

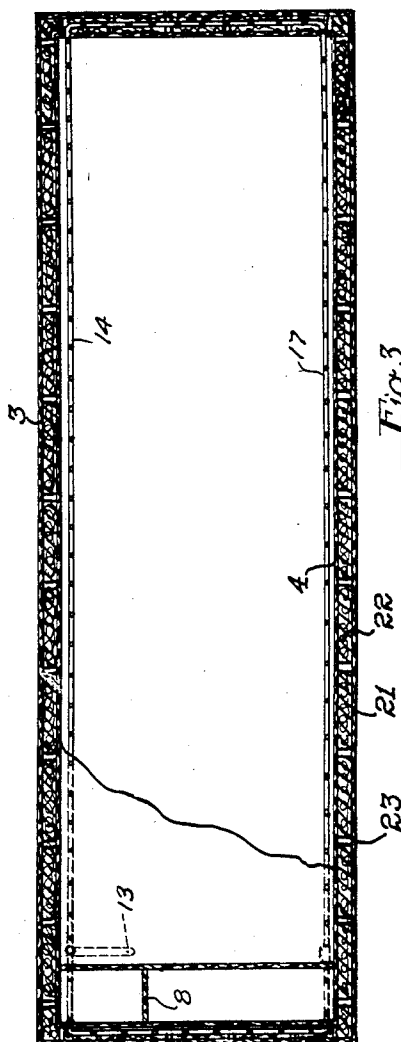
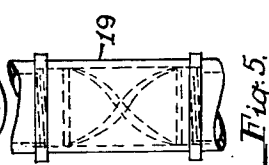
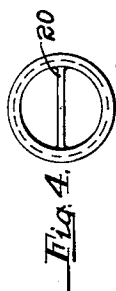
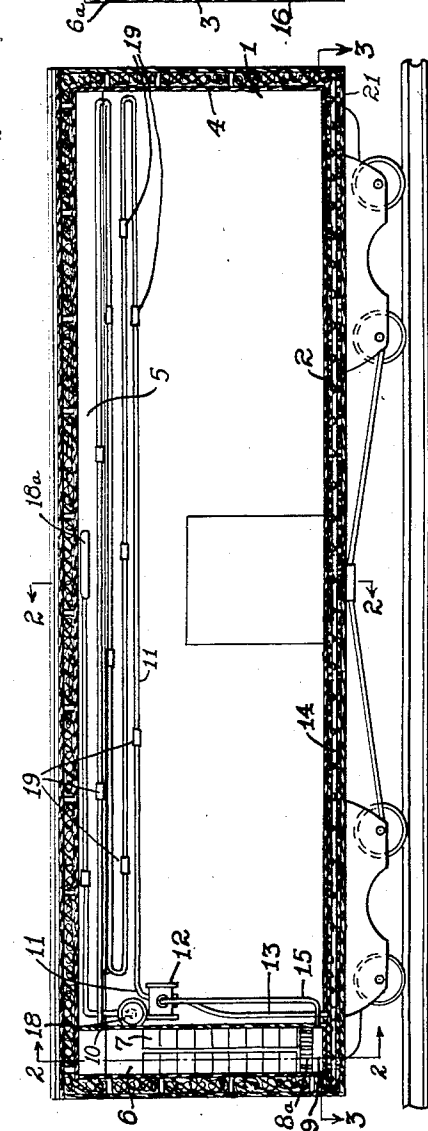
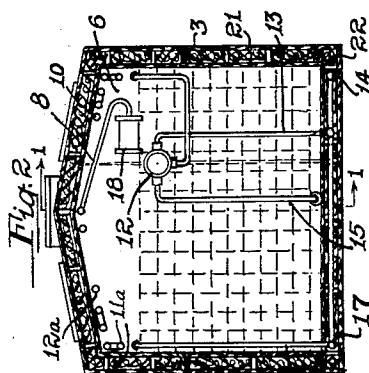
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L. H. VOLD

2,159,187

REFRIGERATING SYSTEM

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2,159,187

REFRIGERATING SYSTEM

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3 Claims. (Cl. 62—91.5)

This invention relates to improvements in refrigerating systems, more particularly to systems utilizing dry ice, frozen carbon dioxide (CO₂) as a refrigerant.

Refrigeration by the use of frozen carbon dioxide necessitates a circulation of the carbon dioxide gas generated in the ice compartment to absorb heat from the refrigeration or storage compartment, the degree of cooling being controllable by regulation of evaporation in the ice compartment in the manner as set forth in my United States Letters Patent No. 1,949,518 March 6, 1934, wherein such evaporation is stimulated by the use of a plurality of ice compartments for use in railway refrigerator cars.

In accordance with the present invention, the carbon dioxide gases generated in the ice compartments after going through the refrigerating compartment are directed through the space of a double wall of the refrigerating compartment for the purpose of utilizing the left-over coldness of the gas, and incidentally increase the insulating effect of the space between the walls.

The invention will become more apparent from a consideration of the accompanying drawing constituting a part hereof in which like reference characters designate like parts and in which:

Fig. 1 is a longitudinal cross-sectional view of a refrigerating car to which the invention is applied;

Fig. 2 a transverse section taken through the cooling compartment of the refrigerator car along the line 2—2 of Fig. 1;

Fig. 3 a plan view of the floor of the car taken along the line 3—3, Fig. 1;

Fig. 4 an end view of a pipe union; and

Fig. 5 an elevational view thereof.

With reference to the several figures of the drawing, the numeral 1 designates the car compartment constituted by a floor 2, side and end walls 3 and 4, respectively, and a roof or top wall 5. The numerals 6 and 6a designate ice compartments divided by partition 8 for receiving frozen carbon dioxide blocks 7 which are supported on a perforated base 8a below which is provided a compartment 9. The gas from compartment 6 leaves the compartment through pipe 11 and enters valve 12 after circulating in the car compartment at 10 in pipe 11 where it is deflected either to pipe 13 then to pipe 14, or to pipe 15 into space 9 communicating with compartment 6a, to circulate around the ice cubes therein. The gases from compartment 6a leave the compartment at 12a and circulate in pipes 11a of the refrigerating compartment, then down

through pipe 16 to a perforated pipe 17. Valve 12 is controlled by an actuator 18 through a temperature responsive medium such as liquid contained in a bulb 18a below the ceiling of the refrigerator compartment which, in response to temperature changes in the refrigerating compartment, operates valve 12 to deflect the gases to exhaust through pipe 14 or through pipe 15 into the ice compartment 6a.

A plurality of pipe unions 19 are connected at intervals in the circulating pipes 11 and 11a of the refrigerating compartment, these unions being provided with a central baffle 20 which acts like a helical partition element to set the gases in circular motion with increased velocity for the purpose of sweeping away or breaking-up films tending to form on the inner surface of the pipe, which would act as insulation to prevent heat carrying conductivity between the gas and pipe walls. As noted in Fig. 1, the unions are connected at intervals in the pipe lines 11 and 11a.

The entire refrigerator car is surrounded with an outer wall 21 to form an air space 22 which is loosely packed with an insulating material 23 to impede circulation. The exhaust carbon dioxide gases enter this space beneath the floor of the refrigerator car through the pipes 14 and 17 which are perforated as shown in Fig. 3 to distribute the gases through the length of the bottom space from which they travel into the side and end wall spaced upwardly around the refrigerating compartment. The insulating material 23 is of such character as to permit the penetration or saturation of the exhaust gases thereto without, however, allowing free circulation of the gases in the double-walled space.

The operation of the above described refrigerating system is briefly as follows:

Carbon dioxide gases are caused to be circulated from compartments 6 and 6a through the circulating pipes 11 and 11a in accordance with temperature changes in the car compartment effecting expansion or contraction of the fluid in the bulb 18a, which exerts pressure on the actuator 18 to deflect valve 12. After the carbon dioxide gases have circulated through the pipes 11 and absorb heat in passing therethrough, they are conducted through the exit pipes 13 and 16 to the horizontal perforated pipes 14 and 17 in the outer insulated space 22 of the refrigerating compartment. By passing through the perforations of the pipes 14 and 17, the full length of such pipes in quantities depending upon the rate of circulation of the gases through the piping 11 and 11a, they will pass into the insulating space around

the compartment to cool the space. The exhaust gases may be vented from the insulating space in any suitable manner at the top of the car.

By means of the hereinbefore described construction of refrigerator compartments to have an insulating space around their outer walls wherein to circulate exhaust carbon dioxide gases, a lower consumption of frozen carbon dioxide is possible because the effect of external temperature entering the refrigerating compartment by radiation and conduction is to a large extent nullified.

The application of the invention to refrigerator cars as herein described is for the purpose of illustration only as it is obviously adapted for use in any frozen carbon dioxide refrigerating system.

Although one embodiment of the invention has been herein illustrated and described, it will be apparent to those skilled in the art that various modifications may be made in the details of construction without departing from the principles herein set forth.

I claim:

1. In a refrigerating system, a refrigerator chamber, a frozen carbon dioxide compartment, an external wall spaced from the walls of said chamber and compartment to form an insulating space therearound, means for evaporating frozen carbon dioxide in said compartment and circulating the gas through the refrigerator chamber,

and perforated conduits extending the full length of and beneath the refrigerator chamber in the insulating space between the walls of said chamber for conducting and distributing the exhaust gases leaving the refrigerating chamber in the insulating space surrounding said chamber.

2. In a refrigerating system, a refrigerator chamber, a frozen carbon dioxide compartment, an external wall spaced from the walls of said chamber and compartment to form an insulating space therearound, a system of piping at the top of the refrigerator chamber for circulating carbon dioxide gases generated in the frozen carbon dioxide compartment to remove heat from said chamber, and perforated conduits disposed in the insulating space beneath said chamber and connected to said circulating piping to exhaust the carbon dioxide gases into the insulating space after passing through the piping of the refrigerating chamber.

3. In a refrigerator system, a refrigerator compartment and a storage compartment for frozen carbon dioxide, a system of piping opening to the storage compartment and extending into the refrigerator compartment, and means in the form of pipe couplings connected at intervals in said piping and embodying partition members for subjecting the gases circulating in said piping to a swirling movement.

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