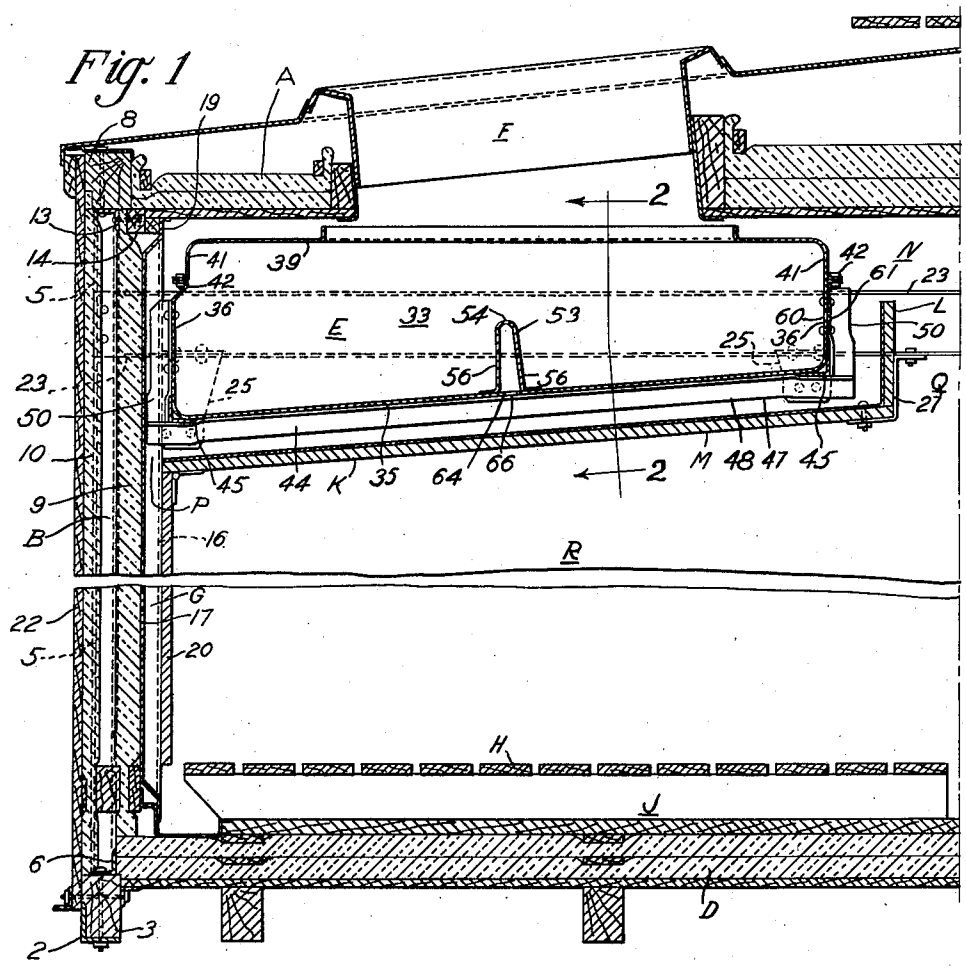
Sept. 29, 1942. C. D. BONSALL 2,296,900

REFRIGERATOR CAR CONSTRUCTION

Original Filed May 16, 1940 3 Sheets-Sheet 1

Fig. 1



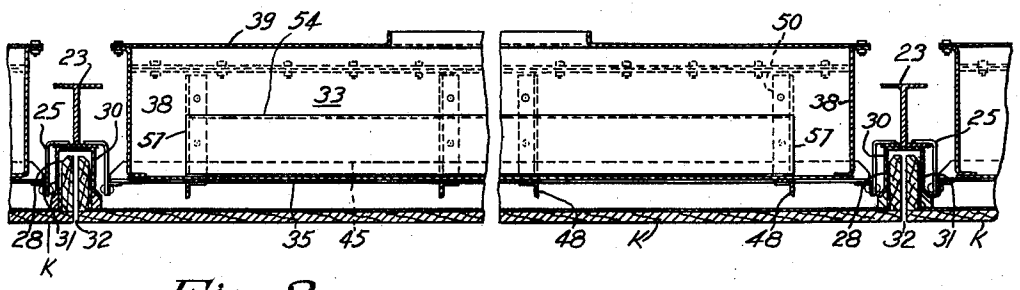


Fig. 2

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REFRIGERATOR CAR CONSTRUCTION

Original Filed May 16, 1940 3 Sheets-Sheet 2

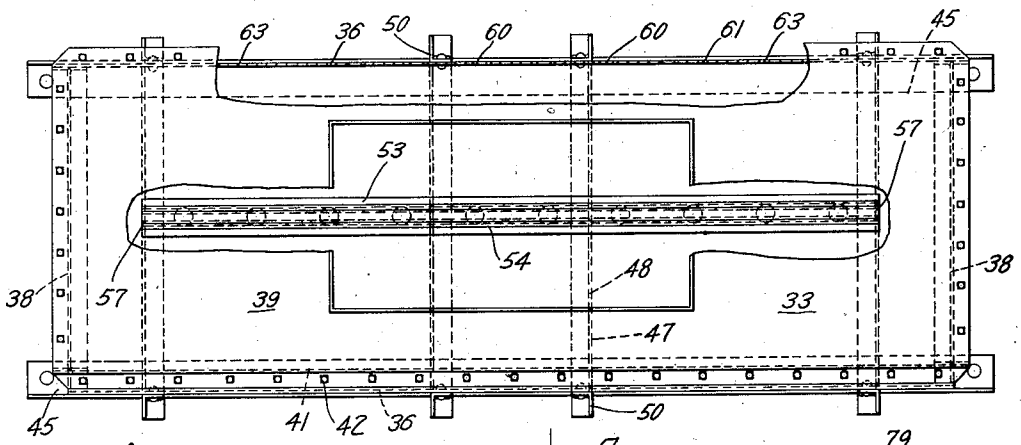


Fig. 3

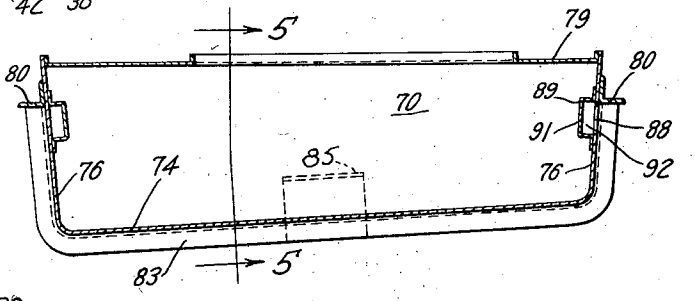


Fig. 4

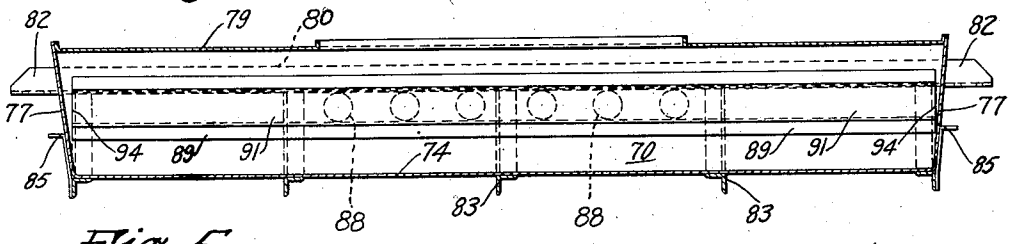


Fig. 5

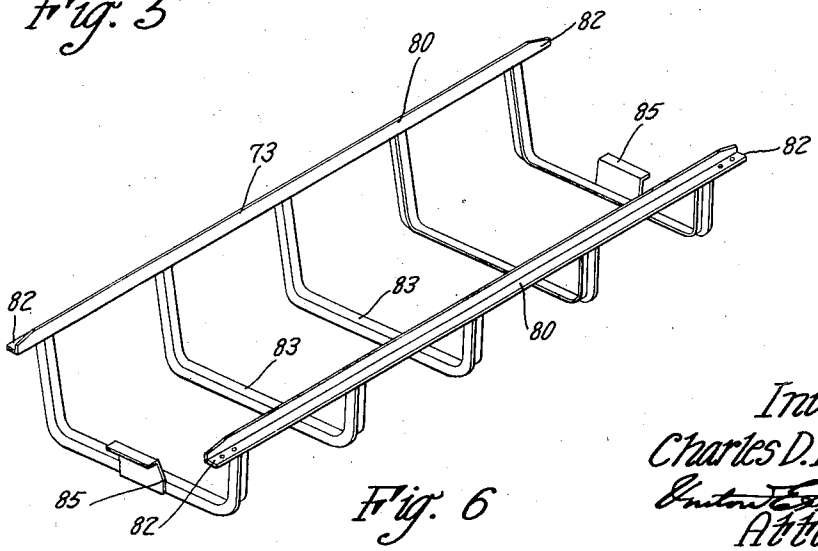


Fig. 6

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REFRIGERATOR CAR CONSTRUCTION

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Fig. 7

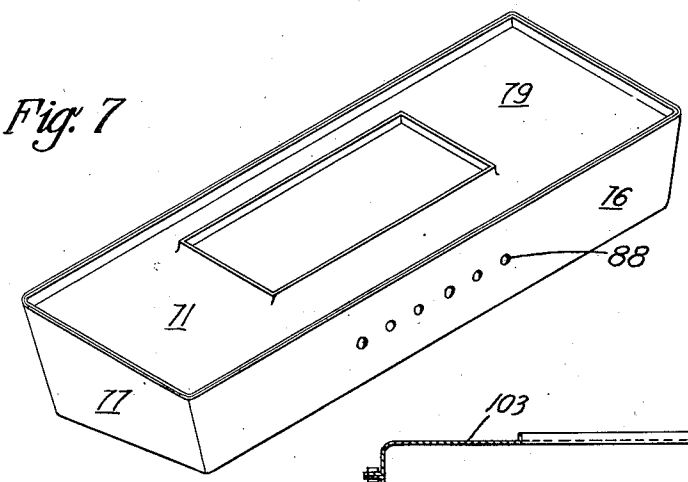


Fig. 8

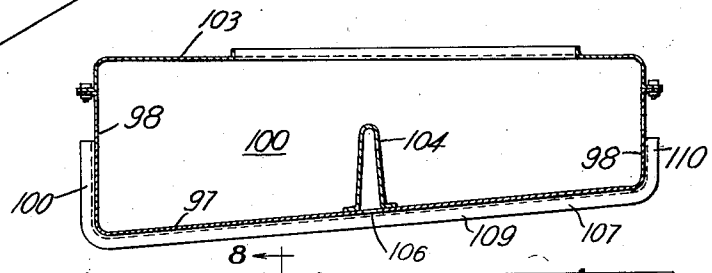


Fig. 9

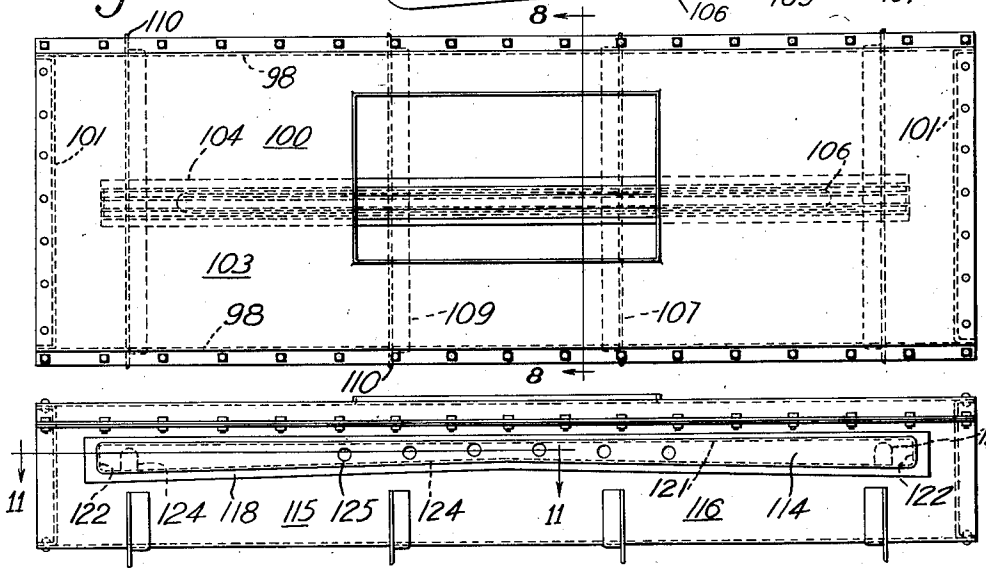


Fig. 10

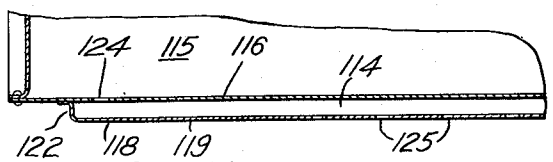


Fig. 11

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Patented Sept. 29, 1942

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UNITED STATES PATENT OFFICE

2,296,900

REFRIGERATOR CAR CONSTRUCTION

Charles D. Bonsall, Chicago, Ill., assignor to Standard Railway Devices Company, Chicago, Ill., a corporation of Delaware

Original application May 16, 1940, Serial No. 335,445. Divided and this application January 26, 1942, Serial No. 428,156

8 Claims. (Cl. 62—17)

This invention relates to refrigerator cars used to transport perishable commodities at a predetermined temperature. The essential features of a refrigerator car are an insulated body to prevent or retard ingress of heat during warm weather and egress of heat during cold weather, and a cooling means and a heating means to be used during warm and cold weather respectively.

This invention applies particularly to cars in which the cooling means, preferably containers for water ice, eutectic ice, brine or dry ice, are disposed immediately below the roof of the car. The lading is supported in spaced relation to the floor by a foraminous rack. Flues, preferably associated with the side walls of the car, communicate between the cooling means and the space under the floor rack to provide a path for the circulation of air. The path is from the cooling means downwardly through the aforementioned flues, through the space under the floor rack, upwardly through the lading compartment thereby cooling the lading, and finally to the cooling means from where the cycle is repeated.

An object of the invention is to provide means to prevent surging of the liquid refrigerant within the refrigerant container during service movements of the car.

A refrigerant container used in a car of this type is commonly provided with apertures spaced a substantial distance above the bottom of the container for overflow of liquid from the container as described in Bonsall Patent No. 2,168,556 of August 8, 1939. A further object, consequently, is to prevent the loss of an excessive amount of refrigerant through the overflow apertures. I disclose herein two methods of preventing such excessive loss of liquid refrigerant.

First, by the provision of a relatively small channel communicating with the interior of the container and apertures communicating between the channel and the exterior of the container so that small quantities of liquid refrigerant may escape from the channel but large quantities are retained in the container.

Second, by the provision of the overflow apertures in the central portion of the container rather than in the end portions. The liquid refrigerant within the refrigerant container surges lengthwise of the container during service movements of the car and builds up against the end wall of the container. The liquid when in this position would overflow in large quantities through the apertures if such apertures were in the end portions of the container. Surge retarding means, such as an upstanding baffle, is preferably positioned opposite the apertures to reduce the possibility of large waves of surging refrigerant being thrown through the apertures.

Another object is to provide a reinforcement for the bottom of the tank, which reinforcement also functions as a baffle means to retard surging of a liquid refrigerant as hereinabove pointed out. A further object is to arrange such baffle means and reinforcement to have sufficient stability to resist lateral movement of the refrigerant.

Another object of the invention is to provide, in combination with the reinforcing and baffle means, provision for retaining substantially equal liquid levels in all parts of the container.

A further object is to provide a refrigerant container which may be economically manufactured. I show in one modification a container comprising a liquid retaining tank made of substantially thin metallic sheet and a support for such tank made of relatively heavy structural members. The advantages of such construction are that the thin tank may be made from standard galvanized or corronized sheets which effectively resist corrosion and avoid the disadvantage of the poor bond sometimes existing between the steel and zinc in hot dipped galvanized material; the reinforcement may be either hot dipped galvanized after assembly or used in the ungalvanized condition. Another advantage of such construction is that the thin tank, being of substantially uniform thickness in all parts, may be hot dipped galvanized after assembly without the danger of warping which is present when structures consisting of relatively thin and relatively thick parts are galvanized.

Another object is to provide a combination reinforcing and baffle means which consists of an inverted channel member secured at both flanges thereof to the bottom of the container and to provide apertures in said bottom below the channel so that moisture condensed upon the interior of the walls of the channel may be drained off without corroding the channel.

Other objects and advantages of my invention will be apparent from the following detailed description by referring to the accompanying drawings.

In the drawings:

Fig. 1 is a partial transverse section of a refrigerator car embodying one modification of my invention.

Fig. 2 is a section through the refrigerant container of Fig. 1 as indicated by the line 2—2.

Fig. 3 is a plan view with certain parts broken

away of the refrigerant container shown in Figs. 1 and 2.

Fig. 4 is a transverse section through a modified form of refrigerant container.

Fig. 5 is a longitudinal section on line 5—5 of Fig. 4.

Figs. 6 and 7 are perspective views of the cradle type support and the liquid retaining tank, respectively, of the container shown in Figs. 4 and 5.

Fig. 8 is a transverse section through another modified form of refrigerant container.

Fig. 9 is a plan view of the container shown in Fig. 8.

Fig. 10 is a longitudinal elevational view of another modified form of refrigerant container.

Fig. 11 is a horizontal section on line 11—11 of Fig. 10.

The general parts of the refrigerator car shown in Fig. 1 are insulated roof A; side wall B; floor D; refrigerant container E; hatch F for loading refrigerant into the container E; side wall flue G; foraminous floor rack H and space J between the rack H and the floor D. A refrigerant container E is positioned directly below the roof A and adjacent a side wall B. A drip pan K is provided below the container E and a partition L is disposed in an upstanding position at the edge of the drip pan K. The drip pan K and the partition L cooperate with the roof A and the upper part of side wall B to form an enclosure M around the container E, an air inlet opening N to the enclosure M being provided by spacing the partition L from the roof A. An air discharge opening P leads from the enclosure M to the flue G at a lower elevation than the air inlet opening N. Cars of this type commonly have a row of refrigerant containers E near each side wall B, which containers are spaced apart at the center of the car. The partitions L are also spaced apart to form a duct Q which communicates between the lading compartment R and openings N.

Air circulation is as follows: Air in the lading compartment R is warmed by contact with the lading and rises through the duct Q to enter the enclosing structures M through the air inlet openings N. The air is then cooled by contact with the cold refrigerant containers E and falls by reason of its lower temperature, and therefore greater density, through the discharge openings P and flues G to the space J whence it rises through the rack H to the lading compartment R. The above described cycle is thereafter continuously repeated.

Each side wall B of the refrigerator car shown in Fig. 1 is comprised of a metal side sill 2, wooden side sill 3 secured to the metal sill 2 and spaced apart posts 5 upstanding from the wooden sill 3 and attached thereto by means of the longitudinally extending angle 6. The side plate 8 is preferably made of wood and secured to the upper ends of the posts 5. Side wall insulation blankets 9, 10 are disposed on both sides of the posts 5 and the upper edge of the inner blanket 9 is compressed between the angle 13 and the cleats 14, thereby supporting the inner blanket 9.

Metallic flue sheets 16 having outwardly projecting panels 17 formed therein are secured at their upper edges 19 to the cleats 14. Side wall lining 20 is secured in flatwise relation with the flue sheets 16, thereby forming the side wall flues G between the panels 17 and the lining 20. The side wall sheathing 22 extends between and is secured to the side plate 8, and side sill 3. The outer insulation blanket 10 is clamped between the sheathing 22 and side plate 8. Spaced apart carlines 23 which, in modification shown are I-beams, extend between the opposite side walls B of the car and are secured preferably to the posts 5. Brackets 25 are provided for attaching the refrigerant containers E to the carlines 23.

The drip pan K is shown hinged to the side wall B, preferably at the upper edge of the lining 20, and latching means 27 is provided at the center of the car so that the drip pan K may be swung downwardly when it is desired to clean or repair the drip pan K or refrigerant container E. Upstanding marginal members 28 are provided on the transverse edges of the drip pan K, which members extend into inverted channel shaped members 30 secured to the under sides of the carlines 23. The depending flanges 31 of the channel members 30 rest upon parts of the drip pans K to prevent leakage of liquid through the space 32 between drip pans K.

In the form of refrigerant container 33 shown in Figs. 1 to 3, the bottom 35 and the side walls 36 are made integral and the ends walls 38 are made separately and rigidly secured, preferably by welding, to the bottom 35 and side walls 36. The top 39 of the container 33 is formed with depending flanges 41 adapted to align with the side walls 36 and are secured thereto by a relatively removable means, such as rivets or bolts 42. The top 39 is secured to the end walls 38 by similar means. The supporting structure 44 consists of purlins 45 extending lengthwise of the container 33 at the lower corners thereof, which purlins 45 extend slightly beyond the ends of the container 33 and are attached to the brackets 25. Spaced apart U-shape members 47 are secured to the purlins 45, which members 47 each comprise a brace 48 subjacent the bottom 35 of the container and upstanding arms 50 adjacent the side walls 36 of the container. The members 47, therefore, form a cradle-like structure 44 in which the bottom 35 and side walls 36 of the container rest. The arms 50 may be secured to the side walls 36 of the container by any suitable means, such as riveting or welding.

A reinforcing means 53, which also functions as a baffle to retard surging of the refrigerant, is secured to the bottom 35 of the container 33. The reinforcing means 53 is preferably an inverted channel member 54 secured at both flanges 56 thereof to the bottom 35 of the container and arranged to extend lengthwise of the container (i. e., transversely to the end walls 38) below the hatch F so that refrigerant loaded through the hatch F may fall on both sides of the channel member 54. The ends 57 of the channel member 54 are preferably spaced from the end walls 38 of the container so that the liquid level in all parts of the container is substantially the same.

Apertures 60 are usually provided in the side wall 61 of the container 33 which is adjacent the center of the car for overflow of liquid refrigerant from the container. Bonsall patent No. 2,168,556 of August 8, 1939, shows a container adapted to overflow liquid refrigerant adjacent the center of the car and points out the advantages of such overflow. As indicated in Fig. 3, the overflow apertures 60 are limited to approximately the central third of the side wall 61 of the container 33. The portions 63 of the side walls 36 adjacent each end wall 38 are substantially imperforate so that when a liquid refrigerant surges against the end walls 38 dur-

ing service movements of the car, the refrigerant builds up to a considerable depth and the imperforate end portions 63 retain the refrigerant within the container. The inverted channel member 54 is disposed opposite the overflow apertures 60, as shown in Fig. 3, to reduce the magnitude of sidewise surging of the refrigerant, thereby reducing the amount of liquid which surges through the overflow apertures 60. The inverted channel member 54 is secured, preferably by welding along the lower edges of both flanges 56, to the bottom 35 of the container 33. The ends 57 of the channel member 54 are imperforate to retain liquid within the container. The part 64 of the container bottom 35 which is disposed below the channel member 54 is preferably provided with openings 66 which may be a plurality of relatively small apertures or a continuous slot so that moisture condensed from the air within the channel may drain therefrom, thereby preventing corrosion of the channel.

The refrigerant container 70 shown in Figs. 4–7 comprises a tank 71 of relatively thin sheet material and a tank supporting cradle-like structure 73 for supporting the tank 71. In the modification shown, the tank 71 is made with the bottom 74 and both side (76) and end (77) walls all integral; the side and end walls being welded together at the corners of the tank. The top 79 may be secured to the upper parts of the side and end walls by any suitable means.

The supporting structure 73 comprises spaced apart purlins 80, one disposed adjacent each side wall 76 of the tank 71 and arranged to extend beyond the end walls 77 thereof so that the ends 82 of the purlins 80 may be supported within the car. Suitable supporting brackets 25 are shown in Fig. 1. A plurality of spaced apart U-shape members 83 span the distance between the purlins 80 and form a cradle structure in which the relatively thin tank 71 is supported. The U-shape members 83 and the side walls 76 of the tank 71 are preferably divergent upwardly so that the tank, due to its own weight and the weight of the refrigerant contained therein, nests snugly into the cradle-like supporting structure 73. Clips 85 may be secured to the U-shape members adjacent the opposite ends of the supporting structure, which clips 85 extend substantially above the bottom of such members and prevent endwise sliding of the tank 71 within the supporting structure 73.

The container shown in Figs. 4–7 has manufacturing advantages as follows: The relatively thin tank 71 may be either galvanized (by a hot dipping process) after assembly or made from previously galvanized or corronized commercial sheet, whereas the relatively heavy supporting structure 73 may be galvanized after assembly or used in the ungalvanized condition. In either case, the two piece construction permits treating the tank and supporting structure individually and thereby eliminates the danger of warpage which is present when an attempt is made to galvanize a unit structure having both thick and thin parts.

One or both of the side walls 76 of the tank 71 may be provided with apertures 88 for overflow of liquid refrigerant for the purpose hereinabove pointed out. As shown in Fig. 4, a channel member 89 with the web 91 substantially vertical is secured to one or both of the side walls 76 of the tank 71 in such a position that the web 91 of the channel member is disposed in spaced relation to the apertures 88. The web 91 of the channel member prevents large quantities of liquid from surging from within the tank 71 through the apertures 88. The channel member 89 in combination with the side wall 76 forms a channel 92 associated with said side wall, which channel 92 is provided with the apertures 88 leading from the channel 92 to the exterior of the container 70. The channel 92 is open at its ends 94 so that liquid may overflow from the container 70 through the open ends 94 of the channel 92 and thence through the apertures 88 to the exterior of the container. It is pointed out, however, that the maximum amount of liquid which can be lost during any surge is the amount which is retained within the channel 92 and the channel 92 is preferably relatively small in order to minimize the loss of liquid.

In the modification shown in Figs. 8 and 9, the bottom 97 and side walls 98 of the container 100 are formed integral and the end walls 101 are made separate and secured to the bottom 97 and side walls 98, preferably by welding. The top 103 of the container 100 may be formed as shown in Figs. 1–3. The baffle means 104, which also reinforces the bottom of the container, is substantially similar to that shown in Figs. 1–3. Fig. 9, however, shows a long slot 106 in the bottom of the container 100 below the baffle means 104 in place of the small apertures 66 shown in Fig. 3. The transverse reinforcing members 107 preferably each comprise a brace 109 subjacent the bottom 97 of the container 100 and an upstanding arm 110 at each end of the brace 109, the arms being disposed adjacent the side walls 98 of the container 100. Each of such members 107 may be secured to the bottom 97 or side walls 98 of the container 100 or both. In such a construction the longitudinally extending baffle means 104 cooperates with the transversely extending reinforcing members 107 to form a relatively rigid grid to support the bottom of the container 100.

Figs. 10 and 11 show a modified form of channel 114 associated with one of the side walls 116 of the container 115. The channel member 118 is secured on the outside of the container 115 and is comprised of a vertical web 119 disposed in spaced relation to the side wall 116 of the container 115. Flanges 121 of the channel member 118 are secured to the side wall 116 and end closures 122 for the channel 114 are also secured to the side wall 116. An aperture 124 is provided near each end of the channel 114 leading from the interior of the container 115 to the interior of the channel 114 and a plurality of other apertures 125 are provided at the central part of the channel 114 leading from the interior of the channel 114 to the exterior of the container 115. The channel 114 shown in Figs. 10 and 11 prevents excessive overflow of liquid refrigerant in a manner similar to that hereinabove described in reference to Figs. 4 to 7. The channel 114 is preferably pitched downwardly toward the ends 127 thereof so that moving through the channel 114 has a tendency to wash dirt and other foreign matter toward the ends thereof to prevent clogging of the channel.

The accompanying drawings illustrate the preferred form of the invention, though it is to be understood that the invention is not limited to the exact details of construction shown and described, as it is obvious that various modifications

thereof, within the scope of the claims, will occur to persons skilled in the art.

This is a division of my application filed May 16, 1940, Serial No. 335,445.

I claim:

1. In a refrigerator car a refrigerant container having side and end walls, a substantially vertical baffle within said container extending substantially parallel with said side walls in spaced relation thereto and having the ends thereof spaced from said end walls, and an aperture in one of said side walls in spaced relation to said bottom, said aperture being spaced from each of said end walls at least as far as the end of said baffle adjacent thereto.

2. In a refrigerator car a refrigerant container having side and end walls, a substantially vertical baffle within said container extending substantially parallel with said side walls in spaced relation thereto and having the ends thereof spaced from said end walls, and a plurality of apertures in one of said side walls in spaced relation to said bottom, each of said apertures being spaced from each of said end walls at least as far as the end of said baffle adjacent thereto.

3. In a refrigerator car a refrigerant container having side and end walls and a bottom, a substantially vertical baffle within said container, said baffle comprising an inverted channel member secured at both flanges thereof to said bottom and having closed ends and an aperture in said bottom between the flanges of said channel member.

4. In a refrigerator car a refrigerant container having side and end walls and a bottom, a substantially vertical baffle within said container extending substantially parallel with said side walls in spaced relation thereto and having the ends thereof spaced from said end walls, said baffle comprising an inverted channel member secured at both flanges thereof to said bottom, and an aperture in one of said side walls in spaced relation to said bottom, said aperture being spaced from each of said end walls at least as far as the end of said baffle adjacent thereto.

5. In a refrigerator car a refrigerant container having a bottom and spaced apart walls, a substantially horizontal channel associated with one of said walls in spaced relation to said bottom, said channel being substantially closed except for openings adjacent its ends leading to the interior of the container, and apertures intermediate its ends leading to the container.

6. In a refrigerator car a refrigerant container having a bottom and spaced apart walls, a substantially horizontal channel associated with one of said walls in spaced relation to said bottom, said channel being substantially closed except for openings adjacent its ends leading to the interior of the container, and apertures intermediate its ends leading to the exterior of the container, said channel being inclined downwardly toward said ends.

7. In a refrigerator car a refrigerant container having a bottom and spaced apart walls, a substantially horizontal channel associated with one of said walls in spaced relation to said bottom, said channel formed by a member having spaced apart flanges secured to said last mentioned wall and a substantially vertical web spaced from said wall, said channel being substantially closed except for openings adjacent its ends leading to the interior of the container, and apertures intermediate its ends leading to the exterior of the container.

8. In a refrigerator car a refrigerant container having a bottom and spaced apart walls, a substantially horizontal channel in spaced relation to said bottom formed by a web disposed in spaced relation to one of said walls on the interior thereof, said channel being open at its ends, and apertures in said last mentioned wall communicating between said channel and the exterior of said container.

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