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 [21] Appl. No. **808,832**
 [22] Filed **Mar. 20, 1969**
 [45] Patented **June 8, 1971**
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[54] **CONVERTIBLE MULTIPLE COMPARTMENT**
HOPPER-TANK CAR
 31 Claims, 17 Drawing Figs.

[52] U.S. Cl..... **105/239,**
 105/243, 105/248, 105/358, 105/360, 137/264,
 220/63, 220/85
 [51] Int. Cl..... **B61d 3/00,**
 B61d 5/00, B61d 7/00
 [50] Field of Search..... 105/243,
 358, 238, 248, 360; 137/264; 220/63, 85 A, 85 B;
 260/46

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ABSTRACT: There is disclosed a railway hopper car including a container having a collapsible fluidtight envelope disposed therein, a foldable linked framework mounted in the container and attached to the envelope and movable between folded and extended conditions thereof for insuring proper folding of the envelope, and cover structure attached to the framework and movable between closed and open positions thereof for respectively covering and uncovering both the envelope and the framework whereby the container respectively accommodates pulverulent dry lading therein around the cover structure or liquid lading within the envelope; means for increasing the dry lading capacity of the container are also disclosed.

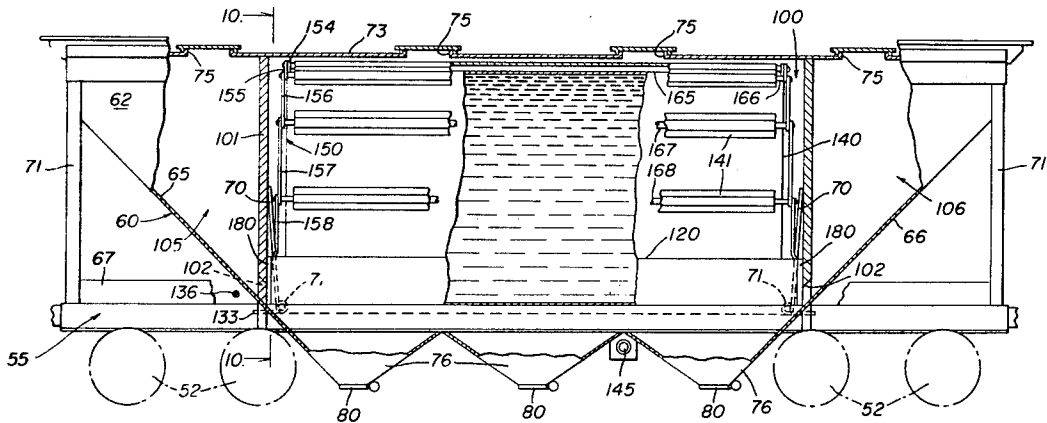


FIG. 3

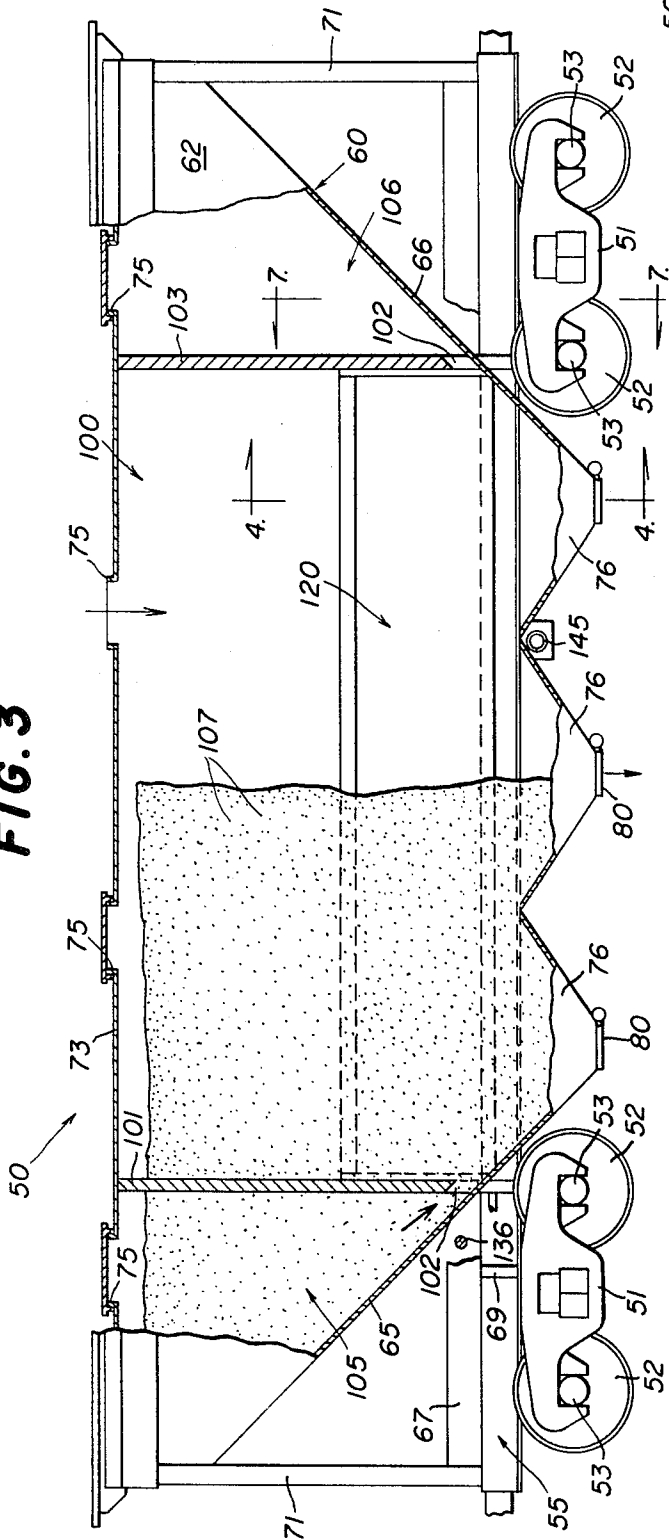


FIG. 1

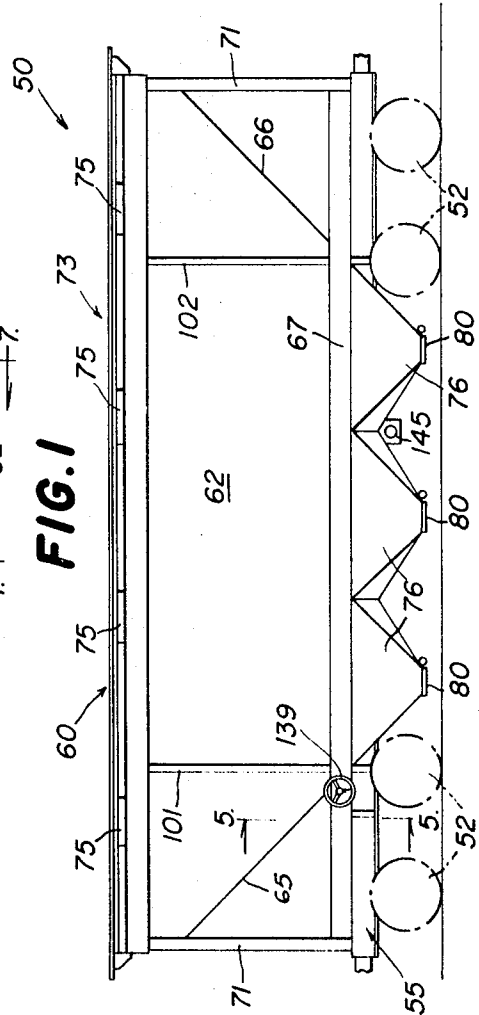
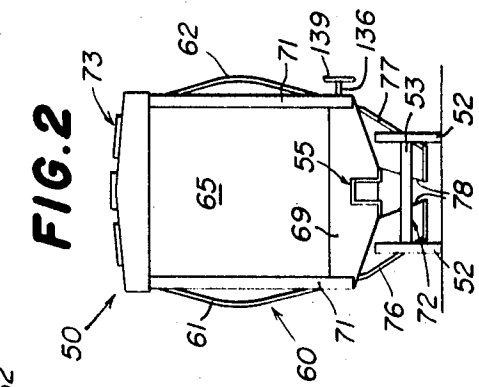


FIG. 2



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FIG. 4

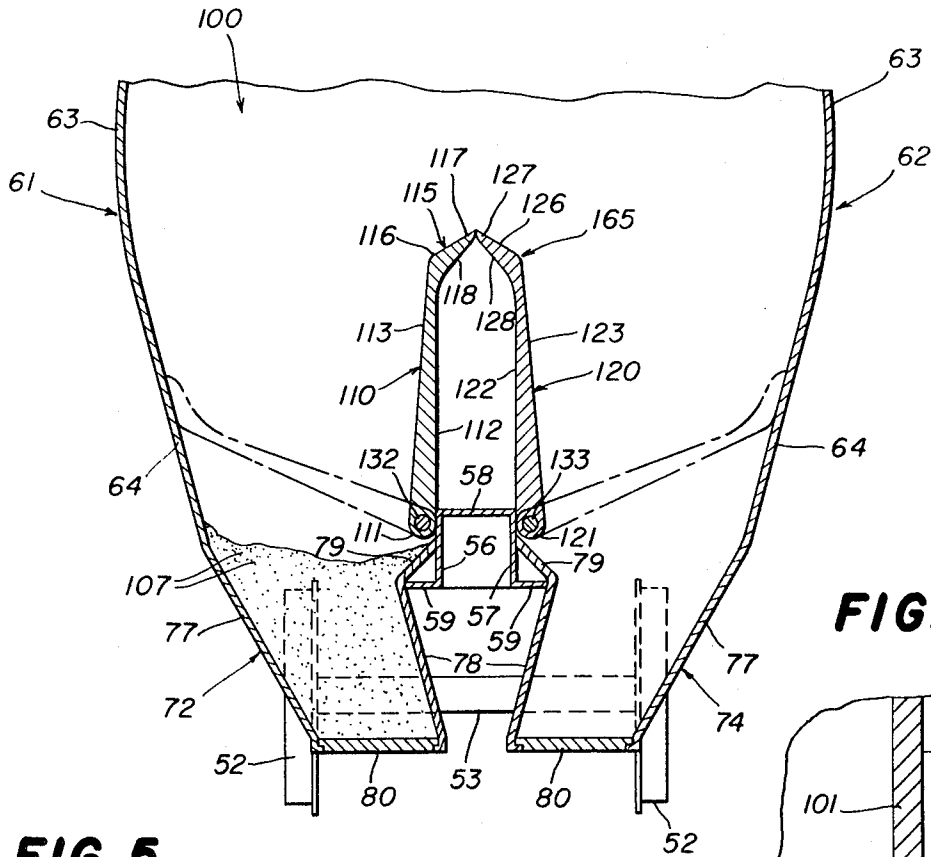


FIG. 6

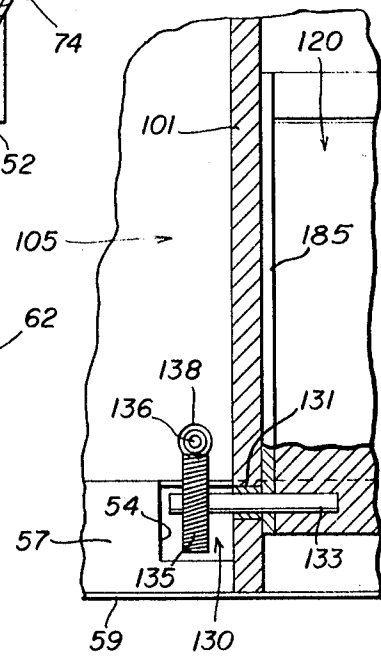
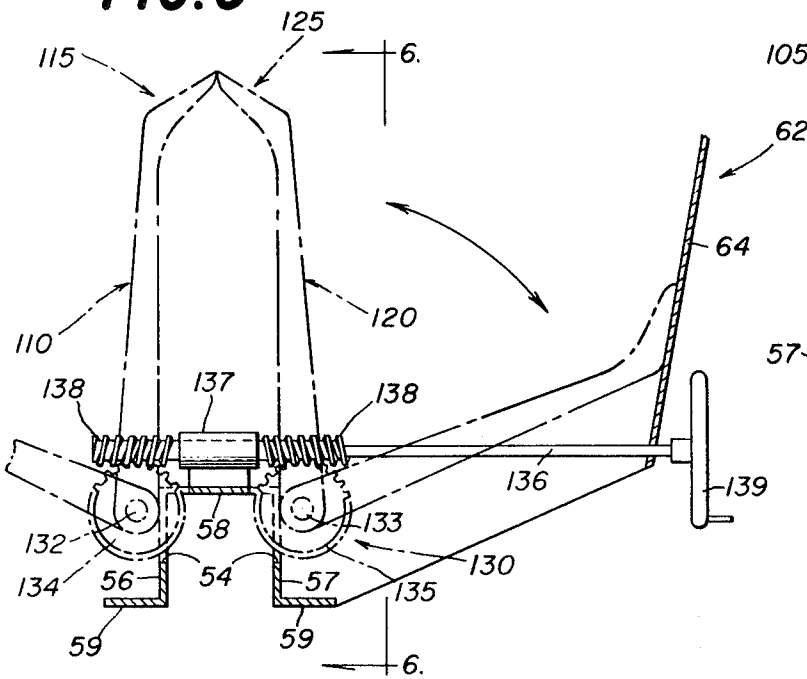


FIG. 5



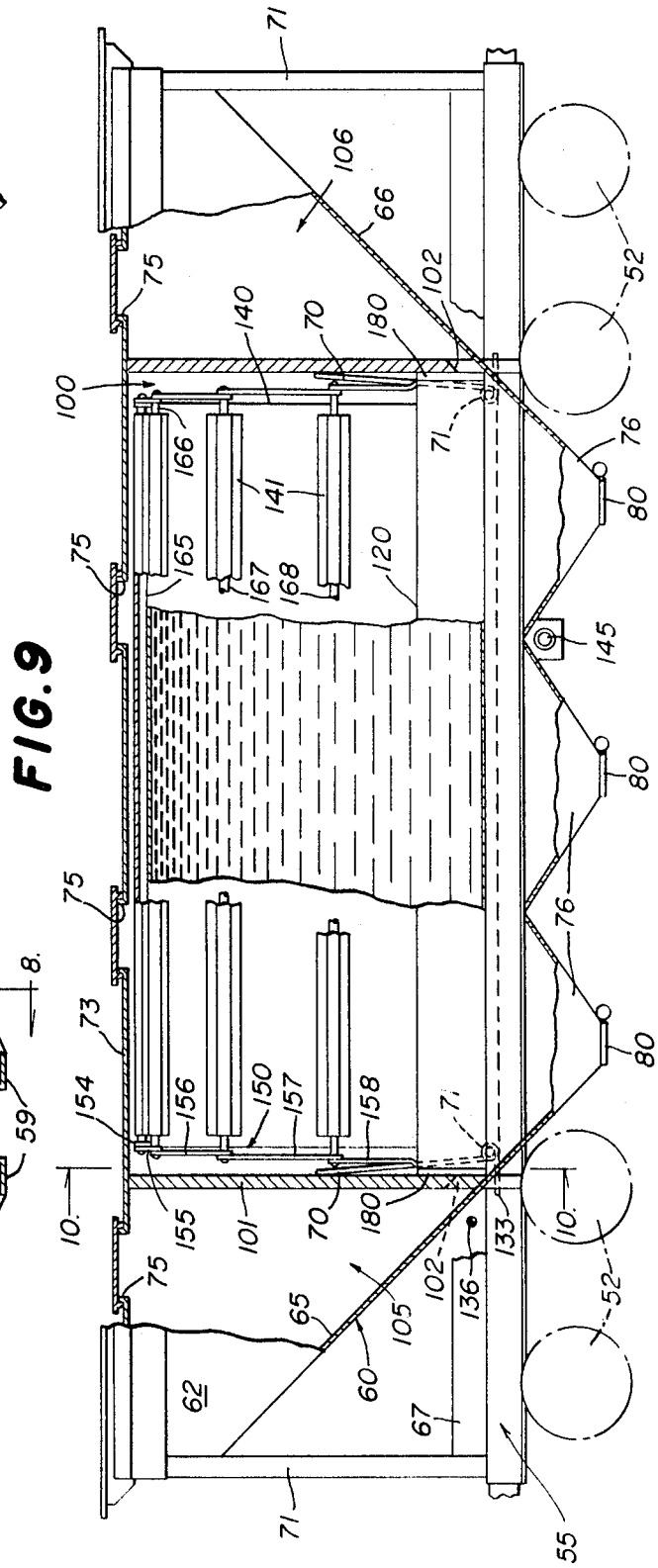
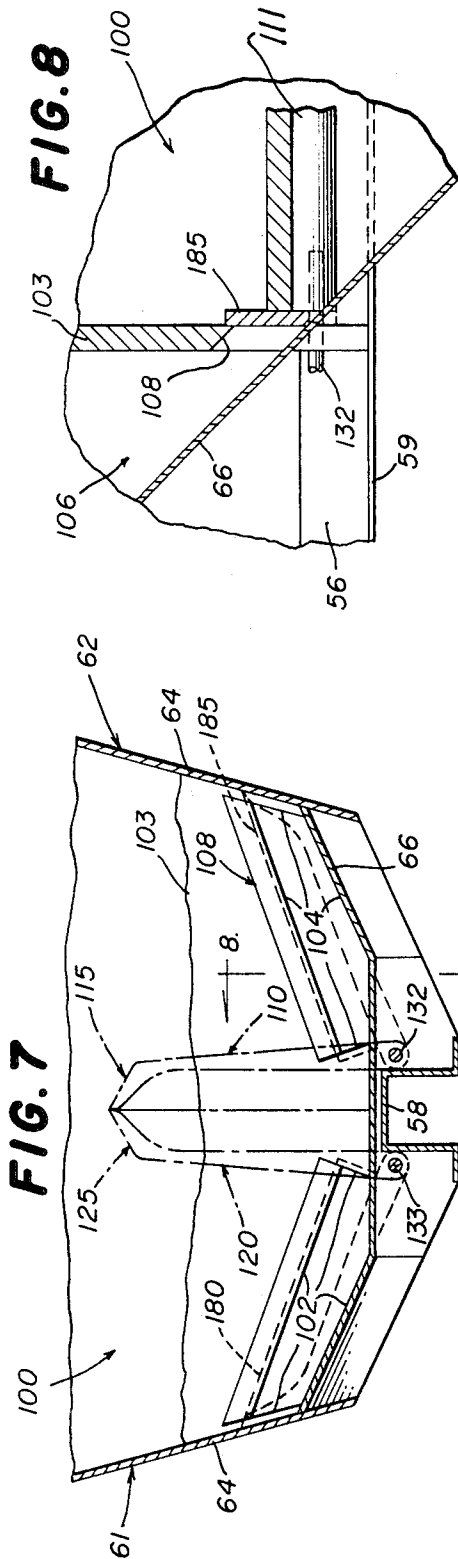


FIG. 10

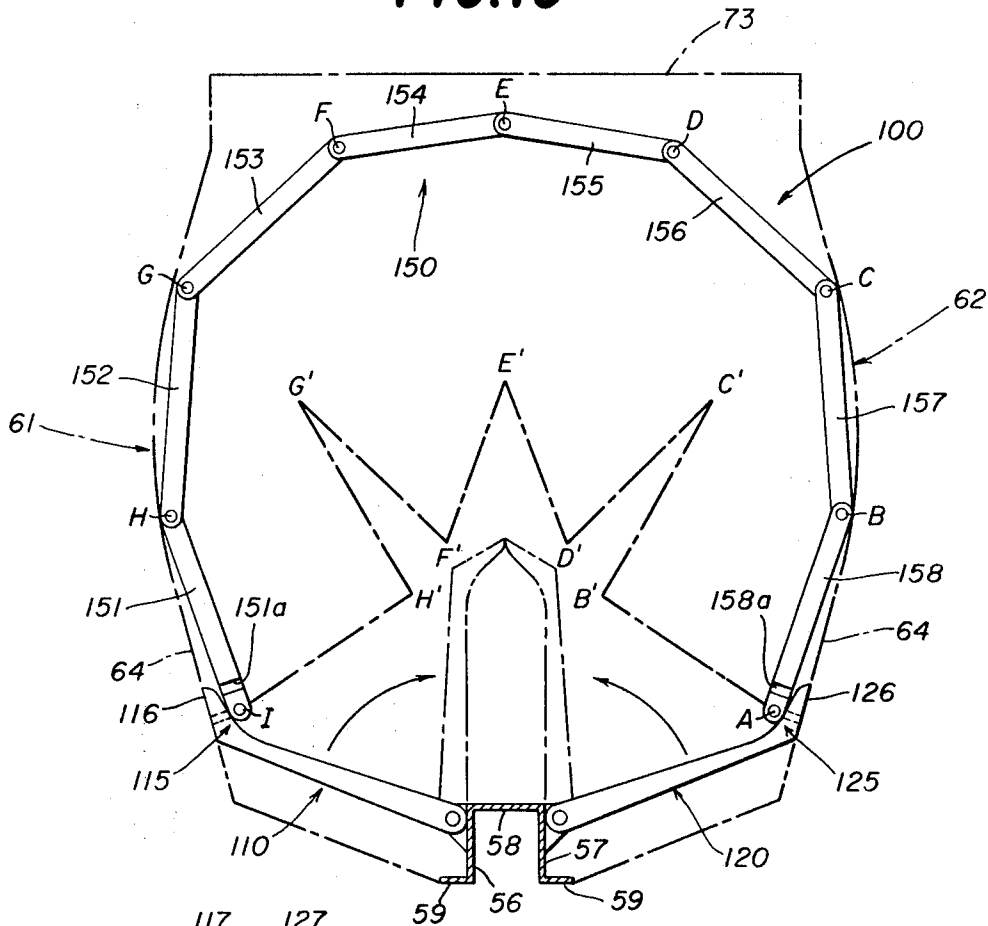
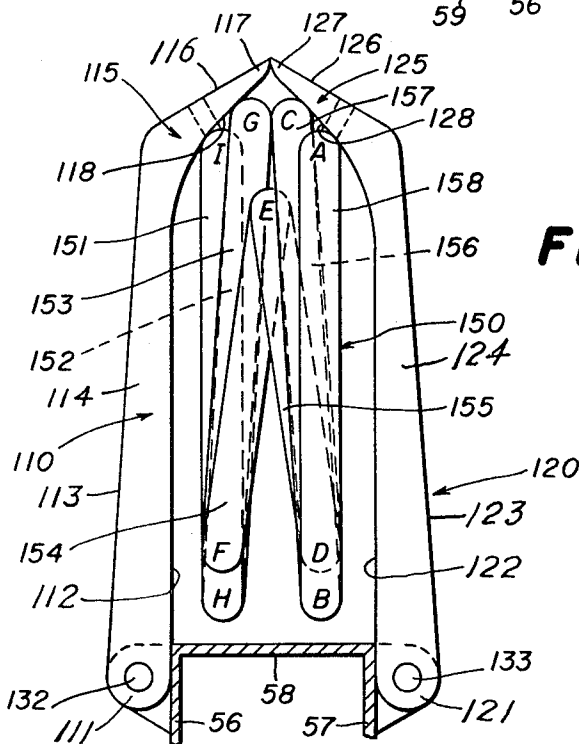


FIG. 11



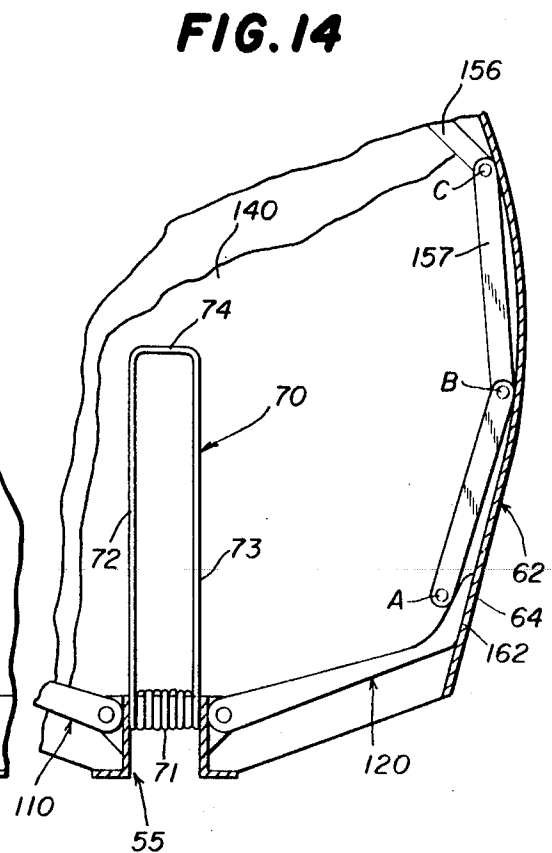
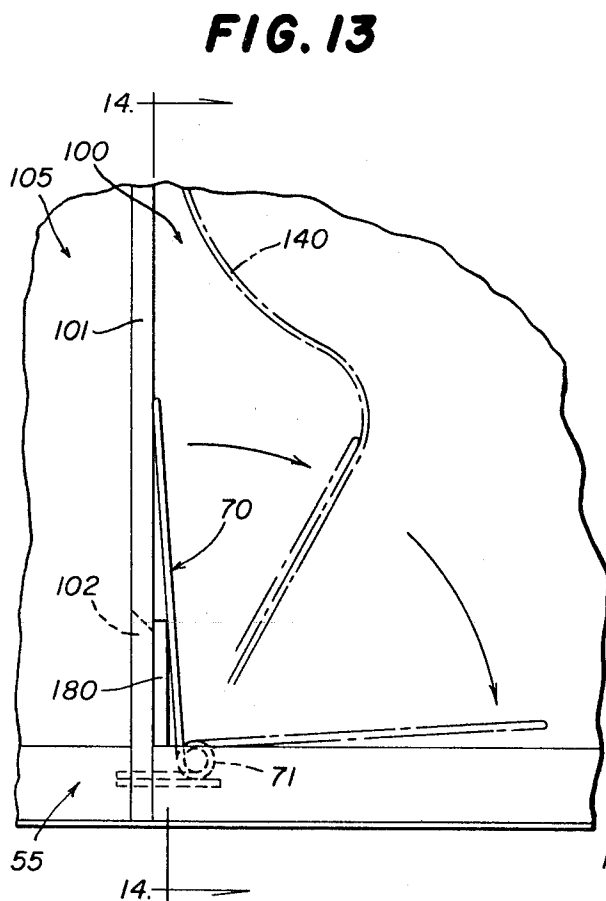
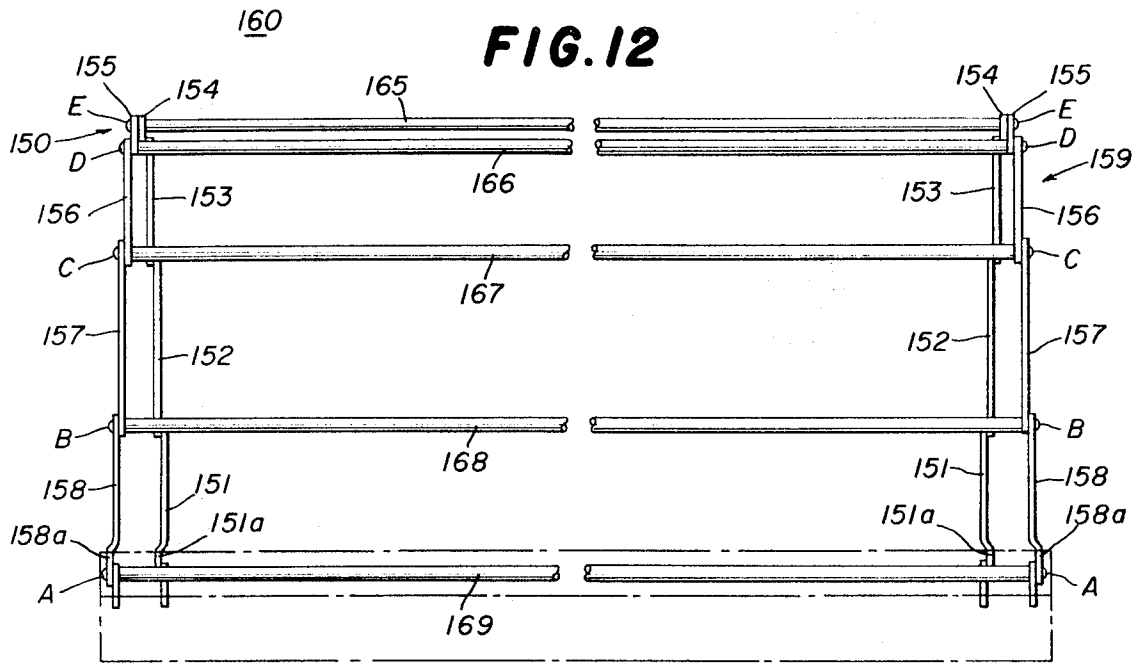


FIG. 15

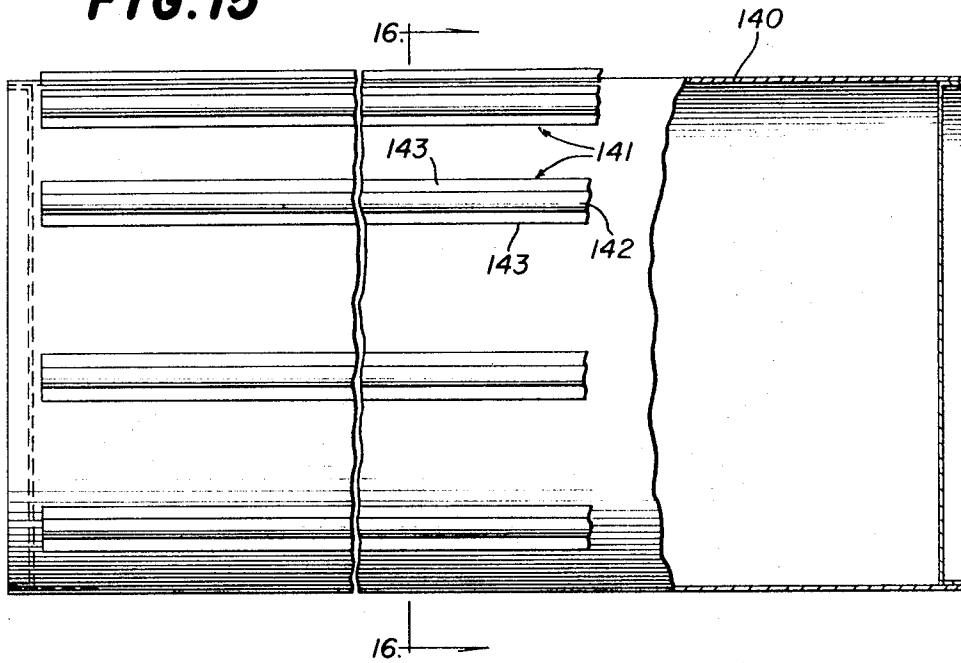


FIG. 16

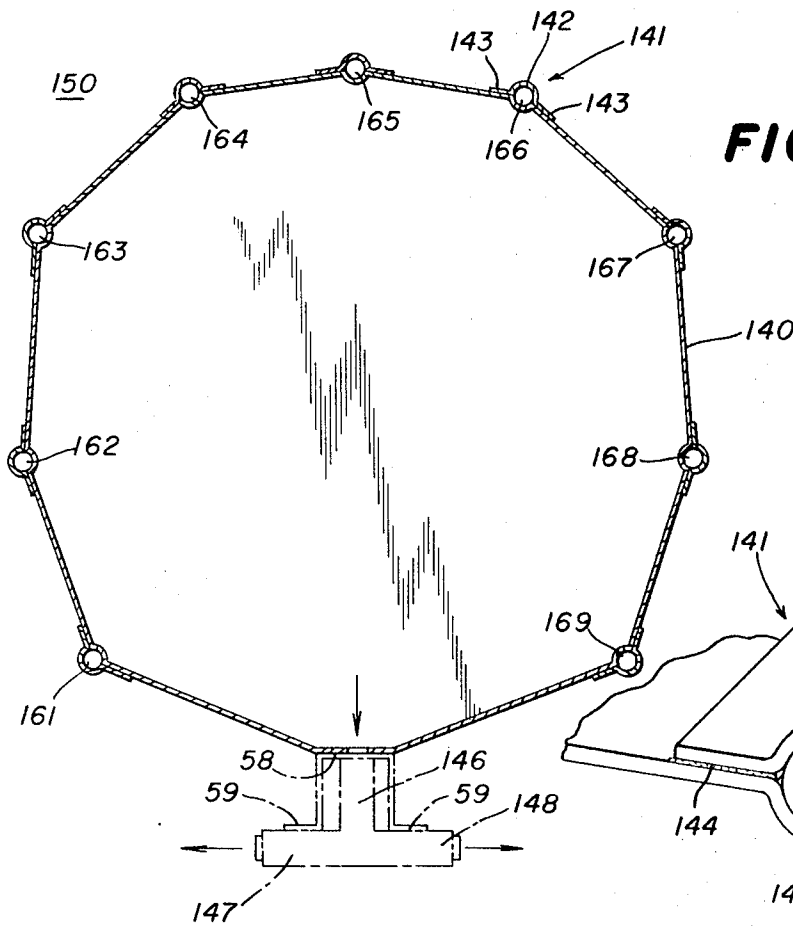
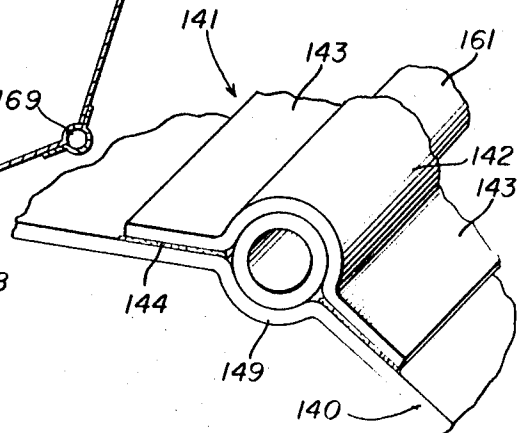


FIG. 17



CONVERTIBLE MULTIPLE COMPARTMENT HOPPER-TANK CAR

This invention is concerned with convertible freight containers for accommodating either pulverulent dry lading or liquid lading therein. More particularly, this invention is concerned with convertible vehicles for transporting freight, and specifically convertible railroad cars.

It is a general object of this invention to provide a convertible freight container for accommodating in one configuration thereof pulverulent dry lading and in another configuration thereof liquid lading, the container comprising an encompassing sidewall and two end walls closing the opposed ends of the sidewall, a collapsible and flexible and fluidtight envelope disposed within the container and having a predetermined folded condition and a predetermined extended condition, and inlet and discharge structure for dry lading in the container and a closeable connection for the envelope for introducing liquid lading therinto and emptying liquid lading therefrom, the space between the walls and the envelope in the folded condition thereof providing a compartment for dry lading and defining the one configuration of the container, the envelope in the extended condition thereof providing within the envelope a compartment for liquid lading and defining the other configuration of the container.

It is another object of this invention to provide a convertible freight container of the type set forth which includes a new and improved apparatus for stowing the envelope in its folded condition when the container is in the dry lading configuration thereof.

In connection with the foregoing objects, it is another object of this invention to provide a convertible freight container of the type set forth which includes a foldable framework attached to the envelope and mounted in the container and movable between a folded position holding the envelope in a predetermined folded condition and an erected position holding the envelope in a predetermined extended condition and further including means for moving the framework between the folded and erected positions thereof.

In connection with the foregoing object, yet another object of this invention is to provide a convertible freight container of the type set forth wherein the foldable framework is connected to the external surface of the envelope and comprises an even number of links pivotally interconnected end-to-end at a plurality of interlink connection points to form a foldable chain, the chain being pivotally mounted at the ends thereof in the container adjacent the lower portion thereof and cooperating therewith in the erected position of the framework to form a closed foldable loop, the framework being so arranged that in moving from the erected position thereof to the folded position thereof alternate interlink connection points undergo an initial motion inward with respect to the loop.

In connection with the foregoing objects, another object of this invention is to provide a convertible freight container of the type set forth including two linkage assemblies respectively disposed within the container adjacent the end wall thereof and connected to the envelope and each having a predetermined folded position and a predetermined erected position, each of the assemblies comprising an even number of links pivotally interconnected end-to-end at a plurality of interlink connection points to form a foldable chain, each of the chains being pivotally mounted at the ends thereof in the container adjacent the lower portion thereof and cooperating therewith in the erected position of the assemblies to form a closed foldable loop, each of the assemblies being so arranged that in moving from the erected position thereof to the folded position thereof alternate interlink connection points undergo an initial motion inward with respect to the loop.

In connection with the foregoing object, still another object of this invention is to provide a convertible freight container of the type set forth which further includes a plurality of connecting rods extending longitudinally of the container and at-

tached to the outer surface of the envelope and respectively interconnecting corresponding interlink connection points of the two assemblies.

In connection with the foregoing objects, a further object of this invention is to provide a convertible freight container of the type set forth including a pair of inwardly biased arms respectively mounted in the container adjacent to the end walls thereof and externally of the envelope, the arms pushing the ends of the envelope inwardly to insure proper folding thereof.

It is another object of this invention to provide a convertible freight container of the type set forth and including cover structure mounted in the container and movable between a closed position covering the envelope in the folded condition thereof and an open position exposing the envelope, and means for moving the cover structure between the closed and open positions thereof, the space between the container walls and the cover structure in the closed position thereof providing a compartment for dry lading and defining one configuration of the container, the envelope in the extended condition thereof with the cover structure in the open position thereof providing within the envelope a compartment for liquid lading and defining another configuration of the container.

In connection with the foregoing object, a still further object of the invention is to provide a convertible freight container of the type set forth and further including a foldable framework attached to the envelope and mounted in the container and movable between a folded position holding the envelope in a predetermined folded condition and an erected position holding the envelope in a predetermined extended condition and means for moving the framework between the folded and erected positions thereof.

In connection with the foregoing object, yet another object of the invention is to provide a convertible freight container of the type set forth wherein the cover structure includes a pair of cover plates each extending longitudinally of the container and pivotally mounted therein adjacent to the lower portion thereof and movable between a closed position and an open position, and wherein the foldable framework includes two linkage assemblies respectively disposed within a container adjacent the end walls thereof and each connected to the cover structure and each having a predetermined folded position and a predetermined erected position, each of the assemblies comprising an even number of links pivotally interconnected end-to-end at a plurality of interlink connection points and cooperating with the cover structure in the erected position of the assemblies to form a closed foldable loop, each of the assemblies being so arranged that in moving from the erected position thereof to the folded position thereof alternate interlink connection points undergo an initial motion inward with respect to the loop, and a plurality of connecting rods extending longitudinally of the container and attached to the outer surface of the envelope and respectively interconnecting corresponding interlink connection points of the two assemblies.

It is a further object of this invention to provide a convertible freight container of the type set forth including two spaced-apart partitions disposed within the sidewall intermediate the ends thereof and dividing the container into a central chamber and two end chambers, each of the partitions having an opening therethrough adjacent to the lower end thereof and providing communication between the central chamber and the adjacent end chamber, the envelope being disposed between the partitions and the end chambers and that portion of the central chamber between the sidewall and the envelope in the folded condition thereof combining to provide a compartment for dry lading and defining the one configuration of the container, a plurality of inlets for dry lading in the upper portion of the container respectively communicating with the end chambers and the central chambers for introducing dry lading into the dry lading compartment, discharge structure in the lower portion of the container between the partitions for emptying dry lading from the dry

lading compartment, two closure members respectively mounted in the container adjacent the openings in the partition and movable between an open position and a closed position, the closure members in the open position thereof allowing passage of pulverulent dry lading through the openings from the end chambers to the central chamber and to the discharge structure when the container is in the dry lading configuration thereof, the closure members in the closed position thereof covering the openings in the partitions to prevent the envelope in the extended condition thereof from protruding through the openings when the container is in the liquid lading configuration thereof, and means for moving the closure members between the open and closed positions thereof.

Another object of this invention is to provide a convertible vehicle for transporting freight and accommodating in one configuration thereof pulverulent dry lading and in another configuration thereof liquid lading, the vehicle comprising a wheeled chassis having mounted thereon a convertible freight container of the type set forth.

Further features of the invention pertain to the particular arrangement of the parts whereby the above-outlined and additional operating features thereof are attained.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawings, in which:

FIG. 1 is a side elevational view of a convertible hopper tank car according to the invention;

FIG. 2 is an end elevational view of the convertible hopper tank car of FIG. 1 as viewed from the lefthand side of FIG. 1;

FIG. 3 is an enlarged side elevational view of the convertible hopper tank car of FIG. 1 with portions of the sidewall broken away to show the internal structure of the car in the dry lading configuration thereof;

FIG. 4 is a further enlarged fragmentary view of a section taken along the line 4-4 in FIG. 3;

FIG. 5 is a further enlarged fragmentary view of a section taken along the line 5-5 in FIG. 1;

FIG. 6 is a fragmentary view of a section taken along the line 6-6 in FIG. 5;

FIG. 7 is an enlarged fragmentary view of a section taken along the line 7-7 in FIG. 3;

FIG. 8 is a fragmentary view of a section taken along the line 8-8 in FIG. 7;

FIG. 9 is an enlarged side elevational view of the convertible hopper tank car of FIG. 1 with portions of the sidewall broken away to show the internal structure of the car in the liquid lading configuration thereof;

FIG. 10 is a further enlarged view of a section taken along the line 10-10 in FIG. 9;

FIG. 11 is an end view of the envelope cover structure and foldable framework when the convertible hopper tank car is in the dry lading configuration thereof;

FIG. 12 is a side elevational view of the foldable framework in the erected position thereof;

FIG. 13 is an enlarged fragmentary view in side elevational of one of the end arms for the envelope;

FIG. 14 is a fragmentary view of a section taken along the line 14-14 in FIG. 13;

FIG. 15 is a side elevational view of the envelope in the extended condition thereof showing the arrangement of the attachment sleeves therearound;

FIG. 16 is an enlarged view of a section taken along the line 16-16 in FIG. 15; and

FIG. 17 is a fragmentary view of a portion of the envelope showing one of the connecting rods attached thereto by the associated attachment sleeves.

Referring to FIGS. 1 to 4 of the drawings, there is shown a convertible railway hopper-tank car generally designated 50, according to the invention. The car 50 comprises a wheeled chassis including standard trucks 51 carrying wheels 52 mounted in standard fashion upon axles 53. Supported by the

trucks 51 is a central-supporting member or center sill 55. The center sill 55 has a generally U-shaped transverse cross section comprising a pair of vertically extending legs 56 and 57 joined at the upper edges thereof by a horizontally extending bight portion 58. Integral with the legs 56 and 57 at the lower edges thereof and respectively extending outwardly therefrom and normal thereto are a pair of side flanges 59. (See FIG. 4)

Mounted upon the center sill 55 is a closed freight container generally designated by the numeral 60 and comprising a pair of sidewalls 61 and 62, each of the sidewalls 61 and 62 comprising a curved upper portion 63 and a flat lower portion 64. Connected to the sidewalls 61 and 62 and respectively closing the opposite ends thereof are a pair of end walls 65 and 66, the end wall 65 sloping downwardly and inwardly to the right as shown in FIG. 1 and the end wall 66 sloping downwardly and inwardly to the left as viewed in FIG. 1, thereby providing surfaces of sufficient slope to facilitate the discharge of pulverulent dry lading from the container 60 as will be described more fully hereinafter.

Overlying the sidewalls 61 and 62 and the end walls 65 and 66 at the upper edges thereof and closing the area therebetween is a top structure 73 having spaced longitudinally therealong a plurality of input or loading ports 75 for introducing pulverulent dry lading into the container 60. In the particular car shown in FIGS. 1 and 3 four loading ports are shown, two of which are located in the central portion of the top 73 and one adjacent to each end thereof. The purpose of providing a plurality of loading ports is to expedite the loading of pulverulent dry lading into the container 60 by enabling the loading of such lading into more than one or all of such loading ports simultaneously and to enable the dry lading to be distributed more uniformly along the length of the car 50 as the container 60 approaches the filled condition and thus to utilize fully the interior of the container 60 as will be more fully explained hereinafter.

Depending from the bottom of the sidewalls 61 and 62 and the end walls 65 and 66 and integral therewith and closing the bottom of the container 60 are one or more discharge hoppers 76, there preferably being three such hoppers arranged beneath the central portion of the container 60. Each of the hoppers 76 is so constructed as to straddle the center sill 55 to form a pair of hopper sections 72 and 74 as can be best seen in FIGS. 2 and 4. Each of the hopper sections 72 and 74 includes an outer sidewall 77 and an inner sidewall 78 converging toward the bottom of the hopper section and integral with a pair of similarly converging end walls, thereby to form a chute. Integral with the upper end of each of the inner sidewalls 78 is an returned flange 79 connected to the center sill 55 and respectively overlying the flanges 59 thereof to provide support for the hopper sections 72 and 74. At the bottom of each of the hoppers 76 is a discharge gate 80 movable between open and closed conditions for controlling the discharge of pulverulent dry lading from the container 60.

Adjacent to the opposite ends of the center sill 55 and mounted thereon are respectively disposed a pair of end support members 69 extending laterally outwardly from the center sill 55. A pair of side rails 67 are respectively disposed on the opposite sides of the hopper car 50, each of the side rails 67 being mounted at the opposite end thereof respectively on the end support members 69, thereby forming a rectangular lower framework for the hopper car 50. Extending vertically upward from the ends of the side rails 67 at the four corners of the rectangular framework are four end struts 71, the end struts 71 being secured by appropriate means to the top structure 73 and providing support therefor. The sidewalls 61 and 62, the end walls 65 and 66, the hoppers 76 and the top structure 73 cooperate to define the closed container 60.

Extending vertically upward from the center sill 55 and through the container 60 adjacent to the opposite ends thereof are two bulkheads 101 and 102 for dividing the interior of the container 60 into three chambers.

Referring now more particularly to FIGS. 3 through 17 of the drawings, the internal structure of the hopper tank car 50

and the convertible operation thereof will be described in detail. The container 60 defines therein an inner space for accommodating liquid lading or dry lading. This inner space is divided by the bulkheads 101 and 102 extending thereacross into a center chamber 100 between the bulkheads 101 and 102 and a pair of end chambers 105 and 106, the end chamber 105 being defined between the bulkhead 101 and end wall 65 and the end chamber 106 being defined between the bulkhead 102 and the end wall 66. Each of the bulkheads 101 and 102 has a pair of openings 102 and 104 therethrough adjacent to the lower end thereof, each of the openings 102 and 104 having a beveled upper edge as at 108 and a lower edge bounded by and following the outline of the respective end wall 65 or 66 as can best be seen in FIG. 7. The end walls 65 and 66 are respectively integral with the end walls of the endmost hoppers 76 thereby forming a continuous downwardly and inwardly sloping surface extending through the openings 102 and 104. This construction allows for the passage of pulverulent dry lading stored in the end chambers 105 and 106 along the end walls 65 and 66 through the openings 102 and 104 and into the adjacent hoppers 76 for discharge from the container 60. It is noted that an input port 75 directly overlies each of the end chambers 105 and 106 to facilitate the introduction of pulverulent dry lading into the end spaces.

Disposed within the container 60 is a flexible collapsible bag or envelope 140 preferably formed of a fabric such as canvas or a plastic capable of inflation and expansion. The envelope 140 in its inflated condition preferably has a size and shape generally conforming to the interior of the central chamber 100 and defines therein a liquid lading compartment and is collapsible when empty into a volume only a fraction of the expanded volume of the envelope. Connected to the bottom of the envelope 140 and mounted on and disposed through an opening in the bight 58 of the center sill 55 is an inlet-outlet structure 145 forming a closeable connection for introducing liquid lading into and emptying liquid lading from the envelope 140. The inlet-outlet structure 145 is an essentially T-shaped tubular fixture having a vertically extending hollow arm 146 connected to and communicating with an opening in the lower portion of the envelope 140 and a pair of horizontally extending hollow sidearms 147 and 148 communicating with the arm 146. The arms 146 to 148 are all essentially tubular in shape and allow passage of liquid lading therethrough. Disposed in the lateral arms 147 and 148 are appropriate closure means for opening and closing the inlet-outlet structure 145. The vertical arm 146 of the inlet-outlet structure 145 is mounted on the bight portion 58 of the center sill 55 and communicates with an opening therethrough as can best be seen in FIG. 16. The inlet-outlet structure 145 is arranged so that liquid lading may be introduced into and emptied from the envelope 140 from either side of the hopper car 50 by attaching appropriate hose or nozzle means to either the arm 147 or the arm 148. To empty the envelope the liquid lading is drawn out through the inlet-outlet structure 145 by gravity or may be pumped out, whichever method is most appropriate.

Disposed within the container 60, and specifically within the central chamber 100 thereof, and mounted on the center sill 55 are two floor or cover plates 110 and 120. Each of the cover plates 110 and 120 extends longitudinally substantially the entire length of the center chamber 100 and has a transverse cross section defining a leg portion 114 and a foot portion 115. More particularly, the cover plate 110 has a flat leg portion 114 having an inner surface 112 and an outer surface 113, the surfaces 113 and 114 being joined at the inner ends thereof by an arcuate end portion 111. Integral with the leg portion 114 at the outer end thereof and disposed at an obtuse angle thereto is a foot portion 115 comprising a flat sole 116, a curved toe 117 and an instep 118, the surface of the instep 118 being integral with the inner surface 112 of the leg portion 114 and the surface of the flat sole 116 being integral with the outer surface 113 of the leg portion 114. The cover plate 110 is mounted on the bulkhead 101 by means of a hinge pin 132, the hinge pin 132 being disposed in a complementarily cylin-

drical opening in one end of the end portion 111 of the cover plate 110 and extending outwardly therefrom and supported in a bearing 131 (not shown) which is disposed through an opening in the bulkhead 101. A similar hinge pin bearing is located at the opposite end of the cover plate 110 for supporting that end of the cover plate 110 on the bulkhead 103, whereby the cover plate 110 is pivotally mounted in the container 60 on the bulkheads 101 and 103 and is pivotally rotatable about the axis of the hinge pins 132 between the broken line and solid line positions shown in FIG. 4. The cover plate 110 is so mounted that the arcuate surface of the end portion 111 contacts the upper end of the leg 56 of the center sill 55.

Similarly, the cover plate 120 comprises a leg portion 124 and an integral foot portion 125 disposed at an obtuse angle to the leg portion 124 and is disposed adjacent to the upper end of the leg 57 of the center sill 55. More particularly, the leg portion 124 has a flat inner surface 122 and a flat outer surface 123, the surfaces 122 and 123 being joined at the inner ends thereof by an arcuate end portion 121. The foot portion 125 has a flat sole 126, a rounded toe 127 and an instep 128 cooperating with the inner and outer surfaces 122 and 123 in the same manner as the foot portion 115 cooperates with the leg portion 114 of the cover plate 110. The cover plate 120 is mounted on the bulkheads 101 and 103 by hinge pins 133 respectively received in complementary openings in the opposite ends of the arcuate portion 121 of the cover plate 120. The hinge pins 133 are mounted in bearings 131 (see FIG. 6) in the same manner as are the hinge pins 132. Accordingly, the cover plate 120 is pivotally rotatable about the axis of the hinge pins 133 between the broken line and solid line positions shown in FIG. 4 in the same manner as the cover plate 110 is rotatable about the axis of the hinge pins 132. The cover plate 120 is so mounted that the end portion 121 thereof contacts the upper end of the leg 57 of the center sill 55.

At one end of the cover plates 110 and 120, (left-hand end as viewed in FIG. 1) is a control apparatus for operating the cover plates 110 and 120 (see FIGS. 5 and 6). The control apparatus 130 comprises a worm gear construction including a pair of worm wheels 134 and 135 respectively mounted on the outer ends of the hinge pins 132 and 133 and a pair of worms 138 mounted coaxially on a common control shaft 136 and respectively meshing with the worm wheels 134 and 135. The control shaft 136 is supported at a point between the worms 138 in a bearing 137 which is mounted on the bight portion 58 of the center sill 55. The control shaft 136 extends outwardly to the right as viewed in FIG. 5 beyond the adjacent side rail 67 and has a handwheel 139 mounted on the outer end thereof for manual operation of the apparatus 130. When the handwheel 139 is turned clockwise as viewed in FIG. 1 the worms 138 respectively rotate the worm wheels 134 and 135, the worm wheel 134 moving in a clockwise direction as viewed in FIG. 5 and the worm wheel 135 moving in a counterclockwise direction as viewed in FIG. 5. The worm wheels 134 and 135 in turn rotate the hinge pins 132 and 133 clockwise and counterclockwise respectively as viewed in FIG. 5, thereby swinging the cover plates 110 and 120 from the open position shown in broken lines in FIG. 4 to the substantially upright closed position shown in solid line in FIG. 4. It is noted that in the open position thereof the flat soles 116 and 126 of the cover plates 110 and 120 respectively lie flat against the inner surfaces of the flat lower portions 64 of the sidewalls 61 and 62 of the container 60 as can be seen from FIG. 4. In this position the cover plates 110 and 120 cooperate with the center sill 55 to form a floor for the container 60 beneath the envelope 140. In the closed position thereof, the cover plates 110 and 120 are so disposed that the toe portions 117 and 127 thereof contact each other, whereby the cover plates 110 and 120 cooperate with the bight portion 58 of the center sill 55 to form an enclosure for the envelope 140 in the collapsed condition thereof.

While in the preferred embodiment of the control apparatus 130 a single control shaft 136 controls both cover plates 110 and 120, it is of course also possible to have two sets of worm

gear control apparatus, one for each of the cover plates 110 and 120. In such an arrangement the two control apparatuses might advantageously be disposed on opposite sides and/or at opposite ends of the car 50. While manually operated control apparatus has been shown, motor driven or automatic control means could also be used.

In order to facilitate the storage of the envelope 140 within the closed cover plates 110 and 120 when the envelope 140 is collapsed, a foldable framework 160 is provided within the central chamber 100 of the container 60, the framework 160 being attached to the outer surface of the envelope 140 to insure proper folding of the envelope 140 into a predetermined folded configuration each time the envelope 140 is collapsed for storage. The framework 160 comprises two linkage assemblies 150 and 159, each assembly preferably including eight link members 151 to 158 pivotally interconnected end-to-end to form a foldable chain. One of these chains comprising the assembly 150 is disposed adjacent to the inner surface of the bulkhead 101 and the other of the chains comprising the assembly 159 is disposed adjacent to the inner surface of the bulkhead 102. More particularly, each of the link members 151 to 158 comprises a flat elongated rigid structure having rounded ends, the adjacent link members of each chain being so arranged that the rounded ends of adjacent link members overlap one another and receive in openings therethrough a connecting pin. The free ends of each of the assemblies 150 and 159 viz, the free ends of the link members 151 and 158, are respectively connected to the instep portions 118 and 128 of the cover plates 110 and 120 adjacent to the opposite ends thereof whereby the linkage assembly 150 cooperates with the cover plates 110 and 120 and the center sill 55 to form a foldable loop adjacent to one end of the central space 100 of the container 60 and the linkage assembly 159 cooperates with the cover plates 110 and 120 and the center sill 55 to form a foldable loop adjacent to the other end of the control space 100 of the container 60.

Referring to FIG. 10 of the drawing, the assembly of the link members 151 to 158 will be described in more detail. One end of the link member 158 is bent to provide an offset attachment flange 158a which is pivotally mounted on a pin as at A, which pin is in turn mounted in an appropriate swivel mounting (not shown) affixed to the instep 128 of the foot portion 125 of the cover plate 120. The pin at A is disposed through the rounded end of the link member 158 and is substantially concentric therewith. Overlapping the other end of the link member 158 on the inner surface thereof is one end of the link member 157, a pin being disposed through openings in the overlapping ends to pivotally interconnect the link members 157 and 158 as at B. In like manner, the link member 156 overlaps the link member 157 and is pivotally connected thereto as at C, the link member 155 is connected to the link member 156 as at D, the link member 154 is connected to the link member 155 as at E, the link member 153 is connected to the link member 154 as at F, the link member 152 is connected to the link member 153 as at G, and the link member 151 is connected to the link member 152 as at H. The other end of the link member 151 is bent to form an offset attachment flange 151a which is pivotally connected to the instep 118 of the cover plate 110 by a pin as at I in the same manner as link member 158 is connected to cover plate 120. It is noted that in the fully erected condition shown in FIG. 10 the link members 151 to 158 cooperate with the cover plates 110 and 120 and the center sill 55 to form a closed loop, the cover plates 110 and 120 constituting two additional links in the chain. It is further noted that proceeding around the loop from point A to point I, each link member is connected to the inner surface of the preceding link member, whereby the loop is arranged as shown in FIG. 12 to facilitate the folding thereof as will be more fully described hereinafter.

As can be seen from FIG. 12 an identical linkage assembly 159 of link members 151 to 158 pivotally interconnected end-to-end at pivot points A to I is disposed at the opposite end of the center space 100 of the container 60 and is mounted on

the adjacent ends of the cover plates 110 and 120 as a mirror image of the assembly 150. The method of interconnection of the links 151 to 158 of assembly 159 and the mounting of the assembly on the cover plates 110 and 120 is identical to that described above with respect to assembly 150 and will therefore not be here repeated.

A plurality of connecting rods are arranged longitudinally with respect to the container 60 within the central chamber 100 thereof and respectively interconnect corresponding pivot points A to I of the linkage assemblies 150 and 159 at the opposite ends of the inner space 100. More particularly, a connecting rod 169 extends between the pivot points A of the two linkage assemblies 150 and 159, being attached at one end thereof to the pin at pivot point A of assembly 150 and at the other end thereof to the pin at pivot point A of assembly 159. In like manner, a connecting rod 168 interconnects the pivot points B of the assemblies 150 and 159, a connecting rod 167 interconnects the pivot points C of the assemblies 150 and 159, a connecting rod 166 interconnects the pivot points D of the assemblies 150 and 159, a connecting rod 165 interconnects the pivot points E of the assemblies 150 and 159 and in like manner connecting rods (not shown) respectively interconnect the pivot points F, G, H and I of the assemblies 150 and 159. The connecting rods cooperate with the linkage assemblies 150 and 159 to form a foldable framework or cage around the envelope 140 in its expanded condition.

Each of the connecting rods is connected to the outer surface of the envelope 140 by means of an attachment sleeve or gusset 141. Referring to FIGS. 15 to 17 of the drawings, nine attachment sleeves 141 are spaced around the periphery of the envelope 140, each of the attachment sleeves 141 extending longitudinally the length of the envelope 140. Each of the attachment sleeves 141 has an arcuate central portion 142 and a pair of attachment flange portions 143 integral with the arcuate portion 142, the flange portions 143 being secured to the outer surface of the envelope 140 by an appropriate adhesive as at 144. The corresponding connecting rod (designated as 161 in FIG. 17) is received beneath the arcuate portion 142 and is disposed between the arcuate portion 142 of the attachment sleeve 141 and the outer surface of the envelope 140, the flexible outer surface of the envelope 140 being deformed by the connecting rod 161 a sufficient amount to accommodate the rod 161 through the attachment sleeve 141 as indicated at 149 in FIG. 17. Each of the connecting rods 161 etc. is similarly disposed through the corresponding one of the attachment sleeves 141, whereby the envelope 141 is connected to the foldable framework structure 160.

In operation, the linkage assemblies 150 and 159 are movable between the fully erected position shown in FIG. 10 and the predetermined folded position shown in FIG. 11. The framework structure is so arranged that the linkage assemblies 150 and 159 will each automatically assume the configuration shown in FIG. 11 when moving from the erected position to the folded position thereof.

More particularly, when the linkage assemblies 150 and 159 are in the erected position shown in FIG. 10 and the envelope 140 is fully extended and filled with liquid lading, the foldable framework and the envelope 140 will assume the configuration shown in FIG. 9. As liquid lading is emptied from the envelope 140, the surface level of the liquid within the envelope 140 lowers and the upper portion of the envelope 140 tends to collapse upon the lowering surface of the liquid lading. In so collapsing the envelope 140 pulls the framework 150 inwardly. The linkage members 151 to 158 are preferably so dimensioned and arranged that when in the erected position shown in FIG. 10 the pivot points B, D, F and H will tend to undergo an initial motion inward with respect to the container when the framework is moved from the erected position shown in FIG. 10 to the folded position shown in FIG. 11. Accordingly, as the upper portion of the envelope 140 collapses it pulls the pivot points D and F inwardly with it. Similarly, as the level of liquid lading in the envelope 140 decreases further, the pivot points B and H are pulled inwardly by the

collapsing envelope 140. As the pivot points B, D, F and H are pulled further inwardly, the remaining pivot points D, E and G are also pulled toward the center of the container 60 by the inward motion of the adjacent link members, until when the envelope 140 is nearly empty, the pivot points B through H assume the positions designated B' through H' in FIG. 10 and the links 151 to 158 are disposed as indicated in broken lines in FIG. 10. While the linkage assemblies 150 and 159 have been shown comprising eight links each (ten including the cover plates 110 and 120 as additional links), it is apparent that the assemblies (excluding the cover plates) might comprise any even number of links, the only constraint being that the even-numbered pivot points around the loop (counting the connection point of the chain to the cover plate as No. 1) undergo an initial motion inward with respect to the container when the framework is moved from its erected to its folded position.

Then, by operation of the control apparatus 130, the cover plates 110 and 120 can be moved to the closed position thereof, thereby enclosing the envelope and the framework structure within the cover plates 110 and 120 as shown in FIG. 11. In this condition the container 60 is in its dry lading configuration, the chambers 105 and 106 and that portion of the chamber 100 between the sidewalls 61 and 62 and the cover plates 110 and 120 combining to form a dry lading compartment for accommodating pulverulent dry lading therein.

Referring to FIG. 11, when the framework 160 is in its folded position, it is suspended from the foot portions 115 and 125 of the cover plates 110 and 120, and specifically from the swivel mountings of links 151 and 158 on the instep 118 and 128. In this folded position the link members 151 to 158 of each of the linkage assemblies 150 and 159 hang substantially vertically downwardly from the foot portions 115 and 125, the lower ends of the link members 151 to 158 being suspended a slight distance above the bight portion 58 of the center sill 55 so as to accommodate the folded envelope 140 thereunder. Because of the arrangement of the links 151 to 158 so that in progressing around link assembly from point A to point I, each link overlaps the prior link on the inner surface thereof as shown in FIG. 12, the link members 151 to 158 nest together as shown in FIG. 11 without obstructing one another.

In order to convert the container 60 to its liquid lading configuration for filling the envelope 140, the cover plates 110 and 120 need only be moved to the open position thereof by operation of the control apparatus 130, after which the rising level of liquid lading within the envelope 140 will carry the framework structure along with the expanding envelope 140 to the fully erected position shown in FIG. 10.

Respectively disposed at the opposite ends of the central chamber 100 adjacent to the inner surfaces of the bulkheads 101 and 103 are two lever arms 70 mounted on the center sill 55 (see FIGS. 13 and 14). Each of the arms 70 is in the form of a generally U-shaped rod having a pair of substantially parallel legs 72 and 73 joined at one end thereof by an integral bight portion 74. The other ends of the arms 70 are bent to form a coil torsion spring 71 which is attached to the center sill 55 as by welding. The torsion springs 71 are so arranged as to normally bias the arms 70 into a substantially horizontal position extending inwardly toward the center of the container 60 as shown in broken lines in FIG. 13. The arms 70 are each disposed externally of the envelope 140, so that when the envelope 140 is filled with liquid lading, the ends thereof respectively bear against the arms 70 and move the arms against the bias of the torsion springs 71 into the substantially upright position shown in solid lines in FIG. 13, wherein the arms 70 contact the inner surfaces of the adjacent bulkheads 101 and 103. As the envelope 140 is emptied and collapsed, the arms 70 move inwardly to their normal position depressing the ends of the envelope 140, to prevent the ends of the envelope 140 from being pinched between the cover plates 110 and 120 and the bulkheads 101 and 103 when the cover plates 110 and 120 are moved from the open to the closed position thereof. While the arms 70 are shown acting under the influence of torsion

springs, which is the preferred embodiment, it will, of course be recognized that the arms 70 may be biased into their normal substantially horizontal position by other means such as appropriate weighting.

In order to protect the opposite ends of the envelope 140 from pulverulent dry lading and in order to prevent the ends of the envelope 140 when in the extended condition thereof from protruding through the openings 102 and 104 in the bulkheads 101 and 103 there are provided at each end of the central space 100 a pair of closure plates 180 and 185 respectively arranged to cover the adjacent pair of openings 102 and 104 in the adjacent bulkhead.

Referring in particular to FIGS. 7 and 8, the closure plates 180 and 185 will be described in detail. Each of the closure plates 180 and 185 has a shape corresponding to the shape of the adjacent opening 102 or 104 and is attached to the adjacent cover plate 110 or 120 and is disposed in a plane parallel to the plane of the adjacent bulkhead 101 or 103. Specifically, the closure plate 180 is attached to the adjacent end of the cover plate 120 and the closure plate 185 is attached to the adjacent end of the cover plate 110, whereby the closure plates 180 and 185 swing with the cover plates 120 and 110 as the latter are moved between the open and closed positions thereof. In the open position of the cover plates 110 and 120 the closure plates 180 and 185, as shown in FIGS. 7 and 8 completely cover the openings 102 and 104 in the bulkhead 103 (or 101). In this position the closure plates 180 and 185 prevent the ends of the envelope 140 from protruding through the openings 102 and 104 and being damaged by the edges thereof and also protect the envelope 140 from any pulverulent dry lading which may remain in end space 106. When the cover plates 110 and 120 are moved to the closed position thereof, shown in broken lines in FIG. 7, the closure plates 180 and 185 also move to a substantially upright position, thereby uncovering the openings 102 and 104 to allow the free flow of pulverulent dry lading therethrough from the end space 106 to the center space 100 and in particular into the hoppers 76. An identical pair of closure plates 180 and 185 are disposed adjacent the bulkhead 101 and are mounted on the opposite ends of the cover plates 120 and 110.

As can be seen from FIG. 8, the closure plates 180 and 185 are disposed between the adjacent bulkhead and the adjacent ends of the cover plates. It will be noted that the closure plates 180 and 185 fit snugly against the adjacent bulkhead 101 or 103 (See FIG. 8, for example). This serves to close the space between the ends of the cover plates 110 and 120 and the bulkheads 101 and 103 to provide a tight end closure for the envelope 140 in the folded condition thereof and prevent the introduction of pulverulent dry lading within the closed cover plates around the ends thereof. Thus, when the cover plates 110 and 120 are in the closed position thereof they cooperate with the closure plates 180 and 185 and the center sill 55 to provide a complete enclosure for the folded envelope 140 and framework 160.

The operation of the convertible hopper tank car 50, in particular the conversion between the dry lading configuration and the liquid lading configuration thereof will now be described. FIG. 3 shows the hopper tank car 50 in the pulverulent dry lading configuration thereof. In this configuration the cover plates 110 and 120 are in their closed position and the central chamber 100 and the end chambers 105 and 106 are filled with pulverulent dry lading, designated 107 in FIG. 3, through the input ports 75 in the top 73 of the container 60. The pulverulent dry lading 107 completely surrounds the closed cover plates 110 and 120 but does not contact the envelope 140 stowed therein. In order to empty the pulverulent dry lading 107 from the container 60, the discharge gates 80 are opened and the dry lading pours out through the hoppers 76. In this regard it will be noted that the cover plates 110 and 120 in the closed position thereof are disposed substantially upright and the flat soles 116 and 126 and the outer surfaces 113 and 123 have a sufficiently steep slope that the pulverulent dry lading flows easily around and over the cover plates

110 and 120 and into the hoppers 76 without clogging. As described above, dry lading in the end chambers 105 and 106 flows along end walls 65 and 66 and through the openings 102 and 104 in the bulkheads 101 and 103 into the hoppers 76.

When the pulverulent dry lading 107 is completely emptied from the container 60, the container may be converted to the liquid lading configuration thereof. To effect this conversion the handwheel 139 of the control apparatus 130 is turned in a counterclockwise direction, thereby actuating the worm gear mechanism to move the cover plates 110 and 120 from the closed position thereof to the open position thereof as shown in FIGS. 4 and 5. In moving from the closed position to the open position thereof, the cover plates 110 and 120 pull the link members 151 and 158 of the framework structure outwardly, thereby loosening the folded framework structure 160 from the tightly folded configuration shown in FIG. 11. The source of liquid lading is then attached to one of the arms 147 and 148 of the inlet-outlet structure 145 and liquid lading is pumped throughout the structure 145 into the envelope 140. As the liquid lading enters the envelope 140 the envelope 140 begins to expand as the level of liquid lading rises therein. By reason of the attachment of the connecting rods 161 etc. to the outer surface of the envelope 140, the expansion of the envelope 140 carries the connecting rods of the framework 160 upwardly within the container 60. The upward movement of the connecting rods 161 etc. carries the two linkage assemblies 150 and 159 attached thereto into the erected position thereof shown in FIGS. 9, 10 and 12.

It will be noted that in the liquid lading configuration of the container 60, which configuration is shown in FIG. 9, the linkage assemblies 150 and 159 form with the cover plates 110 and 120 and the center sill 55 a closed loop substantially conforming in shape and dimensions to the inner surface of the portion of the container 60 enclosing the center chamber 100. In the preferred embodiment the envelope 140 has dimensions sufficient to substantially fill the central chamber 100 when the envelope 140 is completely filled with liquid lading. It will also be noted that in the liquid lading configuration the closure plates 180 and 185 at the opposite ends of the envelope 140 completely cover the openings 102 and 104 in the bulkheads 101 and 103 to protect the opposite ends of the envelope 140.

In order to return the container 60 to the dry lading configuration thereof, the closure means in the inlet-outlet structure 145 is opened and the liquid lading is emptied from the envelope 140. As the level of liquid lading declines in the envelope 140, the envelope 140 collapses inwardly and pulls the framework 160 inwardly with it in the manner shown in FIG. 10 and described in detail above. When the liquid lading is completely emptied from the envelope 140, the envelope 140 will be completely collapsed as will the foldable framework 160, whereupon by actuation of the control apparatus 130 the cover plates 110 and 120 may be moved again to the closed position thereof. In so moving, the cover plates 110 and 120 carry the attached link members 151 and 158 upwardly, thereby folding the linkage assemblies 150 and 159 into the configuration shown in FIG. 11 and completely enclosing the envelope 140 and the framework 160 within the closed cover plates 110 and 120. The container 60 is then again in the dry lading configuration thereof and is ready to receive dry lading through the loading ports 75.

From the foregoing it can be seen that there has been described an improved convertible hopper tank car capable of transporting either pulverulent dry lading or liquid lading therein. More particularly, there has been disclosed a convertible freight container having a flexible collapsible envelope disposed therein for accommodating liquid lading and a novel cover and framework structure for stowing the envelope when not in use.

There have further been disclosed a cover structure and a framework structure for the envelope which insure proper folding of the envelope into a predetermined folded configuration each time the envelope is folded for storage and affords

complete protection of the envelope from the pulverulent dry lading when the envelope is in its stowed condition.

Also, there has been described a novel means of utilizing the entire available area within the container of a convertible hopper tank car for pulverulent dry lading when the car is in the dry lading configuration thereof.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

We claim:

1. A convertible freight container for accommodating in one configuration thereof pulverulent dry lading and in another configuration thereof liquid lading, said container comprising an encompassing sidewall and two end walls closing the opposed ends of said sidewall, a collapsible and flexible and fluidtight envelope disposed within said container and having a predetermined folded condition and a predetermined extended condition, the space between said walls and said envelope in the folded condition thereof providing a compartment for dry lading and defining the one configuration of said container, an inlet for dry lading in the upper portion of said container for introducing dry lading into said dry lading compartment, discharge structure in the lower portion of said container for discharging dry lading from said dry lading compartment, said envelope in the folded condition thereof accommodating ready passage of dry lading from said dry lading compartment through said discharge structure, said envelope in the extended condition thereof providing within said envelope a compartment for liquid lading and defining another configuration of said container, and a closeable connection for said envelope and providing communication between the interior of said envelope and the exterior of said container for introducing liquid lading into and emptying liquid lading from said liquid lading compartment.

2. The convertible freight container set forth in claim 1, wherein said discharge structure comprises at least one hopper depending from the lower portion of said container and communicating with said dry lading compartment, and a discharge gate at the lower end of said hopper.

3. The convertible freight container set forth in claim 1, wherein said closeable connection includes a hollow T-shaped fixture having three interconnected arms, one of said arms communicating with the interior of said envelope and extending vertically downwardly from the lower portion thereof, the other of said arms being integral with and disposed substantially normal to said one arm adjacent to the lower end thereof and extending substantially horizontally outwardly therefrom.

4. A convertible freight container for accommodating in one configuration thereof pulverulent dry lading and in another configuration thereof liquid lading, said container comprising an encompassing sidewall and two end walls closing the opposed ends of said sidewall, a collapsible and flexible and fluidtight envelope disposed within said container, a foldable framework attached to said envelope and mounted in said container and movable between a folded position holding said envelope in a predetermined folded condition and an erected position holding said envelope in a predetermined extended condition, means for moving said framework between the folded and erected positions thereof, the space between said walls and said envelope in the folded condition thereof providing a compartment for dry lading and defining the one configuration of said container, an inlet for dry lading in the upper portion of said container for introducing dry lading into said dry lading compartment, discharge structure in the lower portion of said container for emptying dry lading from said dry lading compartment, said envelope in the extended condition thereof providing within said envelope a compartment for liquid lading and defining another configuration of said container, and a closeable connection for said envelope and providing communication between the interior of said en-

velope and the exterior of said container for introducing liquid lading into and emptying liquid lading from said liquid lading compartment.

5. The convertible freight container set forth in claim 4, wherein said foldable framework is disposed externally of said envelope and is attached to the outer surface thereof.

6. The convertible freight container set forth in claim 4, wherein said foldable framework in the erected position thereof substantially conforms in shape and dimensions to the internal surface of said side wall.

7. A convertible freight container for accommodating in one configuration thereof pulverulent dry lading and in another configuration thereof liquid lading, said container comprising an encompassing sidewall and two end walls closing the opposed ends of said sidewall, a collapsible and flexible and fluidtight envelope disposed within said container, a foldable framework disposed in said container and connected to the external surface of said envelope and movable between a folded position holding said envelope in a predetermined folded condition and an erected position holding said envelope in a predetermined extended condition, said framework comprising an even number of links pivotally interconnected end-to-end at a plurality of interlink connection points to form a foldable chain, said chain being pivotally mounted at the ends thereof in said container adjacent the lower portion thereof and cooperating therewith in the erected position of said framework to form a closed foldable loop, said framework being so arranged that in moving from the erected position thereof to the folded position thereof alternate interlink connection points undergo an initial motion inward with respect to said loop, means for moving said framework between the folded and erected positions thereof, the space between said walls and said envelope in the folded condition thereof providing a compartment for dry lading and defining the one configuration of said container, an inlet for dry lading in the upper portion of said container for introducing dry lading into said dry lading compartment, discharge structure in the lower portion of said container for emptying dry lading from said dry lading compartment, said envelope in the extended condition thereof providing within said envelope a compartment for liquid lading and defining another configuration of said container, and a closeable connection for said envelope and providing communication between the interior of said envelope and the exterior of said container for introducing liquid lading into and emptying liquid lading from said liquid lading compartment.

8. A convertible freight container for accommodating in one configuration thereof pulverulent dry lading and in another configuration thereof liquid lading, said container comprising an encompassing sidewall and two end walls closing the opposed ends of said sidewall, a collapsible and flexible and fluidtight envelope disposed within said container, two linkage assemblies respectively disposed within said container adjacent the end walls thereof and connected to said envelope and each having a predetermined folded position and a predetermined erected position, each of said assemblies comprising an even number of links pivotally interconnected end-to-end at a plurality of interlink connection points to form a folded chain, each of said chains being pivotally mounted at the ends thereof in said container adjacent to the lower portion thereof and cooperating therewith in the erected position of said assemblies to form a closed foldable loop, each of said assemblies being so arranged that in moving from the erected position thereof to the folded position thereof alternate interlink connection points undergo an initial motion inward with respect to said container, said linkage assemblies cooperating to form a foldable framework for said envelope movable between a folded position holding said envelope in a predetermined folded condition and an erected position holding said envelope in a predetermined extended condition, means for moving said assemblies between the folded and erected positions thereof, the space between said walls and said envelope in the folded condition thereof providing a compartment for

dry lading and defining the one configuration of said container, an inlet for dry lading in the upper portion of said container for introducing dry lading into said dry lading compartment, discharge structure in the lower portion of said container for emptying dry lading from said dry lading compartment, said envelope in the extended condition thereof providing within said envelope a compartment for liquid lading and defining another configuration of said container, and a closeable connection for said envelope and providing communication between the interior of said envelope and the exterior of said container for introducing liquid lading into and emptying liquid lading from said liquid lading compartment.

9. The convertible freight container set forth in claim 8, wherein each of said linkage assemblies comprises ten links interconnected at nine interlink connection points, and wherein the even-numbered interlink connection points counting from one end of said assembly to the other undergo an initial motion inwardly with respect to said container when the assembly moves from the erected position thereof to the folded position thereof.

10. The convertible freight container set forth in claim 9, wherein when said assemblies are in the folded positions thereof said even-numbered interlink connection points are disposed adjacent said assembly mounting point and the odd-numbered interlink connection points are disposed a predetermined distance above said mounting point substantially in vertical alignment therewith.

11. A convertible freight container for accommodating in one configuration thereof pulverulent dry lading and in another configuration thereof liquid lading, said container comprising an encompassing sidewall and two end walls closing the opposed ends of said sidewall, a collapsible and flexible and fluidtight envelope disposed within said container, two linkage assemblies respectively disposed within said container adjacent the end walls thereof and each having a predetermined folded position and a predetermined erected position, each of said assemblies comprising an even number of links pivotally interconnected end-to-end at a plurality of interlink connection points to form a foldable chain, each of said chains being pivotally mounted at the ends thereof in said container adjacent to the lower portion thereof and cooperating therewith in the erected position of said assemblies to form a closed foldable loop, each of said assemblies being so arranged that in moving from the erected position thereof to the folded position thereof alternate interlink connection points undergo an initial motion inward with respect to said container, a plurality of connecting rods extending longitudinally of said container and attached to the outer surface of said envelope and respectively interconnecting corresponding interlink connection points of said two assemblies, said rods and said linkage assemblies cooperating to form a foldable framework for said envelope movable between a folded position holding said envelope in a predetermined folded condition and an erected position holding said envelope in a predetermined extended condition, means for moving said assemblies between the folded and erected positions thereof, the space between said walls and said envelope in the folded condition thereof providing a compartment for dry lading and defining the one configuration of said container, an inlet for dry lading in the upper portion of said container for introducing dry lading into said dry lading compartment, discharge structure in the lower portion of said container for emptying dry lading from said dry lading compartment, said envelope in the extended condition thereof providing within said envelope a compartment for liquid lading and defining another configuration of said container, and a closeable connection for said envelope and providing communication between the interior of said envelope and the exterior of said container for introducing liquid lading into and emptying liquid lading from said liquid lading compartment.

12. The convertible freight container set forth in claim 11, and further including a plurality of attachment sleeves equal in number to said connecting rods and attached to the outer sur-

face of said envelope and extending longitudinally thereof, said connecting rods being respectively disposed through said attachment sleeves for supporting said envelope and guiding the folding thereof.

13. A convertible freight container for accommodating in one configuration thereof pulverulent dry lading and in another configuration thereof liquid lading, said container comprising an encompassing sidewall and two end walls closing the opposed ends of said sidewall, a collapsible and flexible and fluidtight envelope disposed within said container, a foldable framework attached to said envelope and mounted in said container and movable between a folded position holding said envelope in a predetermined folded condition and an erected position holding said envelope in a predetermined extended condition, means for moving said framework between the folded and erected positions thereof, a pair of inwardly biased arms respectively mounted in said container adjacent to the end walls thereof and externally of said envelope, said arms pushing the ends of said envelope inwardly to insure proper folding thereof, the space between said walls and said envelope in the folded condition thereof providing a compartment for dry lading and defining the one configuration of said container, an inlet for dry lading in the upper portion of said container for introducing dry lading into said dry lading compartment, discharge structure in the lower portion of said container for emptying dry lading from said dry lading compartment, said envelope in the extended condition thereof providing within said envelope a compartment for liquid lading and defining another configuration of said container, and a closeable connection for said envelope and providing communication between the interior of said envelope and the exterior of said container for introducing liquid lading into and emptying liquid lading from said liquid lading compartment.

14. The convertible freight container set forth in claim 13, wherein each of said inwardly biased arms is substantially U-shaped having a pair of parallel legs connected at one end thereof by an integral bight and mounted at the other end thereof on said support structure.

15. The convertible freight container set forth in claim 14, wherein each of said arms is spring-biased into an inwardly directed substantially horizontal position, said envelope in the extended condition thereof moving each of said arms pivotally about its mounting point to a substantially vertical operated position, said arms upon the emptying of said envelope depressing the ends thereof to prevent pinching thereof by a folded framework and to assure proper folding of said envelope.

16. A convertible freight container for accommodating in one configuration thereof pulverulent dry lading and in another configuration thereof liquid lading, said container comprising an encompassing sidewall and two end walls closing the opposed ends of said sidewall, a collapsible and flexible and fluidtight envelope disposed within said container and having a predetermined folded condition and a predetermined extended condition, cover structure mounted in said container and movable between a closed position covering said envelope in the folded condition thereof and an open position exposing said envelope, means for moving said cover structure between the closed and open positions thereof, the space between said walls and said cover structure in the closed position thereof providing a compartment for dry lading and defining the one configuration of said container, an inlet for dry lading in the upper portion of said container for introducing dry lading into said dry lading compartment, said envelope in the folded condition thereof with said cover structure in the closed position thereof accommodating ready passage of dry lading from said dry lading compartment through said discharge structure, said envelope in the extended condition thereof with said cover structure in the open position thereof providing within said envelope a compartment for liquid lading and defining another configuration of said container, and a closeable connection for said envelope and providing communication between the interior of said envelope and the exterior of said container for

introducing liquid lading into and emptying liquid lading from said liquid lading compartment.

17. The convertible freight container set forth in claim 16, wherein said cover structure comprises a pair of platelike members extending longitudinally of said container and respectively disposed on opposite sides of said support structure, each of said platelike members being pivotally mounted adjacent the inner end thereof on said support structure and being thereby pivotally movable between a substantially horizontal open position and a substantially vertical closed position, the outer ends of each of said platelike members being so dimensioned as to abut one another in the closed positions thereof thereby completely enclosing said envelope and abutting the sidewalls of said container in the open position to hold said framework in its erected position.

18. The convertible freight container set forth in claim 16, wherein said means for moving said cover structure includes a geared control apparatus for gradually moving said cover structure from one position thereof to another.

19. The convertible freight container set forth in claim 16, wherein said cover structure in the closed position thereof cooperates with the adjacent portions of said container to completely enclose said envelope thereby preventing the pulverulent dry lading from coming into contact with said envelope.

20. A convertible freight container for accommodating in one configuration thereof pulverulent dry lading and in another configuration thereof liquid lading, said container comprising an encompassing sidewall and two end walls closing the opposed ends of said sidewall, a collapsible and flexible and fluidtight envelope disposed within said container, a foldable framework attached to said envelope and mounted in said container and movable between a folded position holding said envelope in a predetermined folded condition and an erected position holding said envelope in a predetermined extended condition, means for moving said framework between the folded and erected positions thereof, cover structure mounted in said container and movable between a closed position covering said envelope and said framework in the folded position thereof and an open position exposing said envelope and said framework, means for moving said cover structure between the closed and open positions thereof, the space between said walls and said cover structure in the closed position thereof providing a compartment for dry lading and defining the one configuration of said container, an inlet for dry lading in the upper portion of said container for introducing dry lading into said dry lading compartment, discharge structure in the lower portion of said container for emptying dry lading from said dry lading compartment, said envelope in the extended condition thereof with said cover structure in the open position thereof providing within said envelope a compartment for liquid lading and defining another configuration of said container, and a closeable connection for said envelope and providing communication between the interior of said envelope and the exterior of said container for introducing liquid lading into and emptying liquid lading from said liquid lading compartment.

21. A convertible freight container for accommodating in one configuration thereof pulverulent dry lading and in another configuration thereof liquid lading, said container comprising an encompassing sidewall and two end walls closing the opposed ends of said sidewall, a collapsible and flexible and fluidtight envelope disposed within said container, a foldable framework attached to said envelope and mounted in said container and movable between a folded position holding said envelope in a predetermined folded condition and an erected position holding said envelope in a predetermined extended condition, cover structure mounted in said container and connected to said framework and movable between a closed position covering said envelope and said framework and an open position holding said framework in the erected position thereof, means for moving said cover structure between the closed and open positions thereof, the space

between said walls and said cover structure in the closed position thereof providing a compartment for dry lading and defining the one configuration of said container, an inlet for dry lading in the upper portion of said container for introducing dry lading into said dry lading compartment, discharge structure in the lower portion of said container for emptying dry lading from said dry lading compartment, said envelope in the extended condition thereof with said cover structure in the open position thereof providing within said envelope a compartment for liquid lading and defining another configuration of said container, and a closeable connection for said envelope and providing communication between the interior of said envelope and the exterior of said container for introducing liquid lading into and emptying liquid lading from said liquid lading compartment.

22. A convertible freight container for accommodating in one configuration thereof pulverulent dry lading and in another configuration thereof liquid lading, said container comprising an encompassing sidewall and two end walls closing the opposed ends of said sidewall, a collapsible and flexible and fluidtight envelope disposed within said container, cover structure including a pair of cover plates each extending longitudinally of said container and pivotally mounted therein adjacent to the lower portion thereof and movable between a closed position and an open position, two linkage assemblies respectively disposed within said container adjacent the end walls thereof and each connected to said cover structure and each having a predetermined folded position and a predetermined erected position, each of said assemblies comprising an even number of links pivotally interconnected end-to-end at a plurality of interlink connection points and cooperating with said container and said cover structure in the erected position of said assemblies to form a closed foldable loop, each of said assemblies being so arranged that in moving from the erected position thereof to the folded position thereof alternate interlink connection points undergo an initial motion inward with respect to said container, a plurality of connecting rods extending longitudinally of said container and attached to the outer surface of said envelope and respectively interconnecting corresponding interlink connection points of said two assemblies, said rods and said linkage assemblies cooperating to form a foldable framework for said envelope movable between a folded position holding said envelope in a predetermined folded condition and an erected position holding said envelope in a predetermined extended condition, said cover structure in the closed position thereof covering said framework and said envelope and in the open position thereof holding said framework in the erected position thereof, means for moving said cover structure between the closed and open positions thereof, the space between said walls and said cover plates in the closed position thereof providing a compartment for dry lading and defining the one configuration of said container, an inlet for dry lading in the upper portion of said container for introducing dry lading into said dry lading compartment, discharge structure in the lower portion of said container for emptying dry lading from said dry lading compartment, said envelope in the extended condition thereof providing within said envelope a compartment for liquid lading and defining another configuration of said container, and a closeable connection for said envelope and providing communication between the interior of said envelope and the exterior of said container for introducing liquid lading into and emptying liquid lading from said liquid lading compartment.

23. The convertible freight container set forth in claim 22, wherein each of said cover plates has a substantially flat base portion and a foot portion integral with said base portion and disposed at an angle thereto, said base portions in the open position of said cover structure extending across the lower portion of said container and said foot portions resting against the adjacent portions of said sidewall whereby said cover plates form a floor beneath said envelope.

24. The convertible freight container set forth in claim 23, wherein each of said linkage assemblies is connected between

said cover plates, one end of each of said assemblies being connected to the foot portion of one of said cover plates and the other end of each of said assemblies being connected to the foot portion of the other of said cover plates, the cover plates thereby forming a pair of end links in each of said assemblies and cooperating with said assemblies and said container to define two closed loops adjacent to the opposite ends of said container.

25. A convertible freight container for accommodating in one configuration thereof pulverulent dry lading and in another configuration thereof liquid lading, said container comprising an encompassing sidewall and two end walls closing the opposed ends of said sidewall, a collapsible and flexible and fluidtight envelope disposed within said container, a foldable framework attached to said envelope and mounted in said container and movable between a folded position holding said envelope in a predetermined folded condition and an erected position holding said envelope in a predetermined extended condition, a pair of inwardly biased arms respectively mounted in said container adjacent the end walls thereof and externally of said envelope, said arms pushing the ends of said envelope inwardly to insure proper folding thereof, cover structure mounted in said container and connected to said framework and movable between a closed position covering said envelope and said framework and an open position holding said framework in the erected position thereof, means for moving said cover structure between the closed and open positions thereof, the space between said walls and said cover in the closed position thereof providing a compartment for dry lading and defining the one configuration of said container, an inlet for dry lading in the upper portion of said container for introducing dry lading into said dry lading compartment, discharge structure in the lower portion of said container for emptying dry lading from said dry lading compartment, said envelope in the extended condition thereof with said cover structure in the open position thereof providing within said envelope a compartment for liquid lading and defining another configuration of said container, and a closeable connection for said envelope and providing communication between the interior of said envelope and the exterior of said container for introducing liquid lading into and emptying liquid lading from said liquid lading compartment.

26. A convertible freight container for accommodating in one configuration thereof pulverulent dry lading and in another configuration thereof liquid lading, said container comprising an encompassing sidewall and two end walls closing the opposed ends of said sidewall, two spaced-apart partitions disposed within said sidewall intermediate the ends thereof and dividing said container into a central chamber and two end chambers, each of said partitions having an opening therethrough adjacent to the lower end thereof and providing communication between the central chamber and the adjacent end chamber, a collapsible and flexible and fluidtight envelope disposed within said container between said partitions and having a predetermined folded condition and a predetermined extended condition, the end chambers and that portion of the central chamber between said sidewall and said envelope in the folded condition thereof combining to provide a compartment for dry lading and defining the one configuration of said container, a plurality of inlets for dry lading in the upper portion of said container respectively communicating with said end chambers and said central chamber for introducing dry lading into said dry lading compartment, discharge structure in the lower portion of said container between said partitions for emptying dry lading from said dry lading compartment, said envelope in the folded condition thereof accommodating ready passage of dry lading from said dry lading compartment through said discharge structure, said envelope in the extended condition thereof providing within said envelope a compartment for liquid lading and defining another configuration of said container, a closeable connection for said envelope and providing communication between the interior of said envelope and the exterior of said container for

introducing liquid lading into and emptying liquid lading from said liquid lading compartment, two closure members respectively mounted in said container adjacent the openings in said partitions and movable between an open position and a closed position, said closure members in the open position thereof allowing passage of pulverulent dry lading through said openings from said end chambers to said central chamber and to said discharge structure when said container is in the dry lading configuration thereof, said closure members in the closed position thereof covering the openings in said partitions to prevent said envelope in the extended condition thereof from protruding through the openings when said container is in the liquid lading configuration thereof, and means for moving said closure members between the open and closed positions thereof.

27. The convertible freight container set forth in claim 26, wherein said discharge structure comprises a hopper depending from the lower portion of said container and communicating with said central space, and each of said end walls slant downwardly and inwardly toward the adjacent partition to facilitate the emptying of dry lading from said end chambers through the openings in said partitions and into said discharge structure.

28. The convertible freight container set forth in claim 26, wherein each of said closure members comprises a plate substantially the same shape as the adjacent opening and is pivotally mounted at one end thereof in the central lower portion of said container.

29. The convertible freight container set forth in claim 26, wherein each of said partitions has a pair of openings therethrough, and wherein each of said closure members com-

prises a pair of pivotally mounted plates respectively disposed in the closed position thereof opposite the adjacent pair of openings.

30. A convertible vehicle for transporting freight and accommodating in one configuration thereof pulverulent dry lading in another configuration thereof liquid lading, said vehicle comprising a wheeled chassis, a freight container mounted on said wheeled chassis, said container including an encompassing sidewall and two end walls closing the opposed ends of said sidewall, a collapsible and flexible and fluidtight envelope disposed within said container and having a predetermined folded condition and a predetermined extended condition, the space between said walls and said envelope in the folded condition thereof providing a compartment for dry lading and defining the one configuration of said container, an inlet for dry lading in the upper portion of said container for introducing dry lading into said dry lading compartment, discharge structure in the lower portion of said container for discharging dry lading from said dry lading compartment, said envelope in the folded condition thereof accommodating ready passage of dry lading from said dry lading compartment through said discharge structure, said envelope a compartment for liquid lading and defining another configuration of said container, a closeable connection for said envelope and providing communication between the interior of said envelope and the exterior of said container for introducing liquid lading into and emptying liquid lading from said liquid lading compartment.

31. The convertible vehicle set forth in claim 30, wherein said vehicle comprises a railway car.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,583,330 Dated June 8, 1971

Inventor(s) Ernest Freudman and George R. Reagle

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 16, Claim 17, Line 15, "sidewalls" should be

-- sidewall --.

Column 20, Claim 30, Line 22, after "envelope" insert

-- in the extended condition thereof providing
within said envelope --.

Signed and sealed this 28th day of September 1971.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents