

R. H. THOMAS.
REFRIGERATING APPARATUS.
APPLICATION FILED OCT. 13, 1905.

938,181.

Patented Oct. 26, 1909.

3 SHEETS—SHEET 1.

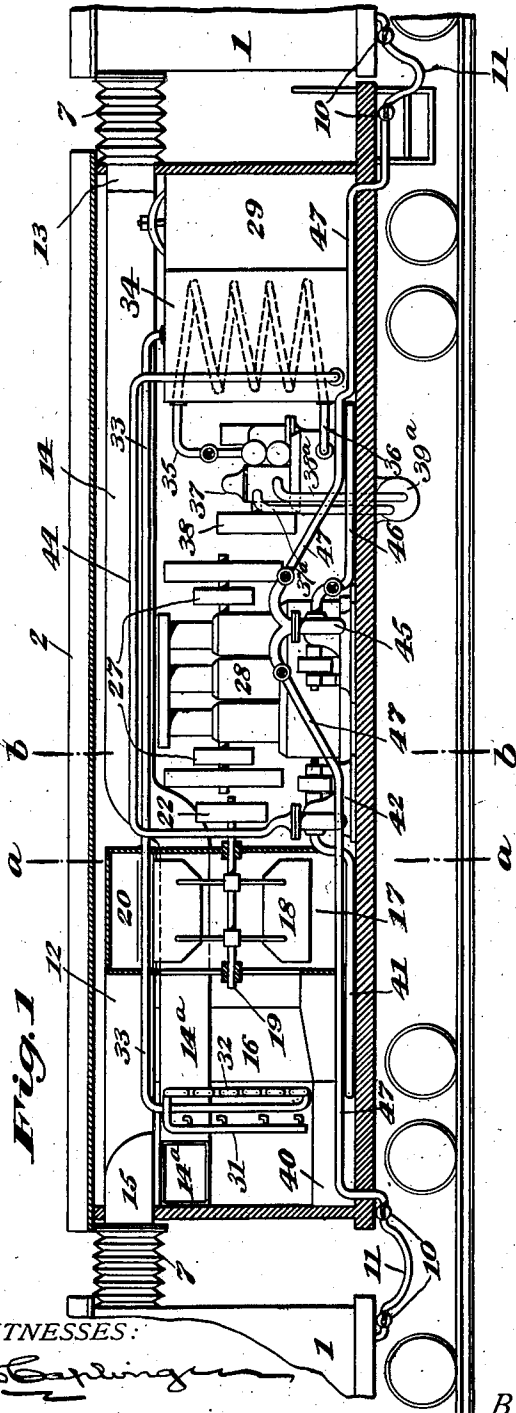


Fig. 1

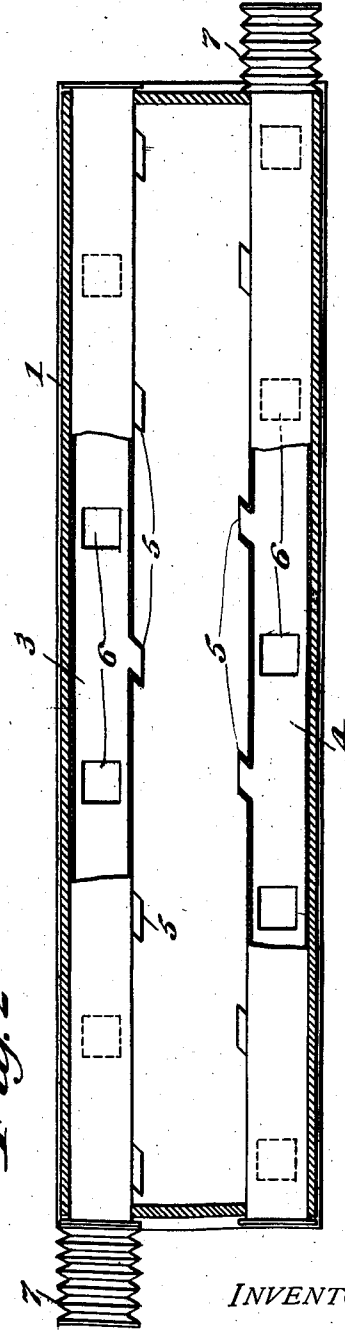


Fig. 2

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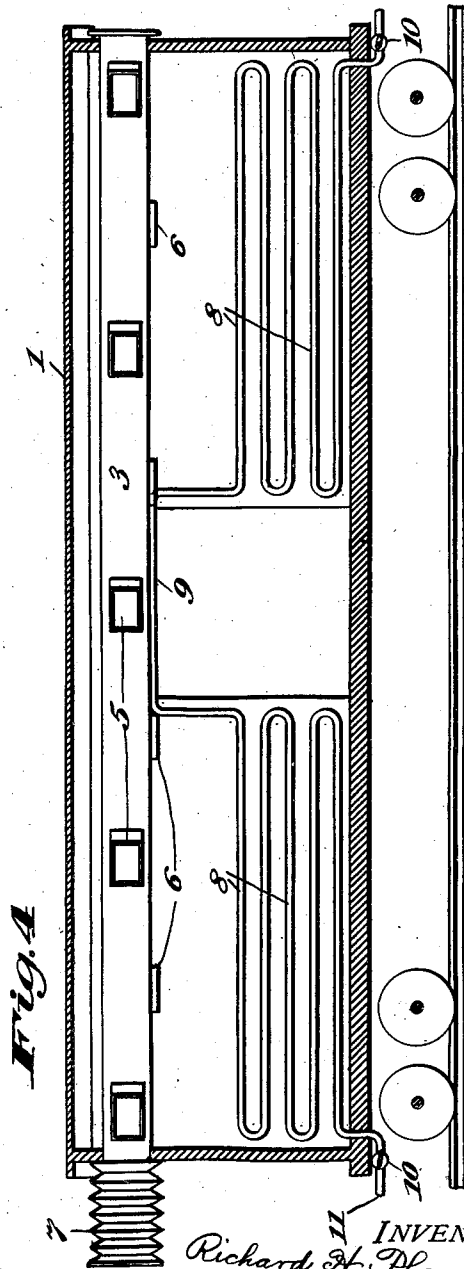
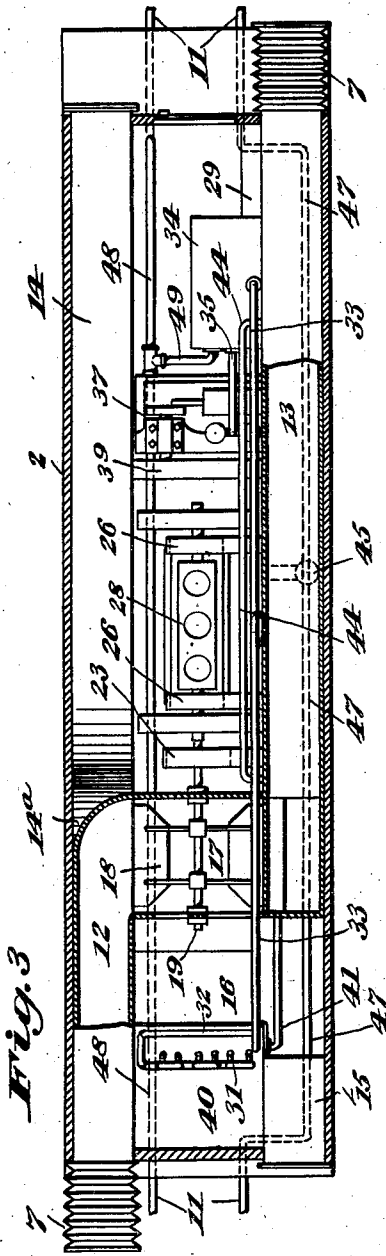
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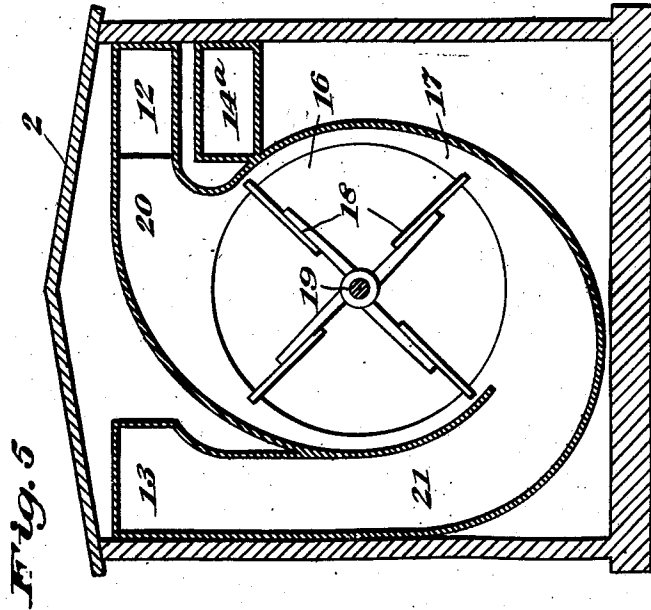
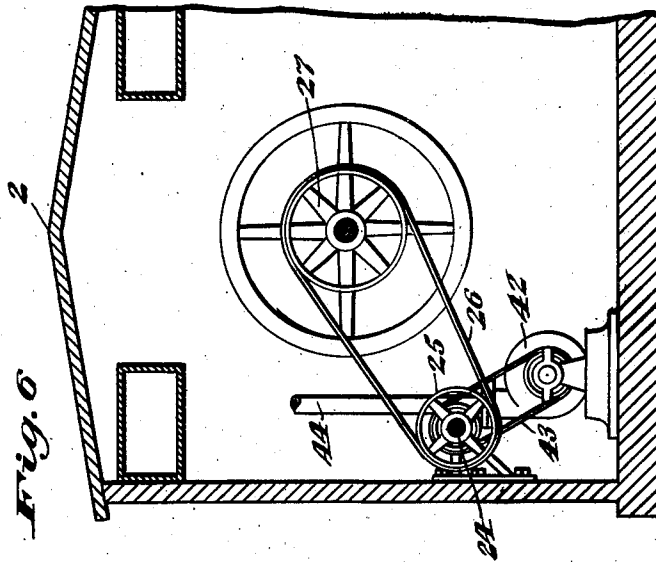
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3 SHEETS—SHEET 3.

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UNITED STATES PATENT OFFICE.

RICHARD H. THOMAS, OF CHICAGO, ILLINOIS.

REFRIGERATING APPARATUS.

938,181.

Specification of Letters Patent.

Patented Oct. 26, 1909.

Application filed October 13, 1905. Serial No. 282,643.

To all whom it may concern:

Be it known that I, RICHARD H. THOMAS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain Improvements in Refrigerating Apparatus, of which the following is a specification.

This invention relates to certain improvements in refrigerating apparatus and more especially in that class of such apparatus which is primarily designed for employment on railway trains and the like for the refrigeration and preservation of perishable freight in transit and the object of my invention is to provide an apparatus of this general character of a simple and comparatively inexpensive nature by means of which the desired degree of refrigeration may be maintained in a substantially uniform and constant manner throughout one or any number of cars of a train and whereby the delay, annoyance and expense attendant on the employment of ice as is customary in ordinary refrigerating cars is altogether done away with.

The invention consists in certain novel features of the construction, combination and arrangement of the several parts of the improved refrigerating apparatus whereby certain important advantages are attained and the apparatus is made simpler, less expensive and otherwise better adapted and more convenient for use, all as will be hereinafter fully set forth.

The novel features of the invention will be carefully defined in the claims.

In the accompanying drawings which serve to illustrate my invention—Figure 1 is a side elevation showing portions of three cars of a railway train provided with my improved refrigerating apparatus, the side wall of the body of the central car being broken out to illustrate certain parts of the apparatus inclosed therein; Fig. 2 is a horizontal section taken lengthwise through the upper part of one of the cars provided with my improvements and illustrating the arrangement of blast and suction ducts for circulation of air therein; Fig. 3 is a horizontal section, similar to Fig. 2, but taken through the central car shown in Fig. 1 and illustrating in plan the several parts of the apparatus inclosed therein; Fig. 4 is a vertical section taken lengthwise through the car shown in Fig. 2 and illustrating the means

for attaining a circulation of brine or other liquid refrigerant for cooling the contents of such car; Fig. 5 is an enlarged vertical section taken transversely through the central car in the plane indicated by line *a-a* in Fig. 1, and Fig. 6 is a similar section taken through said central car in the plane indicated by line *b-b* in said figure.

According to my invention I effect the refrigeration by producing in each car containing perishable freight a circulation of chilled air, brine or other refrigerant, whereby heat is abstracted from such freight, and after circulation through one or more of the cars, this refrigerant is conveyed to a special car of the train whereon is carried means for chilling the air or other medium so that the heat absorbed thereby from the freight is again abstracted in order to adapt the same medium for renewed use and circulation. In this way the same air or other medium is repeatedly circulated through the several cars until a uniform degree of refrigeration has been attained. In accordance with my invention therefore, each train provided with my improved refrigerating apparatus will be made up of cars of two types, one of which types is indicated at 1, 1 on the drawings and is designed for the reception of the perishable freight and for the circulation of the refrigerating medium for abstraction of heat from such freight and the other of which types is represented at 2 on the drawings and contains the special appliances requisite for chilling the refrigerating medium and for effecting a circulation thereof to and from the cars 1, 1 which contain the freight. In carrying out my invention any desired number of the freight cars 1, 1 may ordinarily be employed in making up the train and for chilling and effecting the circulation of the refrigerant through these cars 1, 1, a single special car 2 will usually be sufficient, the construction and arrangement of the several appliances thereon being such that said special car may be at either end or in the middle of the train, as will be hereinafter explained.

The freight cars 1, 1 may be, as to general construction, similar to the refrigerating cars commonly in use, except that the ice receptacles will, of course be omitted. The structure of these cars 1, 1 is illustrated in Figs. 2 and 4, and from these views it will be seen that there are provided air passages

or ducts 3 and 4, extended lengthwise along opposite sides of the upper part of the car body, each duct being provided, at intervals in its bottom and inner wall, with ports 6, 6 and 5, 5 respectively, so that chilled air may be discharged from such ports 5 and 6 of one of the ducts or passages for circulation through the freight in the car and after such circulation has been completed and as much heat as possible has been abstracted from the contained freight, the same air will be received through the ports 5 and 6 into the other duct so that it may be conveyed away from the freight car to the special car there to be again chilled for repeated circulation as above described. The arrangement of both ducts near the car roof insures that the freshly chilled air from one duct, as the duct 3, for example, will fall by gravitation and permeate the lower parts of the car-body and since, by abstraction of heat from the freight, this air will become heated, it will thereupon rise to the top of the car so that it may be readily drawn off at the other or discharge duct 4.

Each of the cars 1, 1 of the train will be provided with a similar arrangement of ducts or passages 3 and 4, and since said ducts extend throughout the full length of each car and open at each end thereof, it will be evident that should either car of the train be reversed and turned end for end, its ducts would still register with the ducts of other cars in front and behind it. A similar arrangement of registering ducts is provided for the special car 2 as will be hereinafter explained and communication between the ducts of the respective cars 1 and 2 of the train is established by the employment of collapsible connections 7, 7 extended between each two cars of the train and affording communication between the ducts at each side of each two adjacent cars. In this way it will be evident that a circulation of air is established in one direction from the special car 2 along one side of each car 1 in the train, there being at the same time a corresponding but reversely directed circulation along the opposite side of each car 1 of the train back to the special car 2. The collapsible connections 7 may be of any preferred kind, being designed merely to maintain communication between the ducts of the cars independent of the motion of the train in rounding curves and the like.

In addition to the air ducts or passages 3 and 4 above described, I preferably provide the several cars 1 and 2 with means for effecting a circulation of chilled brine or other liquid refrigeration, and in Fig. 4 I have shown the car 1 as provided with pipe coils 8 8 at opposite ends and connected by an upwardly directed pipe 9, extended above the central door in the car wall. A similar or other desirable arrangement

of pipe coils may be employed at each side of each car 1, 1 in which freight is to be carried, and the ends of the coils 8 8 are carried down through the floor at the ends of the car and are provided with valves or cocks 10, 10 by means of which the ends of the coils at opposite sides of the cars may be closed to prevent entry or discharge of the liquid refrigerating medium. Flexible hose connections 11 11 may be provided between adjacent ends of the pipe coils at the ends of adjacent cars of the train as shown on the drawings, and on the special car 2 is provided, as will be hereinafter explained, an arrangement of pipes, the ends of which correspond with and are adapted to receive the hose connections of the cars 1, 1. The special car 2 is also provided with means for chilling and circulating the brine or other liquid refrigerant, and in this way it will be seen that when the train is made up with the cars 1 and 2, the hose connections 11 11 being properly arranged and the valves 10 opened, the appliances on the special car 2 may be operated for effecting a circulation of the chilled brine along one side of each car 1 away from the special car and for drawing the brine in a reverse direction through the pipe coils at the opposite sides of the cars 1 1 back to the special car so that it may be again chilled and again circulated through the coils of the freight cars. The ends of the piping on the special car 2 will be provided with cocks or valves 10 10 as shown in Fig. 1 so that the flow of brine between the special car and the freight cars 1 1 may be controlled at will, and by the employment of these cocks 10 on the cars 1 and 2 it will be evident that when any car is to be cut out of the train, its valves 10 and those of the adjacent cars may be closed to prevent loss of brine after the car has been cut out. The brine remaining thus in the coils of a car cut out of a train will serve to refrigerate its contents for a considerable time in case it be impossible to immediately unload the car, and it will also be seen that since each car carries sufficient brine for effective operations when it is again coupled in the train, it will not be needful to carry a large reserve of brine upon the special car such as would be required to replenish its coils were the contents discharged each time the car was cut from the train.

The special car 2 has, at the opposite ends of its opposite sides, ducts 12 and 13 which I will term herein blast ducts and which are designed for the discharge of the chilled air to the cold air ducts or passages of the cars 1 1, the special arrangement of these blast ducts 12 and 13 at diagonally opposite corners of the car-body permitting of reversing the arrangement of the special car in the train, end for end, without re-

versing the other freight cars 1, 1. At its two other diagonally opposite corners, the special car 2 is also provided with suction ducts 14 and 15 through which the warmed air from the cars 1 1 is adapted to be drawn into the special car so that it may be again chilled before being discharged from the special car by way of the blast ducts 12 and 13.

16 represents a chill room or chamber at one end of the special car 2, and into opposite sides of which the extremities of the suction ducts 14 and 15 open for the discharge of the warmed air from the cars 1, 1 into said chill room. The extremity 14^a of the duct 14 where said duct discharges into the chill room or chamber 16 is bent downward so as to underlie the adjacent portion of the blast duct 12 at that side of the car 2, as shown clearly in Figs. 1 and 5. In the chill room or chamber 16 will be arranged means for chilling the air drawn from the freight cars by way of the suction ducts 14 and 15. The means herein shown for accomplishing this result, but to which I do not desire to limit myself, will be hereinafter fully described.

From the chill room or chamber 16, the chilled air is drawn into a fan chamber 17, wherein is operated a fan or blower 18 of any preferred kind, said fan being, as herein shown, mounted on a shaft 19 whereon is a pulley or band wheel 22, driven by a belt or band 23 from a line shaft 24 journaled along one side of car 2 at about the central part thereof, and having a pulley or pulleys 25 (see Fig. 6) over which a belt or belts 26 are passed, the opposite ends of said belts 26 being passed over drive pulleys 27 on the main shaft of a gasolene engine or other motor indicated at 28 in Figs. 1 and 3. 29 indicates a tank for the storage of a supply of gasolene, should a gasolene engine be employed, but it is evident an electric motor may be substituted therefor if desired.

The fan chamber 17 has outlets 20 and 21 (see Fig. 5) through which the chilled air is discharged into the blast ducts 12 and 13 for supply to the freight cars 1 and since these blast ducts extend in opposite directions from said fan chamber 17 toward opposite ends of the special car 2 and are located at opposite sides of the same, it will be evident that chilled air will be supplied from one or both of said ducts 12 and 13 to all of the cars 1, 1, which are connected with the special car, irrespective of the location of the cars 1, 1 in front of or behind the special car 2 in the train. Since the suction ducts 14 and 15 are also extended from the chill room or chamber 16 to the opposite ends of the special car 2 and are at opposite sides thereof, it will also be evident that a complete circulation of air between the cars 1 and 2 is provided for so

that the same volume of air is caused to circulate through the freight cars repeatedly whereby it is not necessary to completely chill a fresh supply of air each time a circulation through the freight cars is effected, but merely to abstract from the air drawn into the chill room the heat which was absorbed by it from the freight during its previous circulation through the cars 1, 1.

The means herein shown for chilling the air drawn into the chill room or chamber 16 by way of the suction ducts 14 and 15 comprises a spraying device 31 and a pipe coil 32 located in the chill room and adapted to be supplied by means of a pipe 33 with chilled brine from a brine tank or reservoir 34, the arrangement being such that the air in said chill room is caused to circulate through the spray produced by said spraying device 31 and also to circulate over the pipe coil 32 through which the chilled brine is caused to circulate from pipe 33 before being supplied to the spraying device 31.

Within the brine tank 34 is a pipe coil the ends of which are connected by means of pipes 35, 36 with an ice machine of any preferred kind which is indicated at 37 on the drawings and which has a pulley 38 over which is passed a belt 39 whereby the ice machine may be operated from a pulley (not shown) on the line shaft 24 in a way similar to that in which the fan 18 is driven from said shaft. The ice machine 37 has communication through pipes 37^a and 38^a with a condenser 39^a, which is shown as being located beneath the floor of the car.

40 represents a tank or receptacle at the base of the chill room or chamber 16 and designed to receive the brine discharged from the spraying device 31 and 41 is a pipe leading from said tank or receptacle 40 to a pump 42 (see Figs. 1 and 6) which is driven by a band 43 from a pulley on the line shaft 24 so that the pump may be continuously operated to withdraw the brine from the receptacle 40 and to pump the same back by way of a pipe 44 into the brine tank 34. Since the ice machine 37 is also adapted to be continuously operated from the motor 28 through the line shaft 24 it is evident that the brine in tank 34 will be maintained at the desired low temperature for chilling the air drawn through ducts 14 and 15 into the chill room 16.

The chilled brine for circulation through the pipe coils 8, 8 of the cars 1, 1 is also drawn from the brine tank 34 by way of a pipe 46 which leads to a pump 45 also driven from the line shaft 24 in a way similar to the pump 42 as above described, and said pump 45 has two pipe connections 47, 47 leading, respectively toward the opposite ends of the special car 2, as seen in Fig. 1, with cocks or valves 10, 10, at opposite ends of said car so that said pipes 47, 47 may

be connected by the hose couplings 11, 11 with freight cars 1, 1 at opposite ends of the special car 2 and in front and behind the same in the train. The pipes 47, 47 are
 5 at one side of the car 2 and at the opposite side thereof is another pipe 48, (see Fig. 3), the ends of which have similar cocks or valves 10, 10 and are likewise designed for connection by couplings 11, 11 with the pipe
 10 coils at the sides of cars 1, 1 opposite to the connections of the pipes 47, 47 with said cars 1, 1. The pipe 48 is extended lengthwise of car 2 and has connection at 49 with the brine tank so that the brine which has been
 15 withdrawn from said tank by pump 45 and has been forced through pipes 47, 47 to and through coils 8, 8 of the freight cars 1, 1 will be returned to the special car by way of the pipe 48 and will be delivered through
 20 its connection 49 into the brine tank 34. By this arrangement it will be seen that when the train has been made up and the connections have been properly established between the several air ducts and brine pipes
 25 of the respective cars 1, 1 and 2, the devices on the special car 2 may be operated for maintaining a continuous circulation of the air and brine through the ducts and pipes and at the same time, the air and brine will
 30 be rechilled after completing each full circulation so that a proper low temperature may be quickly established within the cars 1, 1 and maintained in a substantially uniform and even manner during the entire run
 35 of the train, thus dispensing altogether with the delays heretofore necessary for re-icing refrigerator cars as ordinarily constructed and affording a great economy over present methods.
 40 From the above description of my improvements it will be obvious that the improved refrigerating apparatus constructed and arranged according to my invention is of an extremely simple and practicable nature and affords a material economy in operation sufficient to quickly offset the expense of installation and it will also be obvious from the above description that the improved apparatus is susceptible of considerable
 45 modification without material departure from the principles and spirit of the invention and for this reason I do not desire to be understood as limiting myself to the precise form and arrangement of the several parts
 50 of the apparatus herein set forth in carrying out my invention in practice.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

60 1. In a refrigerating apparatus, the com-

bination with a car having a chill room provided with air cooling means comprising pipes to be traversed by a refrigerant, means for cooling said refrigerant and means for forcing the same through said pipes, suction
 65 and blast ducts extended from the same end of the car and communicating with the chill room and means for drawing air in at the suction duct and forcing it from the car at the blast duct, another car having in its body
 70 piping adapted for the circulation of the refrigerant and having at its ends valved connections communicating with such piping and adapted to be coupled to the pipes on the first named car, and air conduits on the
 75 last-named car adapted to be connected to the suction and blast-ducts.

2. A car having a chill room provided with air cooling means comprising spray
 80 pipes adapted to be traversed by a refrigerant, means for cooling said refrigerant and means for forcing the same through said pipes, suction and blast ducts extended from one end of the car and communicating
 85 with said chill room and means for drawing air in at the suction duct and for discharging it from the car at the blast duct, another car having in its body piping adapted for the circulation of the refrigerant and having at
 90 its ends valved connections communicating with such piping and adapted to be coupled to the pipes on the first-named car, and air conduits in the last-named car adapted to be connected to the suction and blast-ducts.

3. A car having a chill room provided with spray pipes, a tank to receive the liquid
 95 sprayed from said pipes, a pumping device adapted to draw liquid from said tank, another tank having connection with the
 100 pumping device to receive the liquid therefrom and having connection with said spray pipes and an ice machine arranged to chill the liquid in said last-named tank, suction and blast ducts extended from one end of the
 105 car and communicating with the chill room and means for drawing air in at the suction duct and for forcing it from the car at the blast duct, another car having in its body piping adapted for the circulation of the re-
 110 frigerant and having at its ends valved connections communicating with such piping and adapted to be coupled to the pipes on the first-named car, and air conduits on the last-named car adapted to be connected to the
 115 suction and blast-ducts.

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Witnesses:

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