch opening and the cam lock 71 released by pulling upwardly on the handle 73. The handle 62 may be returned to the position shown in FIG. 2 and locked to cause the hatch cover to be pressed downwardly thereby squeezing the gasket between the upper portion of the rim 27 and the underside of the hatch cover. Due to the flexibility of the present gasket constructions, excellent sealing action is afforded between the rim and hatch cover which will remain fluidtight during car impacting and all changes of climatic conditions. The operating means for the hatch cover and the pivot assembly 35 is also sealed interiorly and exteriorly to maintain the lubrication in, and abrasive and corrosive foreign matter out. These features taken in conjunction with the novel operating means provide simple and efficient operation of the hatch cover requiring a minimum of effort.

Obviously, certain modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. In a hopper car having a plurality of aligned hoppers provided with a continuous hatch opening which is defined by a continuous upstanding rim, and a single hatch cover plate enclosing said opening with marginal portions thereof in sealing engagement with said rim, the provision of a hatch cover plate operating means mounted in said opening and comprising, a first housing joined to said rim portion and projecting inwardly therethrough into said hatch opening, gear means mounted for rotation in said housing about a transverse horizontal axis, a second housing intersecting said first housing at right angles with respect thereto, rack means mounted in said second housing having tooth portions thereof in meshing engagement with said gear means for reciprocating movement in a generally vertical direction in response to rotation of said gear means, and horizontal cover plate support means having a first end pivotally attached to said rack means and reciprocably movable therewith while being pivotally movable relative thereto, said horizontal cover plate support means having a central portion joined to said single hatch cover plate between the side marginal edges thereof to provide for raising and lowering of said cover plate upon operation of said gear means, a flexible boot having one end attached to said rack means for movement therewith and the other end of said flexible boot being joined to said second housing at the upper end thereof, and means capping off the lower end of said second housing, said flexible boot and said means capping off the lower end of said housing permitting vertical movement of said rack means and pivoting movement of said cover support means while main-

taining said second housing sealed against the ingress of foreign material.

2. The hopper car of claim 1 wherein said upstanding rim is provided with an arcuate top portion and seal means is mounted on the underside of said hatch cover being adapted to co-operate with said arcuate top portion when said hatch cover is in sealing engagement with said rim.

3. The hopper car of claim 2 wherein said seal means comprises an annular hollow elastomeric member joined to the underside of said hatch cover.

4. The hopper car of claim 1 wherein said gear means in said first housing is provided with a plurality of cylindrical bores generally parallel to a threaded central bore coaxial with the axis thereof, seal means surrounding said gear means adjacent the outer end thereof inwardly of the bottom of said cylindrical bores, and handle means joined to said gear means for rotation thereof to raise and lower said hatch cover.

5. The hopper car of claim 1 wherein shield means is provided outwardly of said flexible boot.

6. The hopper car of claim 1 wherein said gear means is provided with an annular bearing collar on the inner end thereof.

7. The hopper car of claim 1 wherein a handle is adjustably joined to said gear means outwardly of said rim, said handle being joined to said gear means through a drive collar, said drive collar having a plurality of drive pins projecting into axially opening bores in said gear means and a central bolt passing through said handle and collar and being threadably received in a central bore in said gear means for clamping said handle to said collar.

8. In a hopper car having a plurality of aligned hoppers provided with a continuous hatch opening which is defined by a continuous upstanding rim, and a single hatch cover plate enclosing said opening with marginal portions thereof in sealing engagement with said rim, the provision of a hatch cover plate operating means mounted in said opening and comprising, a first housing joined to said rim portion and projecting inwardly therethrough into said hatch opening, gear means mounted for rotation in said housing about a transverse horizontal axis, a second housing intersecting said first housing at right angles with respect thereto, rack means mounted in said second housing having tooth portions thereof in meshing engagement with said gear means for reciprocating movement

in a generally vertical direction in response to rotation of said gear means, and horizontal cover plate support means having a first end pivotally attached to said rack means and reciprocably movable therewith while being pivotally movable relative thereto, said horizontal cover plate support means having a central portion joined to said single hatch cover plate between the side marginal edges thereof to provide for raising and lowering of said cover plate upon operation of said gear means, and a hollow deformable bag like gasket interposed between said rim portion and said hatch cover to provide a fluid-tight seal therebetween.

9. The hopper car of claim 8 wherein mounting means is provided for said gasket on the underside of said hatch cover.

10. The hopper car of claim 8 wherein said gasket comprises a hollow readily deformable bag like member having spaced generally L-shaped leg portions, and said rim portion terminates in a lateral flange receiving said L-shaped leg portions and means joining said gasket to said rim portion.

11. The hopper car of claim 8 wherein a flexible book is joined at opposite ends to said housing and to said rack means to permit relative sealed movement therebetween.

12. The hopper car of claim 11 wherein a shield is provided outwardly of said flexible boot to protect the same from damage during filling.

13. The hopper car of claim 8 wherein a flexible boot is joined to said second housing at a first end and to said rack means at a second end to permit sealed movement of said rack means relative to said second housing as well as sealed movement of said horizontal cover plate support means relative to said rack means.

14. The hopper car of claim 13 wherein said second end of said flexible boot is joined to said rack means by joining to the underside of a plate carried on said rack means and a collar carried on said horizontal cover plate support means is disposed immediately above said plate and antifriction means is interposed between said collar and said plate to permit sealed movement of said collar relative to said plate.

15. The hopper car of claim 14 wherein said plate is provided with a downwardly projecting shield to protect said boot.

No references cited.

LEO QUACKENBUSH, *Primary Examiner.*