J. J. ARMSTRONG.

REFRIGERATOR CAR.

APPLICATION FILED OCT. 23, 1913.

1,237,146.

Patented Aug. 14, 1917.

3 SHEETS—SHEET 1.

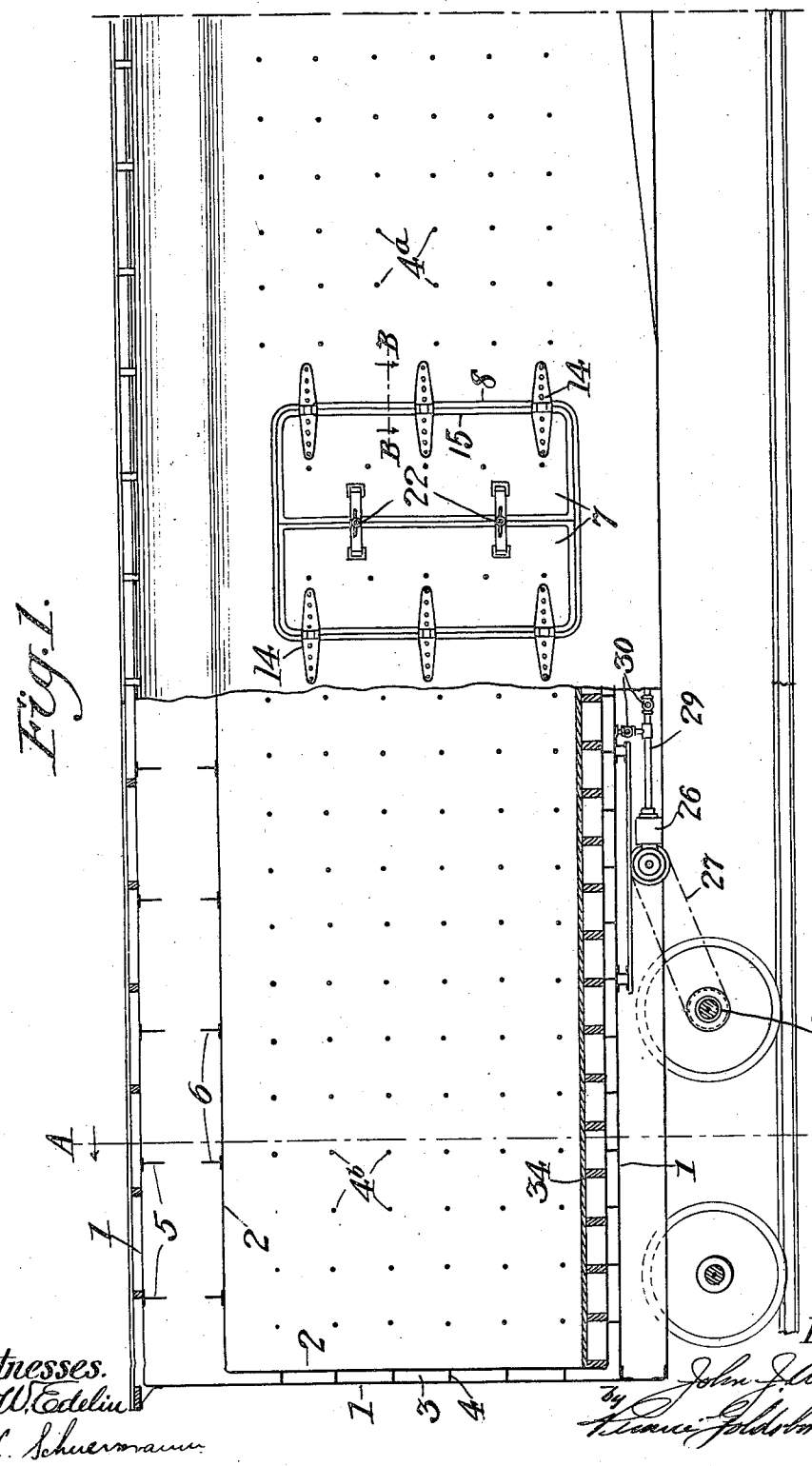

Fig. 1.

Witnesses.
W. W. Edelin
E. C. Schuermann

Inventor
John J. Armstrong
by Francis Goldsborough & Hall
Attys

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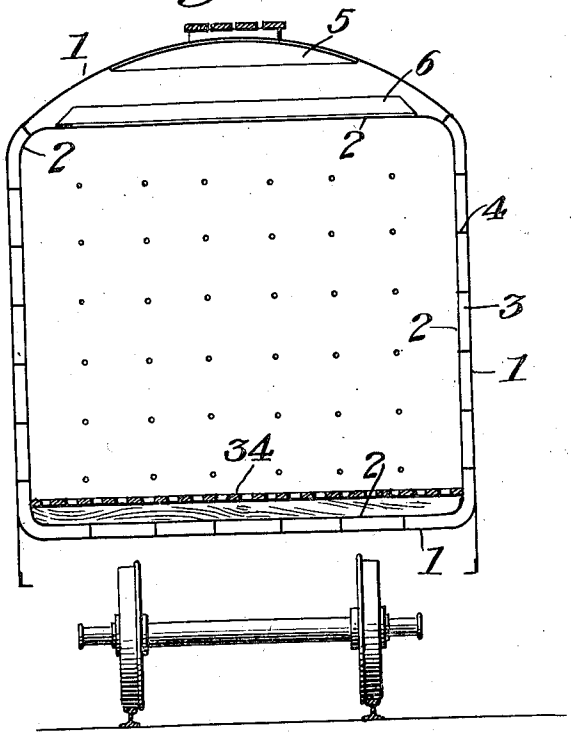
3 SHEETS—SHEET 2.

Fig. 2.



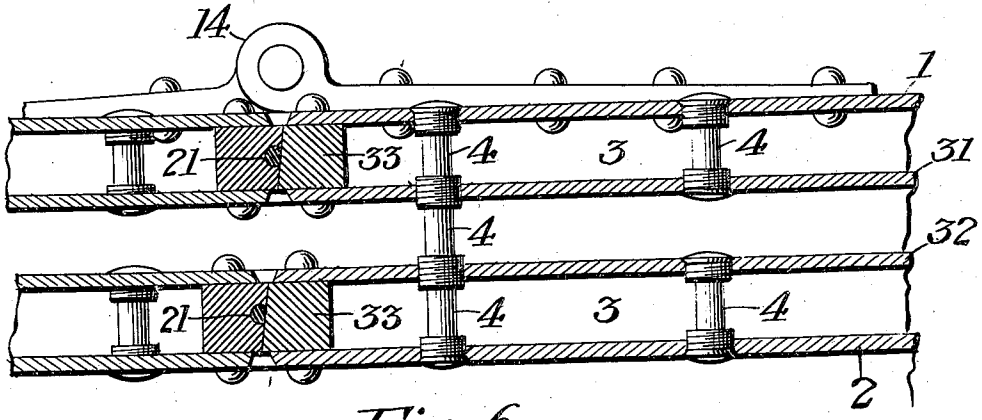


Fig. 6.

Witnesses.

D. W. Edelin.

E. C. Schuermann.

Inventor:

John J. Armstrong

by Lemuel Goldsborough & O'Neill

Attys.

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3 SHEETS—SHEET 3.

Fig. 3.

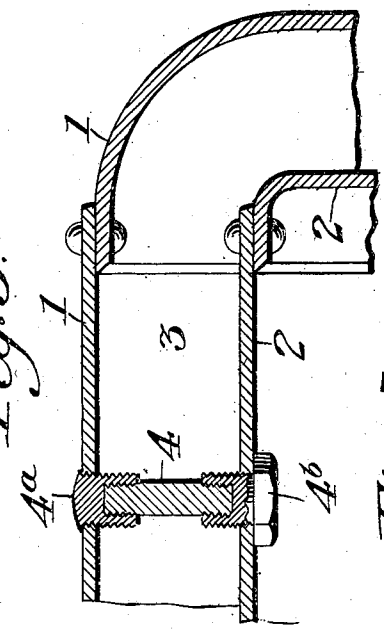


Fig. 4.

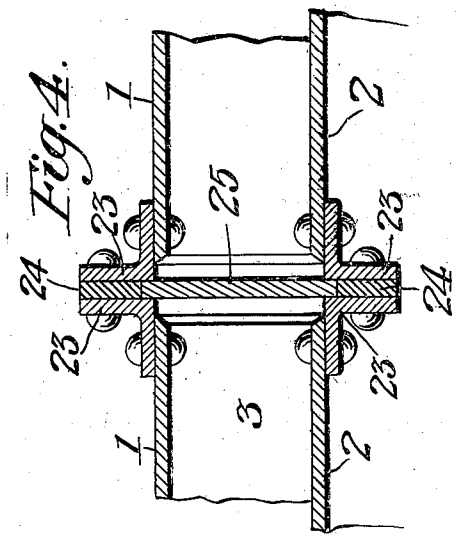
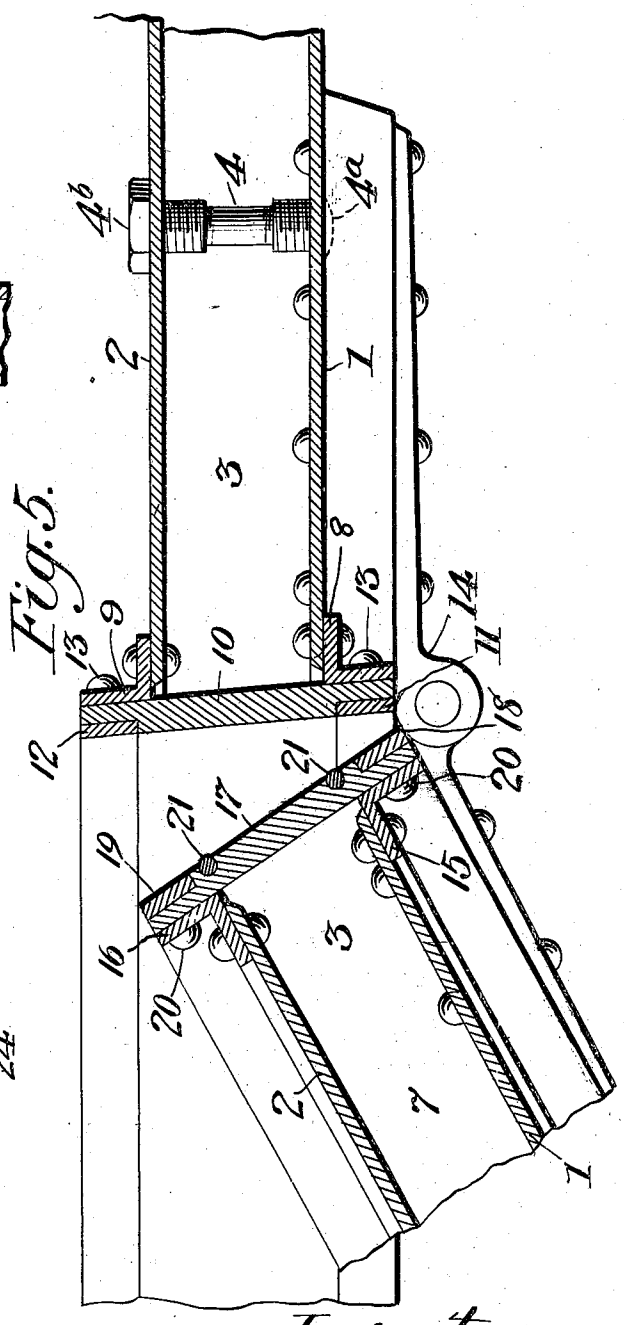


Fig. 5.



Witnesses.

D. W. Edelin

E. C. Schuermann.

Inventor.

John J. Armstrong

by Kenny Goldsborough & O'Neill

Attys

UNITED STATES PATENT OFFICE.

JOHN JAMES ARMSTRONG, OF HONOLULU, TERRITORY OF HAWAII, ASSIGNOR OF ONE-EIGHTH TO FRED L. WALDRON, LIMITED, OF HONOLULU, TERRITORY OF HAWAII, A CORPORATION OF THE TERRITORY OF HAWAII.

REFRIGERATOR-CAR.

1,237,146. Specification of Letters Patent. Patented Aug. 14, 1917.

Application filed October 23, 1913. Serial No. 796,828.

To all whom it may concern:

Be it known that I, JOHN JAMES ARMSTRONG, a citizen of the United States, residing at Honolulu, in the county of Honolulu and Territory of Hawaii, have invented certain new and useful Improvements in Refrigerator-Cars; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to refrigerator cars used for railroad transportation of perishable goods and food stuffs.

Refrigerator cars are built of wood, with double walls having an air space, and various insulating materials, such as felt, etc. The thickness of these walls has to be limited in order not to reduce the freight carrying capacity of the car unduly. An ice box is generally located at one or both ends of the car, in which it is necessary to keep a supply of ice, either with or without salt, depending upon the temperature desired within the car. That all portions of the interior of the car may be kept at the same temperature it is customary to allow a current of air to pass over this ice and then be distributed to various parts of the car to cool the contents and also to overcome the losses by radiation through the walls of the car, the motion of the car usually inducing this current of air. It can readily be seen that this method is very destructive to the ice, and that it necessitates the frequent re-icing of the car at various points on a long haul, thereby entailing both expense and delays during transit.

The object of the present invention is to produce a refrigerator car in which temperature variations will be reduced to a minimum and the contents can be maintained at practically any required temperature, irrespective of the climatic conditions existing on its exterior, and at the same time reduce the expense of the cooling ice and eliminate much of the trouble, annoyance and delays in re-icing.

The invention contemplates a refrigerator car, preferably of metal construction, the walls, ceiling and floor of which are double, that is with an inner and an outer casing, in the space between which casings a vacuum is always maintained. This space between the inner and the outer casings may preferably be divided into several compartments, so that in case of an accident to any one compartment the vacuum may still be maintained in the remaining compartments. If preferred, there may also be one or more casings between the inner and the outer casings, that is casings located intermediate thereto, thus forming a plurality of spaces in the walls, ceiling and floor, which spaces preferably may also be divided into compartments, and in which a vacuum is obtained and maintained, thereby further insuring the refrigerating properties of the car. The casings are suitably stayed by stays or separators to resist the atmospheric pressure, preferably by stays or separators of heat insulating or any suitable non-conducting material. A vacuum may be obtained and maintained in these compartments or spaces by means of a vacuum pump operated in any suitable manner, for example, the vacuum pump may be driven by an axle of the car, it only being necessary, after a vacuum has once been obtained, to exhaust any air admitted to the compartments or spaces through leakage. Access to the interior of the inner casing, for the admission and the removal of the perishable goods, may be had by doors so arranged that when locked in place they form air tight joints with the sides of the car.

An absolute vacuum is a perfect non-conductor of heat, and if a car could be made surrounded by a perfect vacuum it would only be necessary to cool the contents of the car to the proper degree and the contents would remain at the same temperature for an indefinite period of time. In practice, however, this ideal condition can only be closely approximated. The change in the temperature of the contents of a car, such as is contemplated by this invention, can be made so small that little or no ice would be required to keep the contents during the average haul, thereby reducing the time of transit and the expense of re-icing the car. Such a car would not only be a refrigerator car in the summer time, but would be practically frost proof in the winter time. When the car is not to be opened during transit, and particularly on long

hauls, the interior of the car, that is its inner casing, may also be exhausted of air, thereby further insulating its contents.

I am aware that the insulating property of a vacuum has been utilized in household refrigerators, in the liquefying of gases, and recently in what are termed thermos bottles. This invention, however, contemplates an entirely new application of this principle to produce results which are beneficial and which hitherto have been unattained.

In the accompanying drawings, forming a part of this specification, Figure 1 is an elevation and part section showing a longitudinal view of a refrigerator car embodying one form of my invention. Fig. 2 is a sectional view on the line A—A of Fig. 1. Fig. 3 is a sectional view on a larger scale showing a detail of a corner of the car and a preferred form of insulating stay. Fig. 4 is a detail showing a section through a joint between two compartments with a heat insulating partition. Fig. 5 is a detail showing a section on the line B—B of Fig. 1 on a larger scale of a joint between a door and the hollow wall of the car, said door being partly opened. Fig. 6 is a detail showing a modification of Fig. 5 when the wall of the car comprises a plurality of vacuum spaces between casings.

Referring to the drawings, the body of the car is of metal construction having an outer casing 1 and an inner casing 2 with a space 3 between said casings in which a vacuum is always maintained. The casings 1 and 2 are separated by separators or stays 4, which are in compression due to the atmospheric pressure. These separators or stays 4 are preferably of heat insulating or con-conducting material, such as vulcanized fiber for example, to prevent as much as possible the transmission of heat from one casing to another. One method of constructing these stays 4 is illustrated in Fig. 3, in which the ends of the fiber rod 4 are threaded and screwed into metal plugs 4^a and 4^b, which plugs are threaded and screwed into the casings 1 and 2 respectively. The outer end of the plug 4^a is riveted and the head of the plug 4^b is hexagonal or provided with flats to take a wrench. The top of the outer casing 1, which forms the roof of the car, is preferably curved and suitably braced by plates 5, Figs. 1 and 2. The top of the inner casing 2, which forms the ceiling of the car, is also similarly braced by the T-bars 6.

The doors 7 are provided for access to the interior of the inner casing 2, and when locked in place they form air tight joints with the walls of the car. One method of accomplishing this is shown in Fig. 5, in which the angle iron frames 8 and 9 are riveted to the casings 1 and 2 respectively, and plates 10 are secured to said frames by the metal bands 11, 12 and the rivets 13, thus forming an opening having slightly tapered walls, as shown. These doors 7, which are hinged to the walls of the car by the hinges 14, are similarly provided with angle iron frames 15 and 16 riveted to their outer and their inner casings 1 and 2 respectively, and with plates 17 secured to said frames by the metal bands 18 and 19 and the rivets 20. The plates 17 are provided with grooves in which are inserted packing rings 21 adapted to engage and form an air tight joint with the plates 10, when the doors 7 are closed and locked in place by the catches 22. These plates 10 and 17 are preferably of heat non-conducting material, such as vulcanized fiber.

When the space 3 between the casings 1 and 2 is divided into compartments, the partitions are also preferably of heat insulating or non-conducting material. One method is to divide the car into sections, these sections being bolted or riveted together. One method of making the joint between these sections is illustrated in Fig. 4, in which angles 23 are riveted to the ends of each section of the casings 1 and 2 respectively, and these angles 23 are riveted together with a metal filler 24 between them, and a plate 25 of heat insulating material interposed between these fillers 24 forms at the same time both a separator and the partition between the compartments.

The air exhaust pump 26 is secured under the floor of the car, and is driven in any suitable manner, as by a silent chain or belt 27 from the axle 28 of the car. This pump 26 is connected by a pipe 29 to the space 3, or to each of the compartments into which this space may be divided. The pipe 29 may be provided with valves 30, so that its connection to any compartment may be cut out in case of an accident causing excessive leakage from the atmosphere into said compartment.

When intermediate casings are desired between the outer casing 1 and the inner casing 2, the joint between the doors 7 and the walls of the car may be made as illustrated in Fig. 6. The intermediate outer casing 31 and the intermediate inner casing 32 are stayed by the stays 4 to the outer casing 1 and to the inner casing 2 respectively, with spaces 3 between them, in which spaces a vacuum is maintained. A separator 33 is riveted between the outer casings 1 and 31 and between the inner casings 2 and 32 around the opening for the doors 7, against which separators 33 the packing rings 21 engage and seal the joints when the doors 7 are closed, as shown.

The interior of the car is preferably provided with a floor 34, which may be of wood.

It is obvious that the interior of the car

or of the inner casing 2 may also be divided into compartments in order that different temperatures may be maintained in each of said compartments, if so desired.

I claim:

In a refrigerator car, an inner casing, an outer casing, and means operated by the movement of the car for maintaining a vacuum between said casings, substantially as and for the purpose described.

In testimony whereof I affix my signature, in presence of two witnesses.

JOHN JAMES ARMSTRONG.

Witnesses:

W. E. JAMES,

ROBT. J. PRATT.