Oct. 2, 1934. S. T. SHERRICK 1,975,177

SOLIDIFIED GAS REFRIGERATOR

Filed Aug. 29, 1932 2 Sheets-Sheet 1

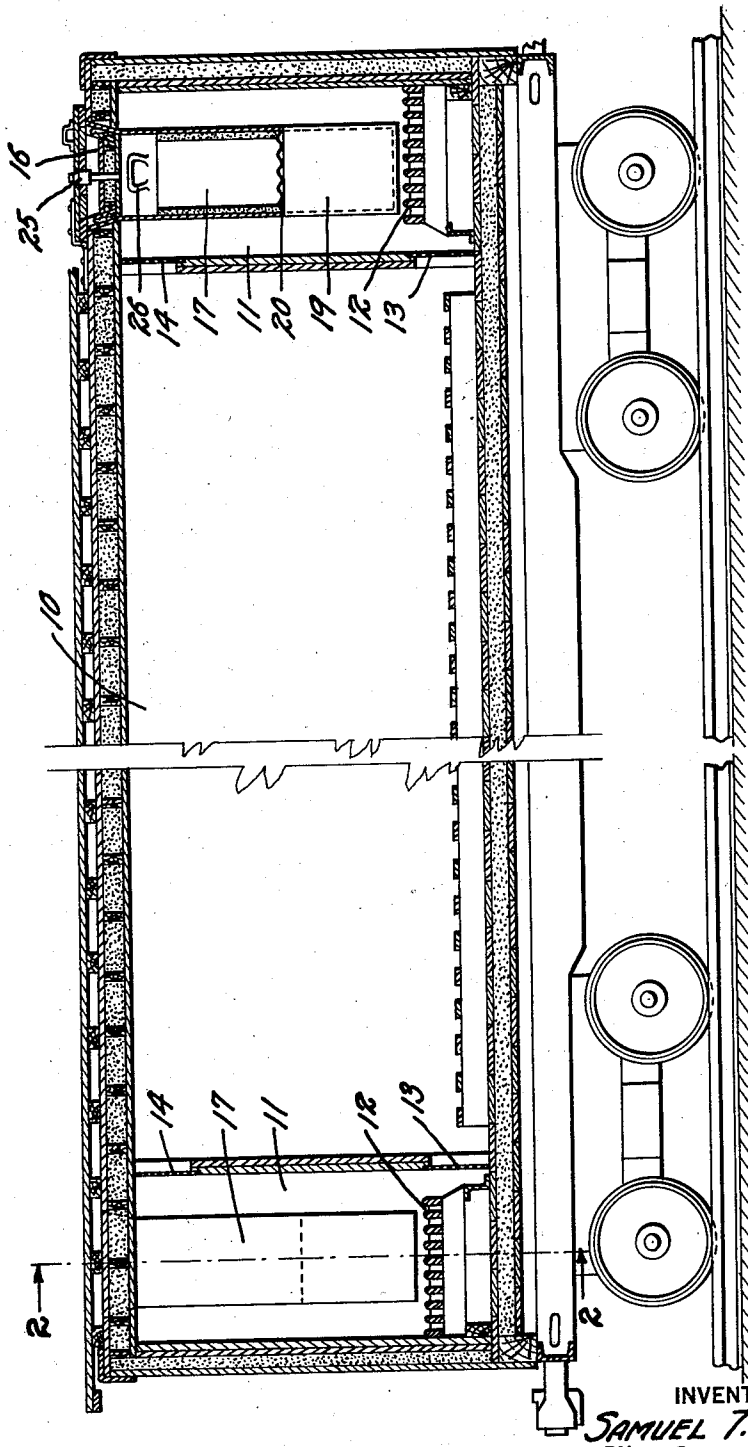

FIG. 1

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Fig 2

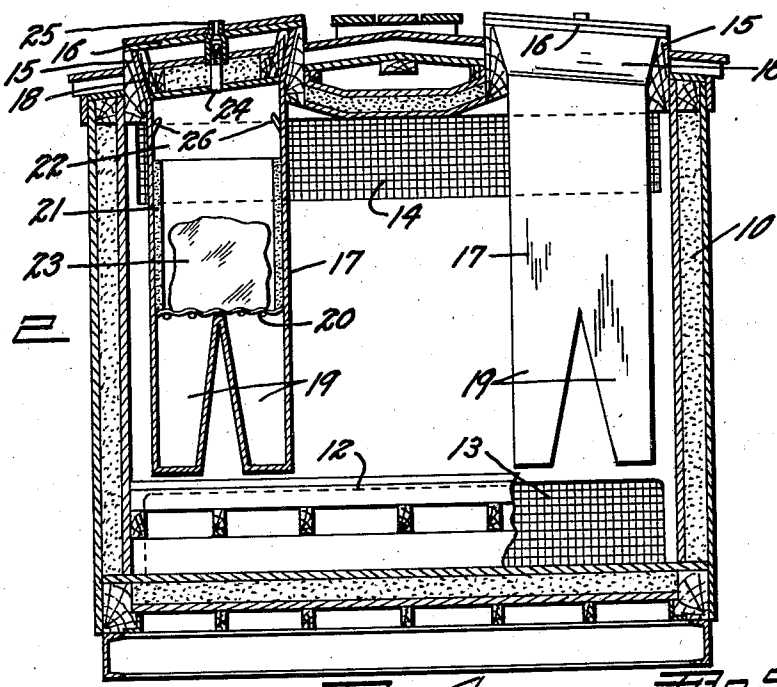


Fig 3

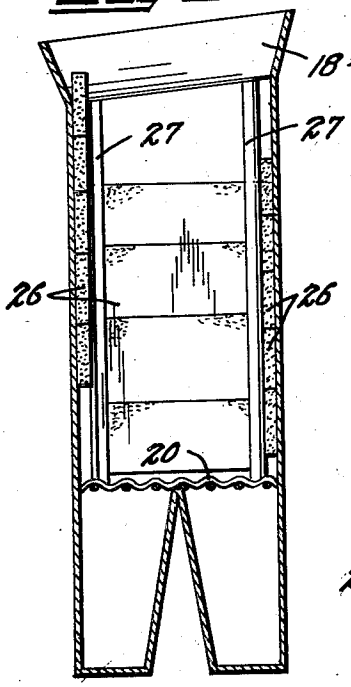


Fig 4

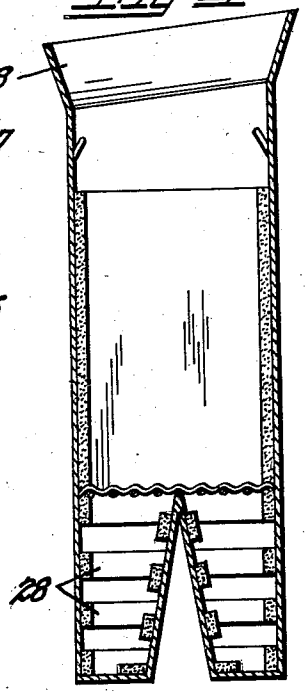
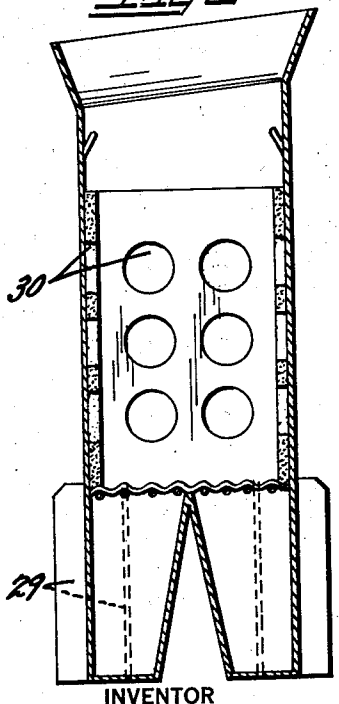


Fig 5



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UNITED STATES PATENT OFFICE

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SOLIDIFIED GAS REFRIGERATOR

Samuel T. Sherrick, Denver, Colo.

Application August 29, 1932, Serial No. 630,843

4 Claims. (Cl. 62—91.5)

This invention relates to means for employing solidified gas, such as solidified carbon dioxide, for use as a refrigerant in railroad refrigerator cars.

The principal object of the invention is to provide a container for the solidified gas which will be unusually efficient in heat absorption, and yet which will be very economical in the use of the solidified gas.

Another object of the invention is to so construct the container that portions of the walls thereof will be brought to an exceedingly low temperature so as to chill and circulate the surrounding air.

Still another object of this invention is to so construct the container that it will have a maximum area of cold surface in comparison to its size that a relatively small container will cool a relatively large volume of air.

A further object is to construct a container which can be fitted through the present ice hatch doors of refrigerator cars so that no change of any nature will be required in the car, and so that, should solidified gas be unobtainable, the container may be instantly replaced with water ice.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention reference is had to the accompanying drawings which form a part hereof. Like numerals refer to like parts in all views of the drawings and throughout the description.

In the drawings:

Fig. 1 illustrates a fragmentary, longitudinal section through a typical railroad refrigerator car with the invention in place therein.

Fig. 2 is a cross section through the ice bunker of the car taken on the line 2—2, Fig. 1.

Figs. 3, 4, and 5 illustrate vertical sections through alternate forms of the invention.

In the drawings the refrigerator car is designated in its entirety by the numeral 10. The car 10 is provided with ice bunkers 11 at its extremities, within which, ice supporting racks 12 are positioned. Each of the bunkers 11 has a bottom grill 13 for the exit of the cooled air and a top grill 14 for the entrance of the heated air. Each of the bunkers 11 is provided with two hatchways 15 through which the bunkers are normally iced. These hatchways are provided with inclined paces against which a relatively thick hatch cover 16 fits.

The invention comprises a sheet metal container 17 of a convenient size to be slid downwardly within the hatchway 15. The upper extremity of the container 10 is flared outwardly as shown at 18 to rest against the inclined inner faces of the hatchway 15. The hatch cover 16 will be received into the inclined top of the container 17 to close the latter and to lock it into place in the hatchway. The entire container may be supported by the flange like action of the flared top 18. When the cover 16 is closed it acts to clamp the flare top to the hatchway sides so that it cannot become loosened therefrom.

It is preferred to form the lower extremity of the container 17 into a series of two or more legs 19. As illustrated the container is provided with two legs 19, but it may be provided with any desired number of legs. A sub-floor 20 is positioned across the container 17 immediately above the legs 19. This sub-floor may be formed in any desired manner so that it will be open for the circulation of gas or air. One method of forming the sub-floor is to place a relatively coarse wire or rod screen or grill across the container.

The inner faces of the walls of the container 17 are provided with suitable heat insulation 21. This insulation, however, does not cover the entire inner surface of the walls. For instance it is preferred to terminate the insulation at the subfloor 20 so as to leave the inner surfaces of the legs 19 bare, and to also terminate the insulation below the top of the container 17 so as to leave an upper bare portion 22. In other words the walls immediately around the solidified gas 23 will be insulated but the walls above and below the position of the solidified gas will be bare or noninsulated.

In use, solidified gas is placed in the container 10 so as to rest upon the sub-floor 20. As the solidified gas vaporizes, the interior of the container 17 will eventually become entirely filled with cold vaporized gas. Means must be provided for allowing this gas to escape, as further vaporization will create a pressure within the container. It is not usually desirable to have this gas escape into the car as it has a decolorizing and injurious effect on some foods. As illustrated, a gas outlet pipe 24 is extended through the hatch cover 16 and provided with a suitable check valve 25. The pressure of the gas in the container will open the check valve and allow the gas to escape to the atmosphere outside the refrigerator car 10.

The gas within the container 17 circulates by convection, that is, the colder gas moves downwardly into the legs 19 and, as it absorbs heat, moves upwardly into the upper portion of the container where a part of it will escape through the check valve 25. Another part will be chilled by its second contact with the vaporizing solidified gas, and will again fall into the legs 19. This constant circulation of exceedingly cold gas will bring the outer surface of the legs 19 to an exceedingly low temperature, especially since the legs are bare and devoid of insulation.

Within the car 10, the warm air will rise to the roof and then flow through the gratings 14 into the ice bunkers 11 there to be chilled by its contact with the exceedingly cold walls of the container, and especially by its contact with the exceedingly cold legs thereof. This cold dense air will settle to the bottoms of the bunkers and then flow through the gratings 13 to chill and refrigerate the car contents.

It is desired to call particular attention to the upper bare surface 22 which is also devoid of insulation. The air entering the bunker through the grill 14 will immediately strike this cool surface which will act to instantly condense it and start it on its downward path through the bunkers. It has been found that the upper bare surfaces 22 quickly increase the circulation through the bunkers as they overcome the initial inertia of the incoming warm air.

It is preferred to form handle loops 26 on the interior of the container 17, to which crane hooks may be attached for removing the containers from, or replacing them in, the cars.

In Fig. 3 an alternate form of the invention is illustrated. In this form, the insulation comprises sectional insulating panels 26 which are maintained against the walls of the container by means of suitable guides 27. The panels 26 are not secured to the walls, but are slidable thereon, so that the may be moved or removed to expose either more or less bare wall or to position the bare portions thereof either at the bottom or at the top as desired. They may be placed apart to provide a series of bare spaces throughout the wall area if desired. This adjustable panel feature provides a minute control of the car temperature if the contents are such that a very low temperature is desired, more of the sectional panels may be removed to expose a larger area of heat absorption surface. This brings the air in the bunkers to a lower temperature and cools a larger volume thereof. If the contents do not require such excessive cold additional panels 26 may be inserted.

In Fig. 4 a second alternate form is illustrated for use where an excessively low temperature is not desired. In this form the legs of the container are partially insulated by means of strips 28 of insulating material spaced apart along the legs. These strips of course, limit the cold area of the legs and naturally reduce the amount of heat transferred from the car interior to the solidified gas. This results in a higher car temperature and less consumption of the gas.

In Fig. 5 still another form is illustrated, more particularly designed where an exceedingly low temperature and exceedingly rapid exchange of heat to the refrigerant. In this form the legs are bare and provided with metallic absorbing vanes 29 which are secured to or formed on the metallic surfaces of the container. These vanes greatly increase the heat absorption area of the container and the heat they absorb is transferred to the container walls thence to the cold interior gas and thence to the refrigerant. Any desired number of the vanes may be employed and they may be extended any desired distance along the container. In this form the insulation about the refrigerant has been reduced to a minimum by forming openings or passages 30 therethrough to allow the heat to be absorbed from spaced apart areas on the outer walls.

While several forms of the invention have been illustrated and described they all carry out the same basic idea of transferring the heat through a metallic membrane or wall from the car interior to the refrigerant so that the cold metallic wall will occupy the position of and function similarly to the surface of the water ice originally used in the refrigerator car, and to provide means for controlling this cold surface so as to increase or decrease its active area according to the temperature desired.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

1. A refrigerating container for solidified carbon dioxide comprising: a container for said material; hollow legs formed in the bottom of said container; a screen member separating said legs from the container proper; insulating material covering the inner walls of said container, said insulating material terminating at said screen so as to leave said legs uninsulated; a cover for said container; and a gas escape vent through said cover.

2. A solidified gas refrigerator comprising: the combination of a metal container for said solidified gas; a shelf with openings through it to support said solidified gas; heat insulating material laterally surrounding the zone in which the solidified gas reposes; hollow legs formed in the lower portion of said container; means for venting vaporized gas from said container; and means for circulating air to be cooled adjacent the said container.

3. A refrigerator using solidified gas as a refrigerant comprising: a metal container for the said solidified gas; a shelf within the said container to support the said solidified gas, said shelf having openings through it to permit passage of vaporized gas; heat insulating material partially lining the inside surfaces of the said container arranged in sections to be removable to change the degree of insulating effect; hollow legs formed in the lower portion of said container; means for venting vaporized gas from the container; and means for circulating air to be cooled, adjacent said container.

4. A refrigerator using solidified gas as a refrigerant comprising: a metal container for the said solidified gas, of a size and shape to go into a standard refrigerator car ice bunker, through the ice hatchway and fit, adjacent its upper etremity, into the tapered hatchway opening; means for supporting the said solidified gas in said container; means for variably heat insulating the interior surfaces of said container; means for venting vaporized gas from said container; and hollow legs formed in the lower part of the said container.

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