

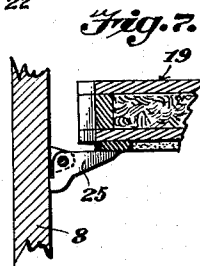
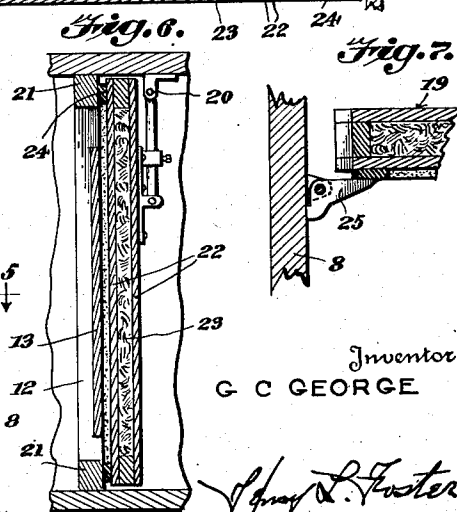
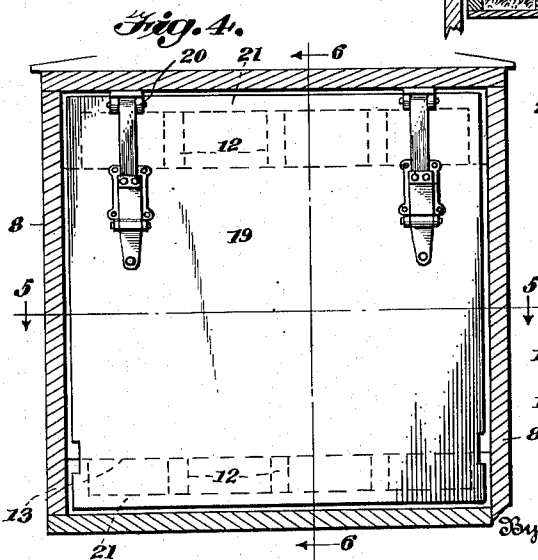
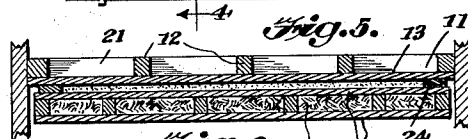
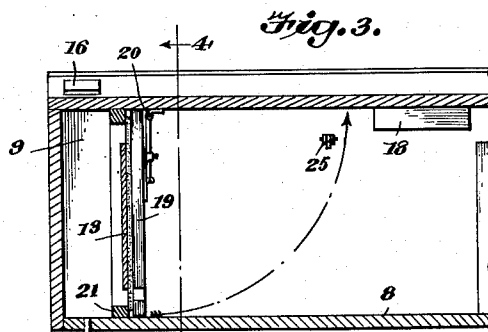
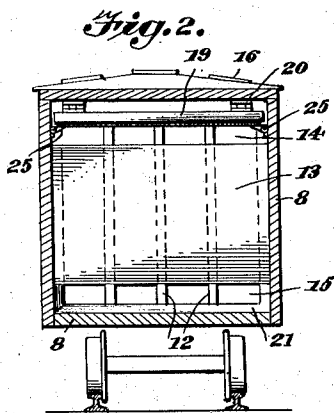
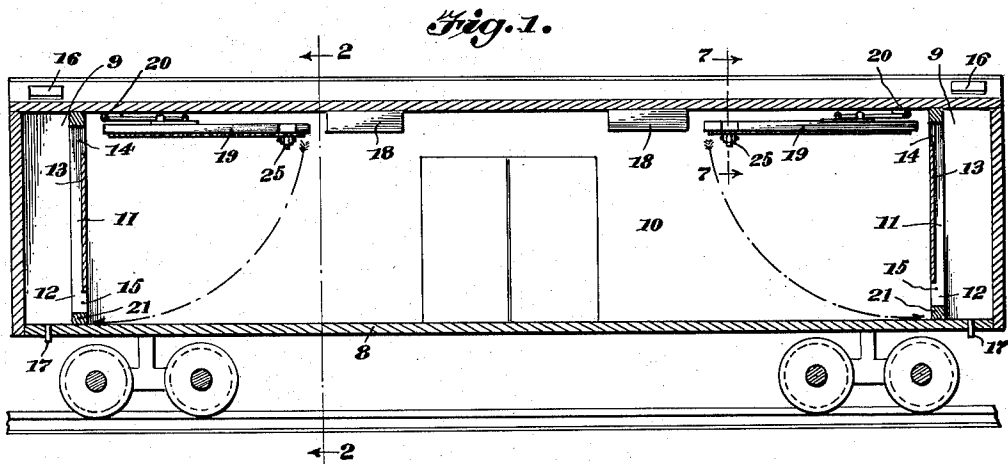
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REFRIGERATOR CAR

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REFRIGERATOR CAR

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3 Claims. (Cl. 62—15)

The present invention relates to refrigerator cars, and more particularly to a car wherein provision is made for converting the cooling system from one wherein an evaporative refrigerant, as for example, solid carbon dioxide is used, to an ice-cooled system.

The advantages of a refrigerant, such as dry ice, are well-known, but in freight cars, the conditions that obtain due to the motion, have required the consumption of an excessive amount of refrigerant, and a consequent high cost.

In a train composed of freight cars there is a space between each two adjacent cars, and as the train moves through the air, the rear end of one car creates two whirling columns of air between it and the front of the following car. The axes of these columns are vertical, and as the speed of the train increases the rate at which the columns revolve increases, the speed of such rotation increasing as the square of the speed of the train.

The heat of the air in the columns is transmitted to the front and rear walls of the forward and rearward cars, respectively, and in addition to the heat of the air, the temperature of the columns is raised by friction of the air against both the surfaces of the cars and against the air through which the columns move.

The heat from these columns is transmitted through the walls of the car to the interior and rapidly melts the ice or causes the rapid evaporation of an evaporative refrigerant. It also causes the creation of air currents within the car. The air currents are known to greatly impair the efficiency of an evaporative refrigerant.

One object of the invention is to provide a novel combination of refrigerating means whereby the car may be converted easily and quickly from an ice-cooled car to an evaporative refrigerant cooled car or vice versa.

Another object is to provide a car in which an evaporative refrigerant may be used, and wherein an excessive amount of refrigerant is not necessary.

Another object is to provide a structure wherein when the car is cooled by an evaporative refrigerant, the end portions of the car will be insulated from the central or cargo-receiving portion, whereby the creation of air currents is prevented and transmission of heat to the cargo space by radiation from the ends of the cars is prevented.

Still another object is the provision of a car in which, when an evaporative refrigerant is used

as the cooling means, ice may also be used, whereby a great saving in the refrigerant is effected.

In the accompanying drawing:

Figure 1 is a sectional view of a car equipped with a preferred embodiment of the invention.

Figure 2 is a sectional view on the line 2—2 of Figure 1.

Figure 3 is a fragmentary view similar to Figure 1, showing one of the closures in closed position.

Figure 4 is a sectional view on the line 4—4 of Figure 3.

Figure 5 is a sectional view on the line 5—5 of Figure 4.

Figure 6 is a sectional view on the line 6—6 of Figure 4.

Figure 7 is a sectional view on the line 7—7 of Figure 1.

Describing the drawing more particularly, the body of a refrigerator car is illustrated, having walls 8 of any suitable insulating construction. At each end of the car is an ice bunker 9 that is set off from the central or cargo-receiving space 10 by a partition 11 comprising spaced vertically disposed studs 12. A barrier 13 is placed across the studs and closes off the spaces throughout the central portion of the studs, but leaving circulating openings 14 and 15, respectively, above and below the barrier, and at the top and bottom of the car. Filling hatches 16 at the top of the car may be provided, and drains 17 pass through the bottom of the car. When the bunkers 9 are filled with ice it will be seen that warm air from the space 10 will enter through the openings 14 and cold air will return from the bunkers through the openings 15.

Within the cargo space 10 are located evaporative refrigerating devices 18 which may be of any suitable type and which are so well-known that they do not require specific description. Preferably several of the devices are used, and are so located as to give a uniform refrigerating effect throughout the entire cargo space.

In order to render the car convertible from an ice-cooled to an evaporative refrigerant cooled vehicle, doors designated generally 19, are provided adjacent each of the partitions 11. These may be of any suitable form, but for convenience and ease in installation and in operation, the disclosed form is at present considered preferable. The doors 19 are hinged to the roof of the car at 20 for vertical swinging between the closed position, as shown in Figure 3, and the open position shown in Figure 1. A sill 21 surrounds

the partition 11 and gives a bearing for the door to close against. The door preferably is built, as indicated in Figure 6 with outer side members 22 and an inner filling of insulating material 23. A gasket 24 may be mounted upon the surface of the door to insure a substantially air-tight closure between the cargo space and the ice bunker. The hinged structure may be advantageously of a well-known spring type, wherein, when the door is in its closed position, spring pressure will be brought to bear upon its rear side in order to force it firmly against the sill 21. A latch, as indicated at 25, may be attached to the side of the car in order to automatically engage the door when it is swung to its open position and hold it.

When it is desired to cool the car by wet ice, the doors are opened as shown in Figure 1, and the bunkers being filled, air will circulate into the bunkers by way of the upper openings 14, and having become cooled, will re-enter the cargo space 10 by way of the lower openings 15. The drains 17 permit the escape of water due to the melting of the ice.

When it is desired to use the evaporative refrigerating system, the devices 18 are charged with a suitable material, such as dry ice and the doors are swung to their closed position, as shown in Figure 3. Wet ice is introduced into the bunkers 9. The effect of the conditions just described is as follows. The sealed space within the bunkers 9 acts as an insulator against the transmission of heat from the columns of air at the ends of the car. The portions of the car walls between the bunkers are not subject to the transmission of heat from the whirling columns, and inasmuch as the air slips by the flat side walls easily, there is relatively little heat transmission through them, so that ordinary insulation is sufficient to effectively protect the cargo space. The introduction of ice into the ice bunkers when the doors are in their closed positions, effectively prevents the transmission of heat by radiation to the cargo space 10, while heat transmission by convection due to air currents within the bunkers is prevented. The ice also prevents the entrance of warm air currents to the cargo space by way of the drains 17, without the necessity of plugging the drains. Thus by the combination of the ice and evaporative refrigerant the efficiency of the latter is improved as the harmful effects due to conditions at the ends of the car are prevented from acting upon it, and its full effect will be exerted upon the cooling of the cargo.

Another use to which a car equipped in this fashion is adapted, is the pre-cooling of the cargo space of the car prior to the beginning of a haul. Inasmuch as the main heat transmission in a freight car is through the ends of the car, the bunkers may be used as dead air spaces to insulate the pre-cooled cargo space from the heated end walls. Of course this insulating effect may be rendered additionally effective by the presence in the bunkers of water ice which will have the above described tendency to inhibit air currents and to absorb heat transmitted from the walls by radiation.

An additional advantage of this system is the provision of a refrigerated car in which, should it be desirable, the ordinary ice method of refrigerating may be used simply by the swinging of the doors to their open position.

The system is relatively inexpensive to install and it may be applied to old refrigerator cars with very little modification or can be installed in new cars as they are constructed without material increase of expense.

In case it is desired to use only an evaporative refrigerant, for example, dry ice, this type of car may be advantageously used. The doors are swung to their closed position, closing off the cargo space completely from the ends of the car. The ice bunkers being sealed from the cargo space, function, as dead air spaces, and effectively insulate the cargo space. This prevents the loss of heat through the ends of the car and results in a saving in the refrigerant.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art without further description, and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

What I claim is:

1. In a refrigerator car, in combination, an ice bunker located in an end portion of the car, an evaporative refrigerating device spaced from the ice bunker, and a movable barrier member located between the ice bunker and the evaporative refrigerating device for completely closing off communication between the portion of the car containing the evaporative refrigerating device and the end portion of the car containing the ice bunker.

2. In a refrigerator car, in combination, an ice bunker located in each end portion of the car, a movable barrier associated with each ice bunker, the barriers being movable between open positions permitting circulation of air between the portions of the car containing the ice bunkers and the central portion of the car and closed positions between the respective ice bunkers and the central portion of the car, completely cutting off communication between the said portions, and evaporative refrigerating means located in the central portion of the car between the barriers.

3. In a refrigerator car, the combination with evaporative refrigerating means located at a point spaced from the ends of the car, of an ice bunker located at each end of the car, each ice bunker being set off from the portion of the car containing the evaporative refrigerating means by a wall extending between the walls of the car and having circulation openings therethrough, and movable closures for the openings for completely cutting off the portions of the car in which the ice bunkers are located from the portion of the car containing the evaporative refrigerating means.

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