July 5, 1966 C. R. RADEY ETAL 3,259,078

TROUGH HATCH COVER AND OPERATING MECHANISM

Filed Sept. 14, 1964 4 Sheets-Sheet 1

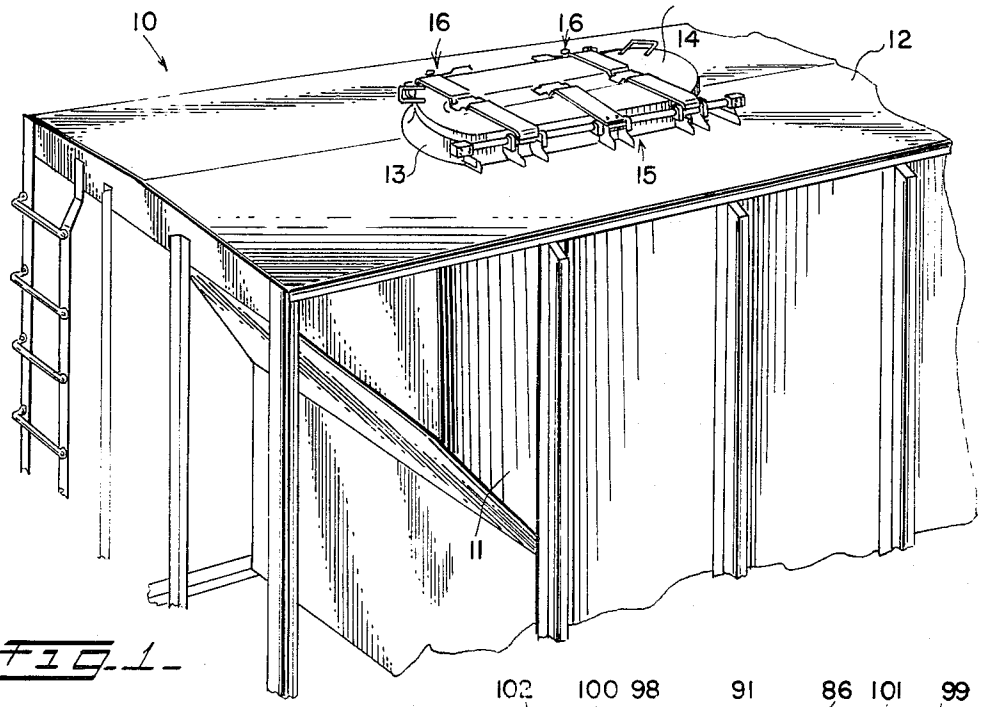


FIG. 1

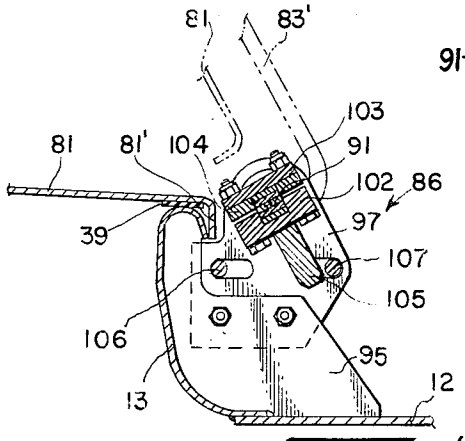


FIG. 10

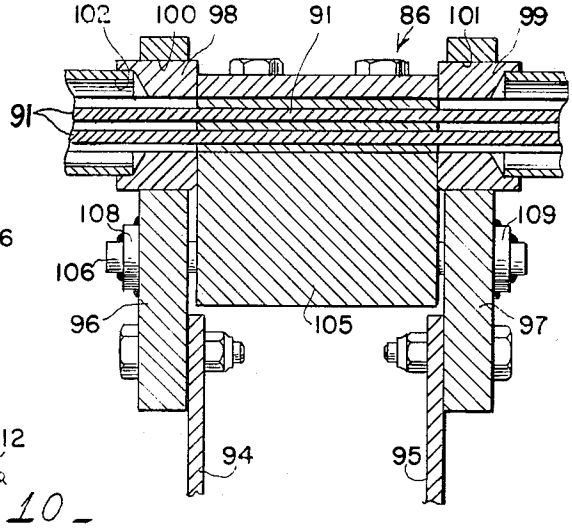


FIG. 11

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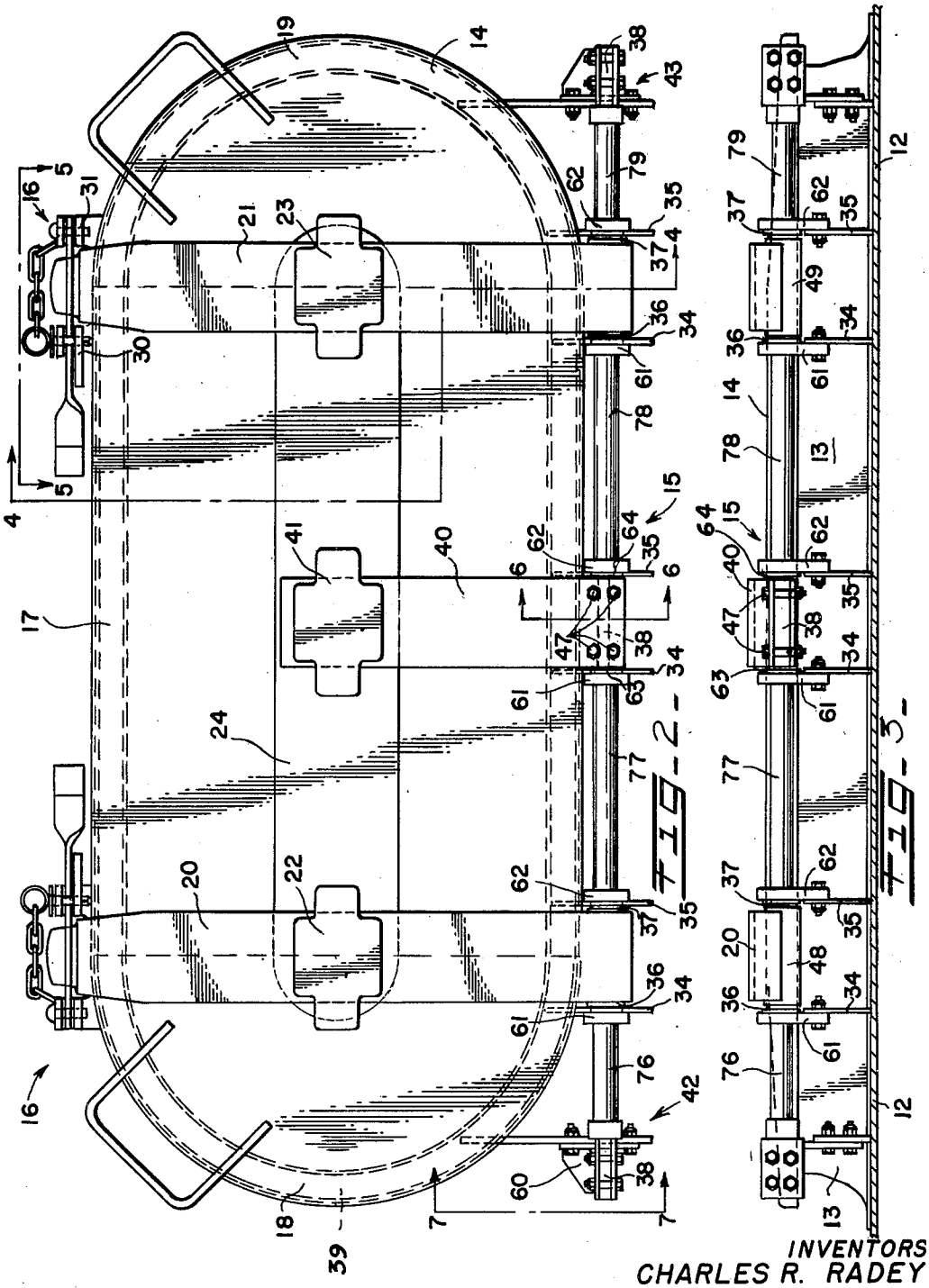


FIG. 2

FIG. 3

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TROUGH HATCH COVER AND OPERATING MECHANISM

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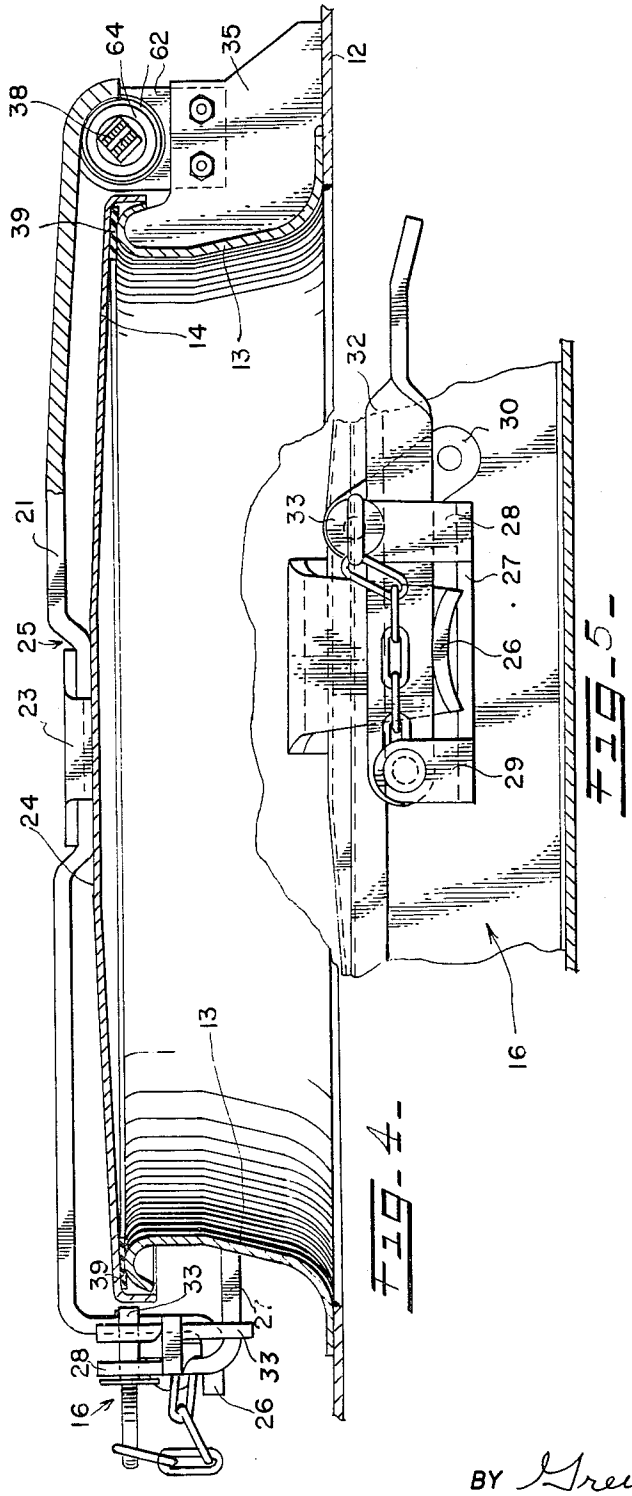


FIG. 4

FIG. 5

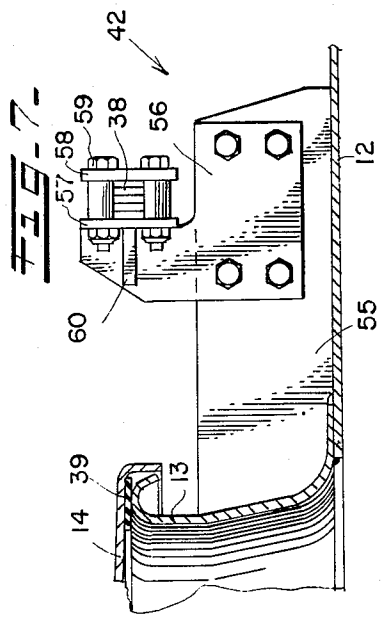


FIG. 7

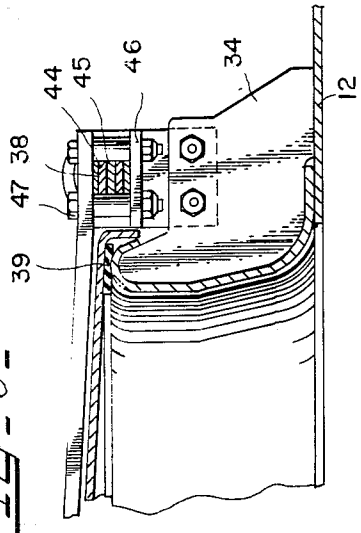


FIG. 6

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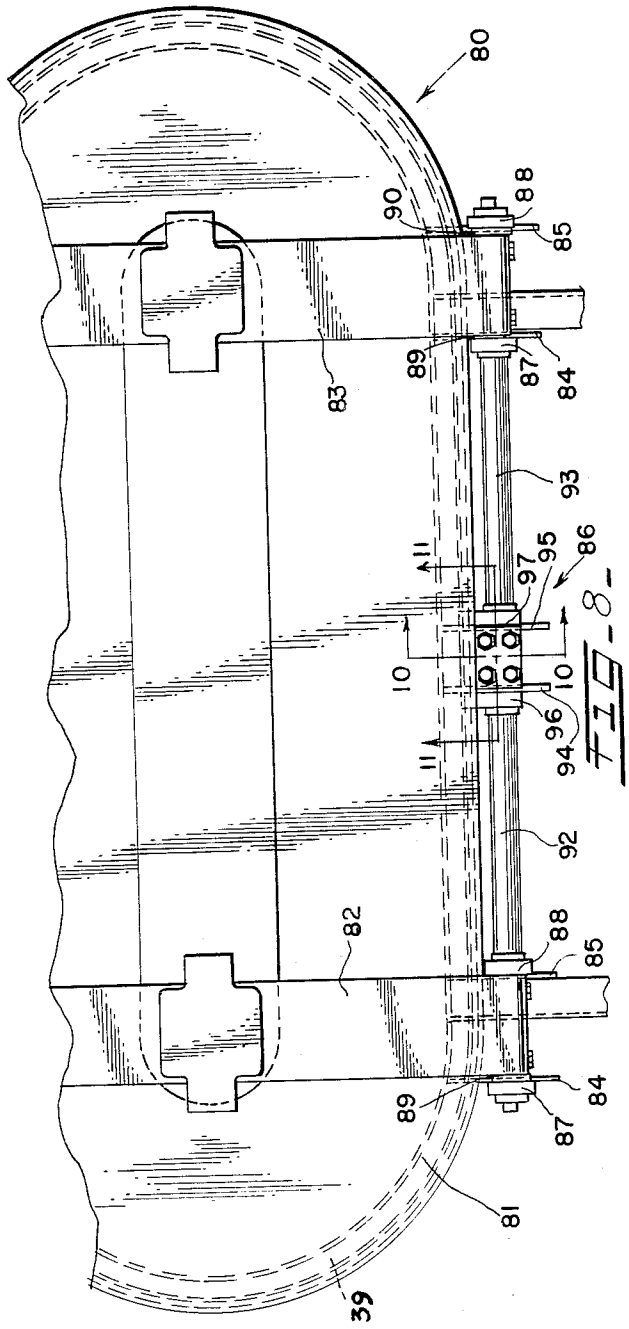


FIG. 8

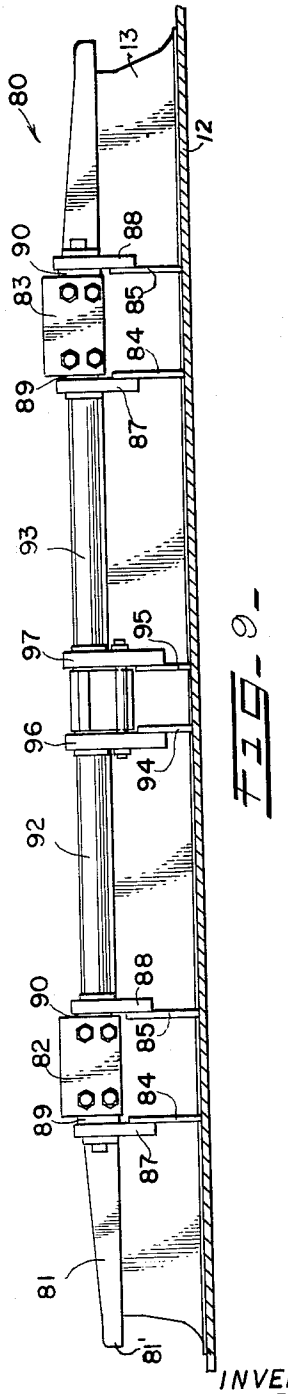


FIG. 9

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3,259,078

Patented July 5, 1966

3,259,078

TROUGH HATCH COVER AND OPERATING MECHANISM

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Filed Sept. 14, 1964, Ser. No. 396,332
2 Claims. (Cl. 105—377)

This invention is directed to improvements in hopper vehicles particularly those of the type provided with elongated hatch openings closed off by a hinged hatch cover plate and having means associated therewith whereby when the hatch cover plate is unlocked, it will be automatically biased to an "open" position exposing the hopper or hoppers covered and permitting unimpaired filling.

More specifically, the present invention deals with a new and improved hopper car having an elongated hatch opening with arcuate end portions which is covered by a hatch cover of similar shape. Suitable means co-operates with the hatch cover and car to automatically bias the hatch cover to an "open" position in the absence of external forces. Automatic opening of the hatch cover when unlocked not only enhances the ease with which the hatch cover may be raised and lowered but also serves to maintain the hatch cover in the "open" position so that loading may be effected with optimum ease.

Covered hopper vehicles such as hopper-type railway cars of usual design are provided with a plurality of longitudinally aligned hoppers having material discharge portions at the lower end of each. In the use of such cars, loading is accomplished through an overhead type of movable chute with the material being fed to the hopper through a hatch opening in communication with a hopper. A hatch cover is hingedly attached to the car and may expose a single hopper or a plurality of hoppers depending upon its length. For obvious reasons, the length is kept within reasonable dimensions. The present hatch cover is provided with arcuate end portions joined by a rectangular center section having an over-all exterior contour which is an elongated race track pattern. The use of arcuate end portions permits the covers for the hopper car to be manufactured with greater economy than was experienced in the past, while providing a cover arrangement which contributes to the structural rigidity of the roof portion of the car. In addition, the hatch cover of the present invention provides a superior type of resistance to the weather when provided with gaskets available on the open market.

An analysis of the more prominent objects stated below and the detailed description which follows will exemplify the importance of the advantages stated as well as pointing out additional benefits obtained by the present construction.

An object of the present invention is to provide a new and improved cover arrangement for a hopper car hatch opening including an operating means for ready and efficient hatch cover opening and closing.

A further object of the present invention is to provide a new and improved hatch cover arrangement for use on hopper cars wherein the hatch cover and opening are shaped in a novel manner to provide greatest structural rigidity at the opening, best weather tightness under expected conditions, and a universal design which permits the hatch covers to be made of any desired length without requiring special dies or the like.

It is a further object of the invention to provide a hatch cover for hopper cars having a uniquely mounted torsion bar arrangement which enhances the opening and closing of the hatch cover.

Other objects not specifically stated will become apparent to those skilled in the art when a detailed description of the invention is made in conjunction with the accompanying drawings wherein:

FIG. 1 is a perspective view of a fragmentary upper end portion of a hopper car including the hatch cover and operating arrangement of the present invention;

FIG. 2 is an enlarged plan view of the hatch cover and operating arrangement illustrated in FIG. 1;

FIG. 3 is an enlarged elevational view of the hatch cover and operating arrangement of FIG. 1;

FIG. 4 is a cross sectional view taken generally along the lines **4**—**4** of FIG. 2;

FIG. 5 is a fragmentary elevational view of the locking arrangement taken generally along the lines **5**—**5** of FIG. 2;

FIG. 6 is a fragmentary cross sectional view taken along lines **6**—**6** of FIG. 2 illustrating the attachment of the strap hinge operatively joined to the torsion bar;

FIG. 7 is an end elevational view with portions of the hatch shown in section taken generally along the lines **7**—**7** of FIG. 2;

FIG. 8 is a fragmentary plan view of a hatch cover similar to FIG. 2 illustrating a modified form of operating means;

FIG. 9 is a side elevational view facing the hinges of the hatch shown in FIG. 8;

FIG. 10 is an enlarged cross sectional view taken along the lines **10**—**10** of FIG. 8; and

FIG. 11 is an enlarged cross sectional view taken along the lines **11**—**11** of FIG. 8 illustrating the torsion bar adjustment.

In FIG. 1 of the drawings, reference numeral **10** denotes a fragmentary upper end portion of a hopper car having the usual hoppers designated at **11** (only the end one of which is shown) suitably shaped to direct material downwardly into discharge openings formed in the bottom of the car. The top of the hopper car **10** is closed off with a roof portion formed by roof sheets indicated generally at **12**. Centrally of the roof portion **12** is formed an opening (not shown) around which is placed a hatch coaming **13**. The hatch coaming **13** is adapted for cooperation with a hatch cover indicated at **14**, the latter being operatively joined to a hatch cover operating means indicated generally at **15**. The construction of the hatch cover and associated operating means will be described with greater specificity in the description of FIGS. 2–11 below.

Suitable locking means **16** serve to draw the hatch cover **14** downwardly into tight engagement with the hatch coaming **13**, when filling of the hopper car is completed, sealing off the hatch opening of the hopper car **10** against the elements. An elastomeric gasket **39** is interposed between the arcuate upper edge of the coaming **13** and the underside of the cover **14** to perfect the seal. The shape of the hatch cover **14** provides for substantially uniform pressure at all points around the hatch coaming for sealing perfection. This permits products which would normally be damaged or destroyed by contact with the elements to be transported in bulk with minimum effort.

Referring now to the enlarged views of FIGS. 2 and 3, the more detailed features of the present invention can be readily appreciated. The hatch cover **14**, when viewed in plan, is of elongated design having arcuate end portions. Expressed another way, the outline is of race track shape.

In the manufacture of hatch covers **14**, a central rectangular section **17** is joined to the semicircular end portions **18** and **19** to form the hatch cover **14**. In this manner, the hatch cover can be made to any specified size by merely increasing the length of the rectangular center section **17**. The present design permits the semicircular

end portions 18 and 19 to be fabricated in the same die in order to keep manufacturing costs at a minimum.

A pair of strap hinges 20 and 21 are joined to the hatch cover through hinge retainers 22 and 23 welded to the central portion of the hatch cover 14. The center section of the hatch cover 14 may be raised as at 24 to provide the usual slope required to shed water.

Referring to FIGS. 4 and 5, the configuration of the strap hinge construction in endwise elevation is more clearly seen. The strap hinge 21 is provided with a depressed center section 25 to receive the hinge retainer 23 for welding to the hatch cover 14 in the manner described above. The strap hinge 21 extends downwardly over the marginal edge of the hatch cover 14 and terminates in an outwardly projecting flange 26 which co-operates with the locking means 16.

The locking means 16 includes a hatch coaming supported L-shaped bracket 27 which curls into longitudinally spaced upstanding lugs 28 and 29. Additional upstanding lugs 30 and 31 are formed inwardly of and parallel to the upstanding lugs 28 and 29. The lugs 28–31 are provided with aligned apertures for reasons to become apparent. Lugs 29 and 31 form a hinge to pivotally mount a locking handle 32 movable downwardly between the spaced lugs 28 and 30. A retainer bolt or pin 33 is received through the aligned apertures and retains locking handle 32 in a horizontal or locked position overlying the top of the flange 26. The inner end of the retainer pin 33 may be provided with a cross slot to receive the usual seal. On the hinge strap 20 a locking means is provided which is identical to that shown in FIGS. 2, 4, and 5.

Referring once again to FIGS. 2–4, it can be observed that each of the hinge straps 20 and 21 is mounted for hinged movement by means of hinge brackets 34 and 35 which are suitably joined as by welding to the roof sheets of the hopper car 10. The hinge brackets 34 and 35 may conform with the configuration of the hatch coaming 13 at their inner edges if desired to facilitate ease of joining to the coaming 13. Hinge bearing members 36 and 37 are carried by bearing holders 61 and 62 bolted to the brackets 34 and 35 and mounts a hinge sleeve 49 which is joined to the torsion bar hinge strap 40 for rotation in the bearing holders 61 and 62.

It is to be appreciated that the hinge construction of the present invention is of a relatively simple but exceedingly sturdy design capable of withstanding the normal abuse anticipated in operational use. In addition, the design is advantageous in that it is relatively inexpensive to manufacture when operational performance is considered.

The operating mechanism 15 is best seen in FIGS. 2 and 3 and includes a torsion bar 38 joined to a torsion bar hinge strap 40 for rotation therewith. The torsion bar hinge strap 40 is attached to the hatch cover 14 by means of a hinge retainer 41 which is identical in construction to the hinge retainers 22 and 23. Mounting brackets 34 and 35 position the hinge strap for rotary movement by torsion hinge bearings 63 and 64 which rotate with the torsion bar 38. The torsion bar 38 passes through the tubular hinge bearing members 36 and 37 and is free to move within the same.

As is seen in FIGS. 2 and 3, torsion bar mounting assemblies 42 and 43 are provided outwardly of the hinge straps 22 and 23 for gripping opposite ends of the torsion bar 38 to restrain rotation. Housings 76, 77, 78 and 79 encase the torsion bar 38 between the hinges and the free ends to protect the same from impact damage and the elements. These housings may be formed of tubular stock such as steel pipe or the like which is readily available on the open market.

Referring to FIGS. 6 and 7, the cross sectional construction of one preferred form of torsion bar is seen. Torsion bar 38 includes a plurality of stacked plates 44 separated by suitable spacers 45 at the clamping points. The torsion bar 38 is clamped at the center portion as seen in FIG. 6, to the torsion hinge strap 40 by means of a clamping plate 46 and a plurality of bolts 47. As the torsion hinge strap 40 moves with the hatch cover 14, the torsion bar 38 is rotated at the center section while the fixed mounting assemblies 42 and 43 restrain the ends against rotation. A greater appreciation of this can be had by examining FIGS. 2–4 and 7 which illustrate the static position of the torsion bars at the torsion hinge strap 40 and the fixed torsion mounting assemblies 42 and 43 when the hatch cover 14 is closed. The torsion bar is twisted a full 90° between the center portion or torsion hinge strap 40 and each of the torsion anchor assemblies 42 and 43 with the angulation of the sides of the torsion bar 38 being slightly in excess of 45° with respect to a horizontal plane as it passes through the strap hinges 20 and 21. This stresses the torsion bar so that on release of the hatch cover 14 it will automatically open.

As seen in FIG. 7, the torsion bar fixed mounting assembly 42 includes a mounting plate 55 which may be welded along the bottom edge to the roof portion 12 and directly to the hatch coaming 13 along one vertical edge. An L-shaped plate 56 is bolted or welded to the mounting plate 55 and is provided with a longitudinally extending clamping plate 57. The torsion bar 38 is clamped between a second clamping plate 58 and the longitudinal clamping plate 57 by means of a plurality of bolts 59. In this manner the free end of the torsion bar 38 is held against rotation. It is to be appreciated that considerable torque is developed during hatch cover opening and closing, and in order to resist this torque a corner reinforcing plate 60 is provided to strengthen the assembly. The fixed torsion bar mounting assembly 43 holds the opposite end of the torsion bar 38 in an identical manner and in the interest of brevity, detailed description will be withheld.

When the hatch cover is in the "closed" position, the torsion bar 38 is twisted a full 90° relative to each of its free ends. As is well known, shear modulus is a function of the length and cross sectional area of a rod or tube and in the present design the length can be extended to obtain any desired force. Accordingly, the elastic behavior of the torsion bar may be governed to suit any desired load by merely changing the length and/or cross sectional area of the torsion bar. The former may be readily accommodated by setting the torsion bar mounting assemblies 42 and 43 outwardly with little or no effect on the remaining components.

When the torsion bar 38 is of laminated form as illustrated, adjustments in the spacers and substitution of a thicker or thinner lamina forming the torsion bar member may be conveniently effected to obtain a wide range of torque values, while the remaining components of the hatch cover and operating means remain substantially unchanged.

It is contemplated that the torsion bar 38 will assume an unstressed condition when the hatch cover is positioned generally vertical. Obviously, the weight of the hatch cover 14 applies a slight load to the torsion bar 38 and in the absence of external forces the hatch cover 14 will be angulated about 60° or 70° relative to a purely horizontal plane lying in the opening. These values, of course, will be dependent upon the torsion bar design and the weight of the hatch cover 14 and are only given as being exemplary of one preferred form.

A modified form of hatch cover and operating means is indicated generally by reference numeral 80 in FIGS. 8 and 9. A hatch cover 81 is constructed in accordance with the principles outlined above in conjunction with the description of the hatch cover 14, and is provided with a marginal flange 81′ surrounding a hatch coaming 13 also described above in conjunction with FIGS. 1–7.

In the hatch cover and operating means shown in FIGS. 8–11, the hatch cover 81, hinge straps 82 and 83 as well as the hinge mounting brackets 84 and 85

for hingedly mounting the cover **81** are of similar construction to that described in conjunction with FIGS. 1–7.

In FIGS. 8–11, however, the operating means includes a torsion bar arrangement in which the torsion bar is held against rotation at the center by a center anchor assembly indicated at **86**, with rotational forces being applied through the hinge straps **82** and **83** to opposite ends of the torsion bar in a manner similar to application of rotational forces through the torsion bar hinge strap **40** shown in FIGS. 1–7.

Hinge brackets **84** and **85** are provided to rotatably support the hinge straps **82** and **83** through a pair of spaced bearing supports **87** and **88** which receive bearings **89** and **90**. Each of the bearings **89** and **90** is of external annular configuration having a central rectangular slot for reception of a torsion bar **91** of the type shown fragmentarily in FIGS. 10 and 11 and described above. A pair of elongated tubular housings **92** and **93** encase the torsion bar between the free ends extending from the respective hing strap **82** and **83** to the center support or anchor assembly **86**. The detailed manner of mounting the housings **92** and **93** to permit freedom of torsion bar movement will be given below.

As best seen in FIGS. 8–11 the center anchor assembly **86** includes a pair of mounting brackets **94** and **95** supporting torsion bar mounting plates **96** and **97** which carry torsion bar bearing means **98** and **99** in bearing receiving openings **100** and **101**. Each of the bearings **98** and **99** is provided with an outwardly facing counterbored portion **102** which receives the tubular housings **92** and **93** with a tight fit. The torsion bar **91** may be of laminar form such as was described in connection with FIGS. 1–7 and is clamped at the center by means of a longitudinally slotted block **102** bolted to a top clamping plate **103** with suitable clamping spacers **104** encasing the torsion bar **91** between the bearing supports **96** and **97**.

A tongue-like rotary stop **105** projects downwardly from the slotted block **102** for co-operation with adjustably mounted fixed stops **106** and **107**. The stops **106** and **107** extend continuously between the bearing supports **96** and **97**, being held by a washer **108** and **109** welded at opposite ends. Each of the stops **106** and **107** are carried in elongated slots provided in the bearing supports **96** and **97** which permit adjustment at assembly to obtain the desired torsional stress in the appropriate position.

The tongue-like rotary stop **105** is free to move between the fixed stops **106** and **107** with the total included angle of movement being governed by the position of the stops. When the hatch cover is in the closed position as shown in solid lines, the center anchor assembly **86** assumes the position shown in solid lines with the tongue **105** being urged against the stop **107**. On release of the hatch cover **81**, it moves to the position shown fragmentarily in phantom lines at **81** with the hinge strap positioned as shown at **83'** in phantom lines also. In this position, the tongue-like rotary stop **105** contacts the inner stop **106** with the torsion bar unstressed. When the movable stops **106** and **107** are spaced their maximum an included angle of 60° of free angular movement of the tongue **105** is available, which may be reduced by inward adjustment of the stops if desired. It is contemplated that adjustment of the stops **106** and **107** will be effected at manufacture and secured by welding the washers **108** and **109** directly to the bearing supports **96** and **97**; however, field adjustability could be provided.

In the embodiment of FIGS. 8–11, it is to be appreciated that the hatch cover and operating means **80** may be

provided with a similar locking arrangement to that shown and described in FIGS. 4 and 5. In operation of the embodiment of FIGS. 8–11, release of the locking mechanism permits the hatch cover to move to the position shown in phantom lines in FIG. 10. During this movement, slight rotation occurs at the center of the torsion bar **91** due to the free movement of the tongue **105** while additional rotation occurs at the opposite ends which are clamped by means of bolts directly to the hinge straps **82** and **83**. The torsion bar assumes an unstressed condition excepting the stress applied through the weight of the hatch cover **81**.

When the hatch cover is lowered under force for locking, the entire torsion bar **91** rotates initially causing the tongue-like rotary stop **105** to engage the stop **107**. Continued movement of the hatch cover **81** causes the torsion bar **91** to be rotated at opposite ends while the fixed anchor support **86** holds the center against rotation causing it to be stressed in the manner similar to the embodiment of FIGS. 1–7.

It is to be appreciated that the torsion bar arrangement of the present invention is capable of providing considerable assistance in handling hatch covers of great weight. It will become obvious to those skilled in the art that minor changes can be made without departing from the inventive principles embodied herein. Therefore, any limitations imposed should be within the spirit and scope of the appended claims.

We claim:

1. A hatch cover and operating arrangement for use on a covered hopper car comprising an upstanding hatch coaming surrounding an opening formed in a roof covering an upper portion of said car, said hatch coaming having a curled upper edge for cooperating with a gasket, a hatch cover mounting said gasket and being adapted to close off said opening by overlying said coaming, said hatch cover being formed from semicircular end sections joined to opposite ends of a straight center section of rectangular form, hinge means mounting said hatch cover for pivoting movement adjacent one side of said hatch coaming, said hinge means including spaced strap hinge means overlying said hatch cover, an operating means to bias said hatch cover from an open and closed position in the absence of external forces, said operating means including an elongated torsion bar, means clamping the opposite ends of said torsion bar to said spaced strap hinge means for rotary movement therewith, rotary stop means clamped to said torsion bar intermediate the ends thereof for rotary movement therewith as said hatch cover is moved from the open and closed position, and angularly spaced second stop means fixed to said roof and in the path of said rotary stop means and position to apply a predetermined torsion force on said torsion bar when said hatch cover is in the open and closed positions.

2. The invention as defined in claim **1** wherein said angularly spaced second stop means are adjustably mounted to selectively vary the angular spacing and thereby the torsional force exerted by said torsion bar in the open and closed position of said hatch cover.

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