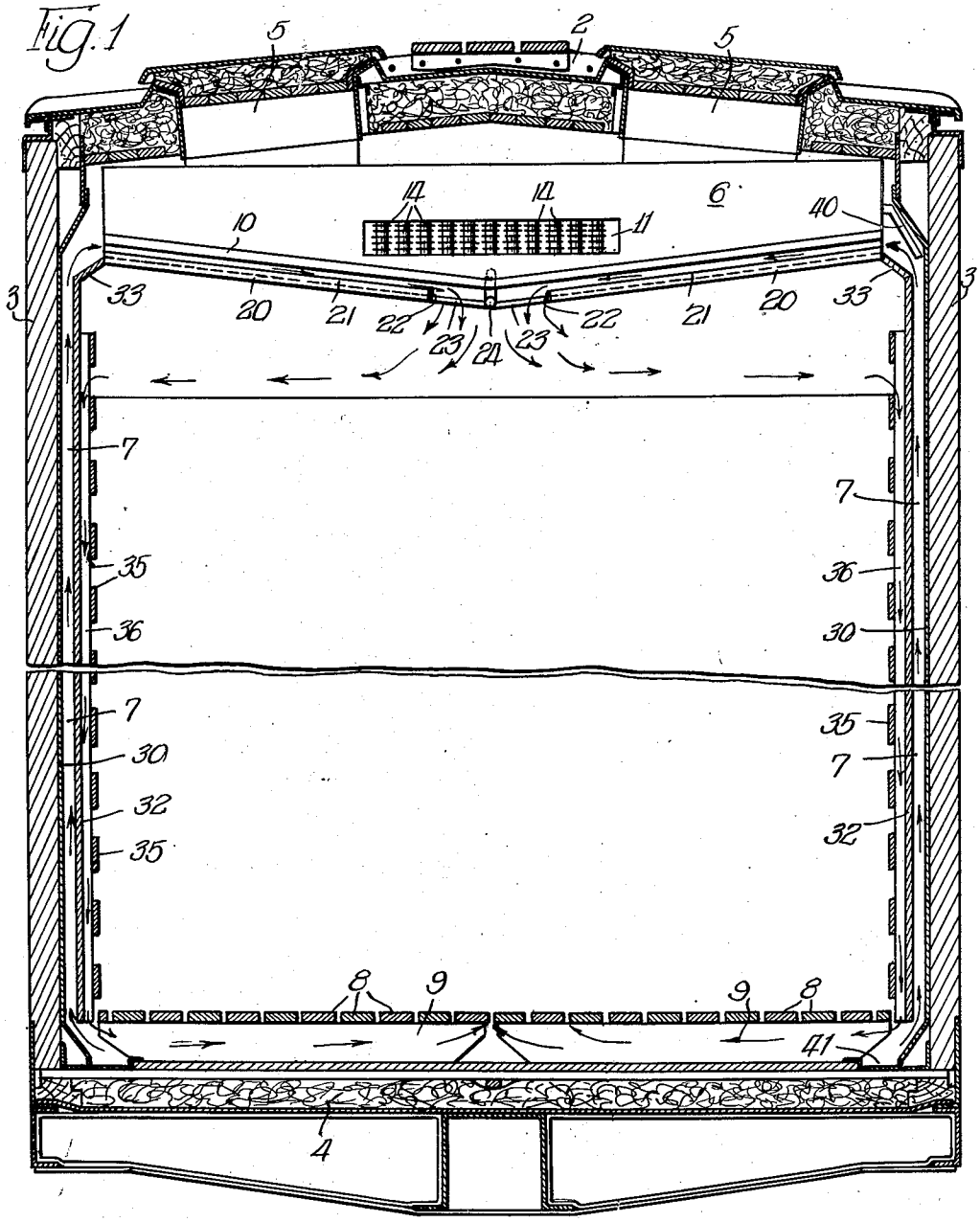
Dec. 2, 1952 R. A. DOERING 2,619,803

OVERHEAD BUNKER REFRIGERATOR CAR WITH A FAN

Filed Oct. 31, 1950 2 SHEETS—SHEET 1

Fig. 1



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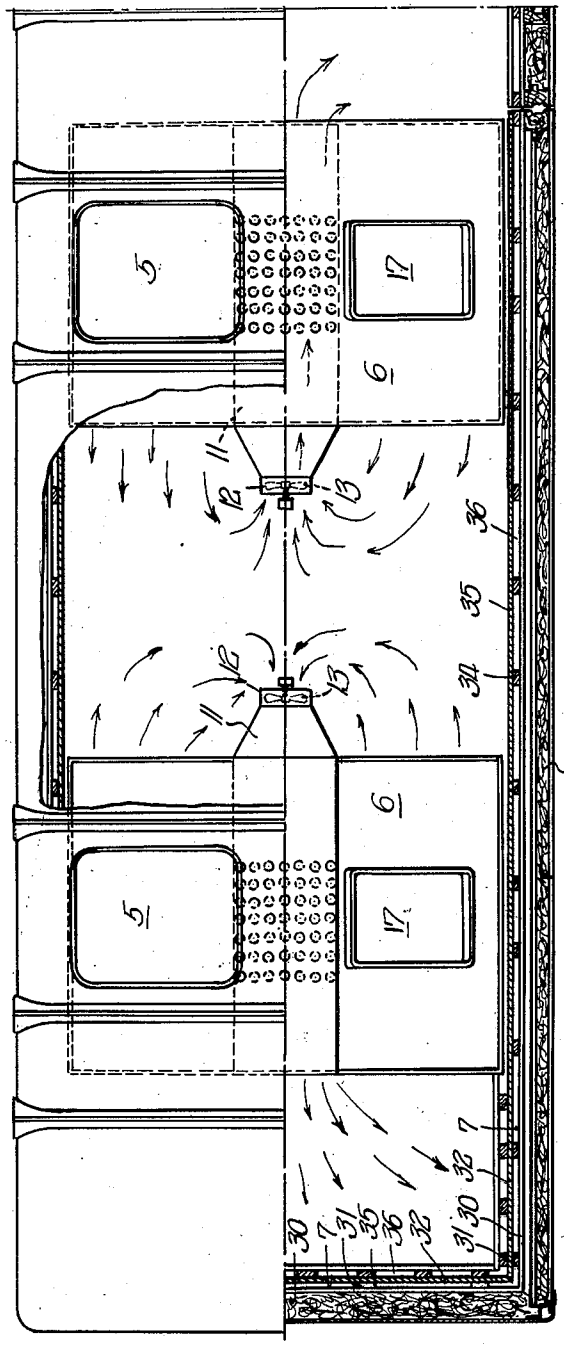


Fig. 2.

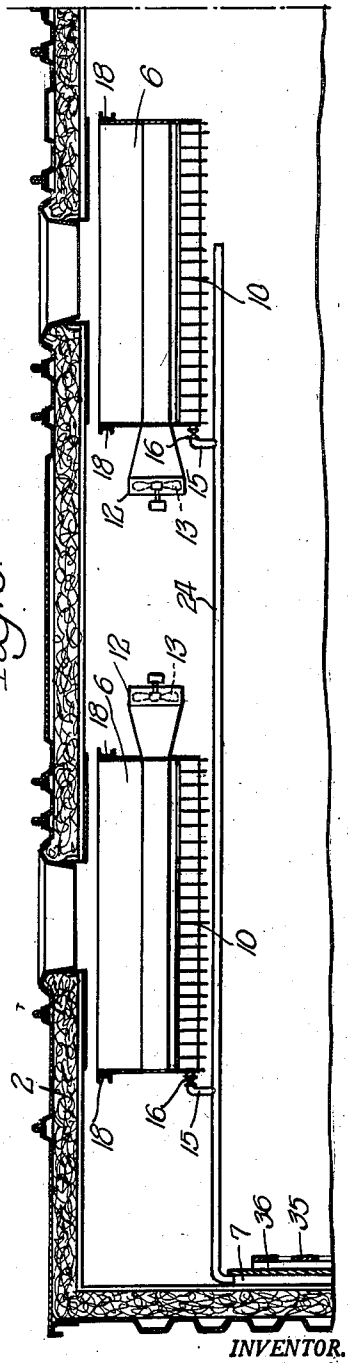


Fig. 3.

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OVERHEAD BUNKER REFRIGERATOR CAR WITH A FAN

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7 Claims. (Cl. 62—17)

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This invention relates to refrigerators used to store and maintain perishable commodities therein at a predetermined temperature. The essential features of a refrigerator are an insulated body to prevent or retard ingress of heat during warm weather and egress of heat during cold weather.

The invention applies particularly to railroad refrigerator cars wherein the cooling means, preferably containers for water ice, eutectic ice, brine or Dry Ice or any other refrigerant, are suspended immediately below the ceiling of the car. The lading is supported upon a foraminous rack in spaced relation to the floor. Flues at the side walls of the car communicate between the refrigerant compartment and the space under the floor rack to provide a path for circulation of air.

The efficiency of any refrigerator is dependent primarily upon the quality of the insulation in the walls, the air circulation, the surface area of the refrigerant containers, and the speed with which the heat transfer takes place.

It is, therefore, the objects of this invention to provide a refrigerator having refrigerant tanks of large surface area and to augment said area by radiation fins; to provide heat transfer ducts through said containers and to provide means for forcing air circulation through said ducts which also augment the circulation of air throughout the refrigerator; and to provide means whereby the warm air in the refrigerator is forced to travel upwardly in a flue formed in part by the side walls of the refrigerator from the space under the floor rack to the area around the refrigerant containers; and the air cooled by the refrigerant is forced to travel downwardly adjacent the first mentioned flue in a foraminous rack flue formed in part by said first mentioned flue to the commodity being cooled.

Other objects and advantages of the invention will appear in the following description thereof.

Referring now to the accompanying drawing forming part of this application, wherein like reference characters indicate like parts.

Fig. 1 is a transverse section through a refrigerator car body illustrating an embodiment of the invention.

Fig. 2 is a partial top plan view and horizontal section of approximately one-half of a refrigerator car.

Fig. 3 is a longitudinal vertical section through the upper part of a refrigerator car body illustrating a pair of the improved refrigerant containers.

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In the drawings, the general parts of the refrigerator car body shown are the insulated roof 2, side walls 3, floor 4, hatches 5, refrigerant containers 6, side wall flues 7, foraminous floor rack 8 and space 9 between the rack 8 and floor 4. The refrigerant containers 6, preferably four, are spaced apart and positioned immediately below the roof 2 extending transversely of the car to adjacent the side walls 3. The bottoms of these containers are inclined downwardly from the ends toward the transverse center thereof below the ridge of the car. The bottoms of said containers are provided with a plurality of spaced parallel radiation fins 10 which extend from end to end of the containers and which provide a plurality of passageways for circulation of air under said containers and between said fins, thereby materially increasing the surface area of heat transfer of said containers. Each container is also provided with a transverse rectangular heat transfer duct 11 extending through the container being supported therein by the sides of said container, said ducts of adjacent containers projecting into the space therebetween. The side walls of the projecting ends of said ducts taper down to a collar 12 within which is mounted a motor driven fan 13 for forcing air through said duct and at the same time increasing the air circulation throughout the car. This duct 11 is spaced from the top and bottom of the container so that the duct is submerged within the brine or other refrigerant within the container. A plurality of parallel transversely disposed finned tubes 14 extend from top to bottom of said container so that the refrigerant may pass freely therethrough or at least so that said tubes will be filled with said refrigerant.

The air forced by the fans 13 through said ducts will be compelled to pass between the finned tubes and thus the area of heat transfer of said containers is further increased. The top and bottom of the ducts are covered with a screen to prevent chunks of ice or salt becoming lodged within the tubes. Each container is provided with a drain pipe 15 provided with a valve 16 for draining the containers when necessary. Through the top of each container is provided a pair of spaced openings 17 which are located so as to occur directly under the hatches 5 when the containers are installed in the car. Carlines 18 extend from side to side of the car on opposite sides of the containers, to which they are attached, to hold said containers in place in the car. Power for the motors of fans 13 may be storage batteries charged by any of several axle

power take-off devices well known in the railroad field.

An overflow pipe **40** extends from an end of each tank downwardly toward the upper end of the adjacent flue **7** to conduct any brine overflowing into said pipe **40** into said flue **7** and downwardly therethrough to gutter **41** and out through an ordinary refrigerator car drain trap, not shown.

Under each refrigerant container **6** is a pair of spaced drip pans **20**, each arranged parallel with the bottom of said container. The space between the ends of the drip pans at the center of the car provides an area for the passage of the cooled air therethrough downwardly to the lading space of the car. Each drip pan has a metal lining provided with upturned flanges **21** at the sides and a flange **22** at the end to prevent condensation falling thereon from running therefrom onto the lading. At the center of each end flange **22** a drain connection **23** is provided to carry the condensation from the pans to the longitudinally disposed drain pipe **24** which extends under both containers **6** and empties into the end wall flue **7**. The drain pipes **15** from the containers also flow into this drain line **24**. Each drip pan extends from a side wall of the car to adjacent the longitudinal center thereof. The space between the drip pans and containers forms a duct for the passage of air therethrough in circulating.

The side walls **3** are of the usual insulated construction and provided with a suitable lining **30** extending from the top to bottom of the car and from end to end thereof. Spaced, vertically disposed spacer strips **31** are secured to lining **30**, to the inner surface of which is secured another lining **32** which extends from adjacent the floor rack **8** to adjacent the outer edge of the drip pan **20**, to which it is connected by an inclined piece **33**. Thus the spaced linings **30** and **32** form the flue **7**, which flue communicates with the space **9** under the floor rack **8** and the space between the drip pan and the container **6**. To the inner surface of the lining **32** are secured a plurality of spaced vertically disposed spacer strips **34**, and to the inner surfaces of these strips are secured a plurality of horizontally disposed spaced slats **35**, thus providing a wall rack flue **36**, which communicates with and is similar to the space **9** under the floor rack **8**. These slats **35** continue up the side walls of the car to adjacent the drip pans **20**, in any event sufficiently high to be at least slightly above the top of the lading in the car.

The end walls of the car are provided with identical flues and are consequently given the same reference characters.

When the fans are not operating, and air circulation is by gravity, the air between the containers and drip pans, upon being cooled by the refrigerant within the containers, will flow down to the center of the car onto the lading within the car below the drip pans. If this lading is boxes, barrels, or the like, with spaces therebetween, the cooled air will filter down and about the lading, gradually being warmed in the process, until it reaches and passes downwardly through the spaces between the slats of the floor rack **8** into the space **9**. It then passes laterally to the side walls of the car and up the outer flue **7** to the space between the drip pans and containers, where the cycle is repeated. If the lading is a tight load, as, for example, boxes which abut with no space therebetween, the cold air moving down from the center of the car will move laterally over the top of the lading to the wall rack flues **36** and will move downwardly therethrough, picking up heat from the lading as it passes downwardly in said flues. It then passes upwardly through outer flue **7** to the space between the drip pans and the containers **6** and repairs the cycle.

When the fans are operating, the air between adjacent tanks is forced by said fans **13** through ducts **11** about finned tubes **14** in containers **6** wherein said air is cooled and then said cooled air falls down through the lading and/or the rack flue **36** and eventually backs up through the flue **7** to the space between the containers **6** and drip pans where the cycle is repeated.

The greater proportion of heat entering the car is through the side walls thereof, and because the warm air is constantly passing upwardly in the flues **7**, said heat units will be carried quickly to the containers and be absorbed by the refrigerant therein. thereby maintaining a cold wall.

I claim:

1. In a refrigerator car, a refrigerant container spaced below the roof and extending from adjacent one wall to adjacent the opposite wall of said car, the bottom of said container being inclined downwardly from opposite ends to the transverse center of said container, drip pans below said container parallel with the bottom thereof each extending from an end of said container to adjacent said transverse center providing a space between said drip pans, a floor rack providing a space between said rack and the car floor, flues formed in part by said walls, said flues communicating with the space between said drip pans and container and the space between said floor rack and car floor, and rack flues formed in part by said first mentioned flues, said rack flues communicating with the space under said drip pans above the space normally occupied by a lading in the refrigerator and the space below the floor rack.

2. In a refrigerator car, a refrigerant container spaced below the roof and extending from adjacent one wall to adjacent the opposite wall of said car and having filling openings adjacent the ends of said container, an air duct extending through said container from side to side thereof between said filling openings, and communicating with the exterior of said container, a plurality of finned tubes extending transversely of said air duct and communicating with the interior of said container, whereby refrigerant within said container may surge through said tubes due to service movements of the car, and air may move through said duct about said tubes and be cooled by contact therewith.

3. A refrigerant container, for a railway refrigerator car, said container having a bottom surface inclined downwardly from opposite ends toward the transverse center thereof, spaced fins projecting downwardly from said bottom surface, a duct extending through said container between opposite walls thereof and open to the exterior of said container for passage of air therethrough said duct being spaced from the top, bottom and ends of said container, a plurality of tubes extending between opposite walls of said duct and communicating with the interior of said container for passage of refrigerant through said tubes, whereby air moving through said duct and about said tubes will be cooled thereby.

4. A refrigerant container, for a railway re-

frigerator car, said container having a duct extending through said container between opposite walls thereof and projecting beyond one wall and open to the exterior of said container for passage of air therethrough said duct being spaced from the top, bottom and ends of said container, a fan mounted within the projecting end of said duct for optionally forcing air therethrough a plurality of tubes extending between opposite walls of said duct and communicating with the interior of said container for passage of refrigerant through said tubes, whereby air moving through said duct and about said tubes will be cooled thereby.

5. A refrigerant container, for a railway refrigerator car, said container having spaced, longitudinally disposed fins projecting downwardly from the bottom surface of said container, a transverse duct extending through said container between opposite walls thereof and projecting beyond one wall for passage of air therethrough said duct being spaced from the top, bottom and ends of said container, a fan mounted within the projecting end of said duct for optionally forcing air therethrough a plurality of finned tubes extending between opposite walls of said duct and communicating with the interior of said container for passage of refrigerant through said tubes, whereby air moving through said duct and about said tubes will be cooled thereby.

6. In a refrigerant container for a railway refrigerator, an air duct extending through said container between opposite walls thereof and communicating with the exterior of said container for passage of air therethrough said duct being spaced from the top, bottom and ends of said container, a fan mounted at one end of said duct for optionally forcing air therethrough, and a

plurality of finned tubes extending transversely of said duct and communicating with the interior of said container for passage of refrigerant therethrough, whereby air moving through said duct and about said tubes may be cooled by contact therewith.

7. In a refrigerator car having a roof with hatchways on opposite sides of the ridge of said roof; a refrigerant container spaced below said roof and extending from adjacent one wall to adjacent the opposite wall of said car, the top of said container having filling openings registering with said hatchways, an air duct extending transversely through said container between said filling openings, and spaced from the top, bottom and ends of said container, and communicating with the exterior of said container, a plurality of finned tubes extending transversely through said air duct and communicating with the interior of said container, whereby refrigerant within said container may surge through said tubes due to service movement of said car and air may move through said air duct about said tubes and be cooled by contact therewith.

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