July 26, 1949. H. M. HINCZ 2,477,250

APPARATUS FOR PRECOOLING REFRIGERATOR CARS, CONSISTING OF A HEAT-EXCHANGE UNIT TEMPORARILY INSERTED INTO THE CAR AND VERTICALLY MOVABLE THEREIN

Filed April 23, 1945 5 Sheets-Sheet 1

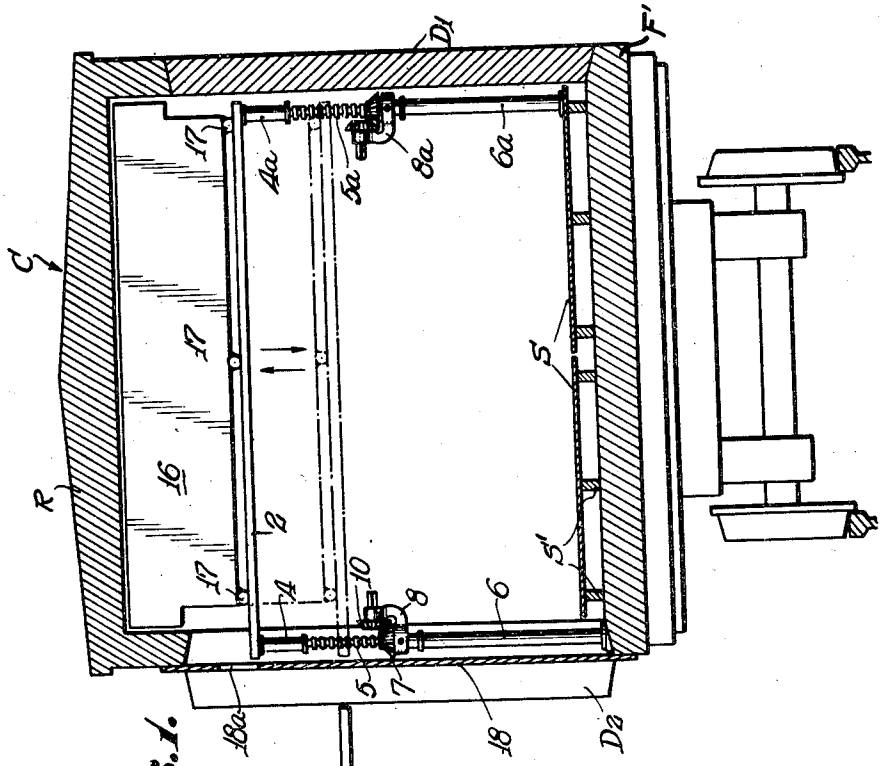


Fig. 1.

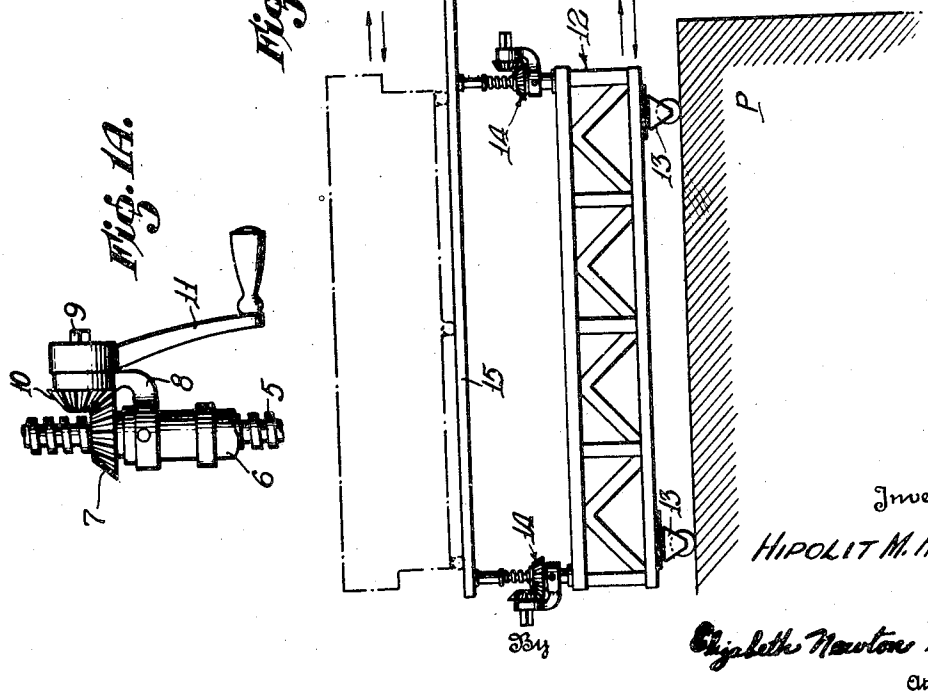


Fig. 1A.

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Fig. 6.

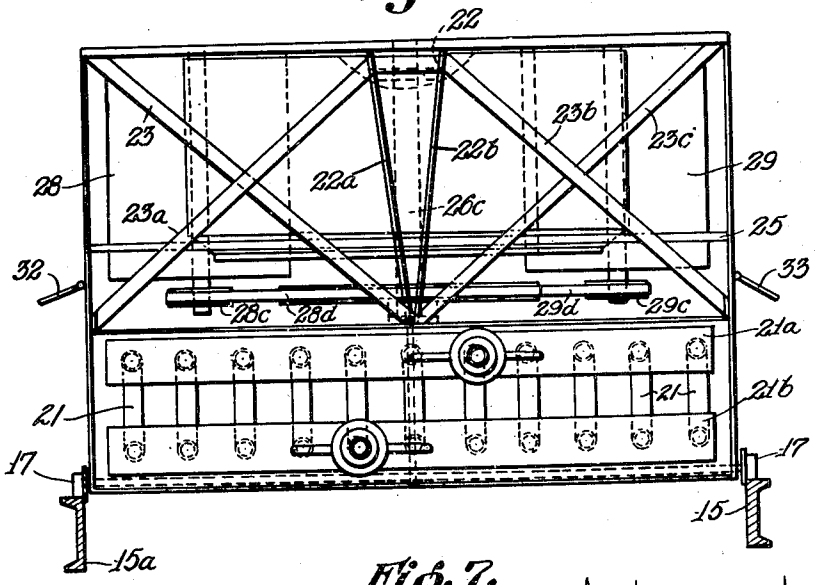


Fig. 7.

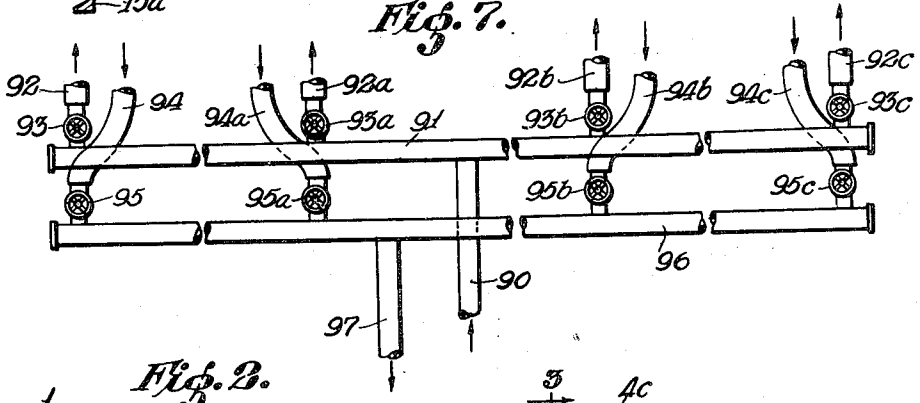


Fig. 2.

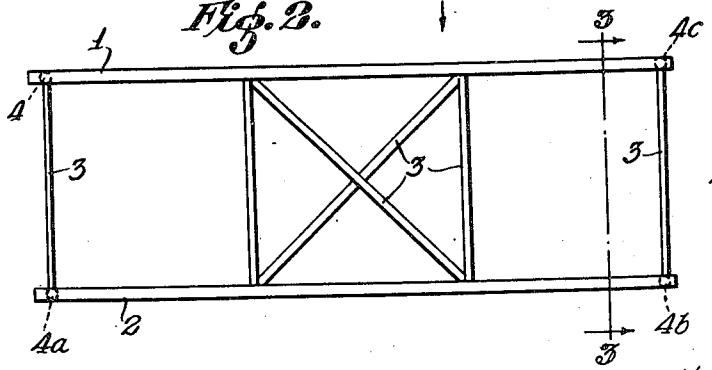
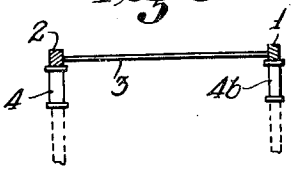


Fig. 3.



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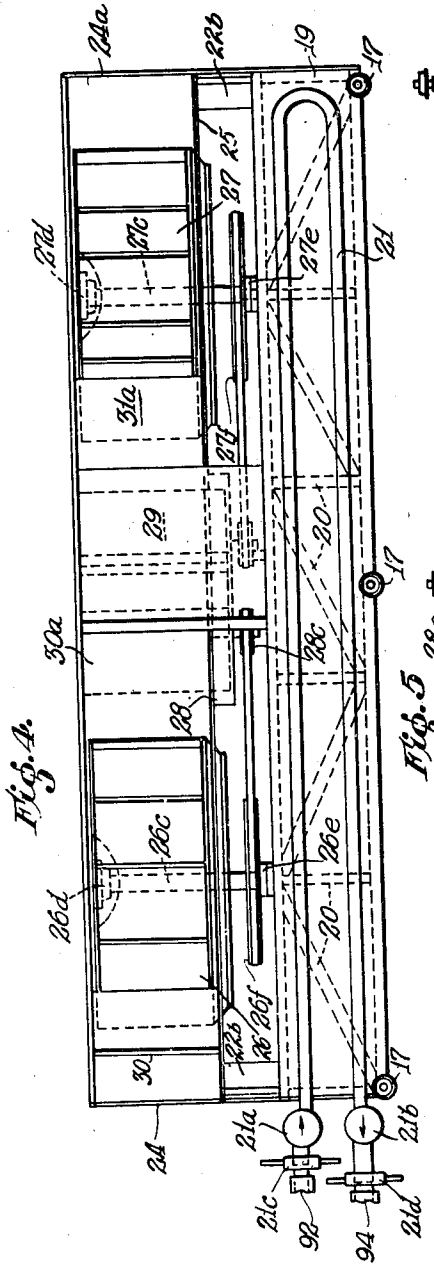


Fig. 4.

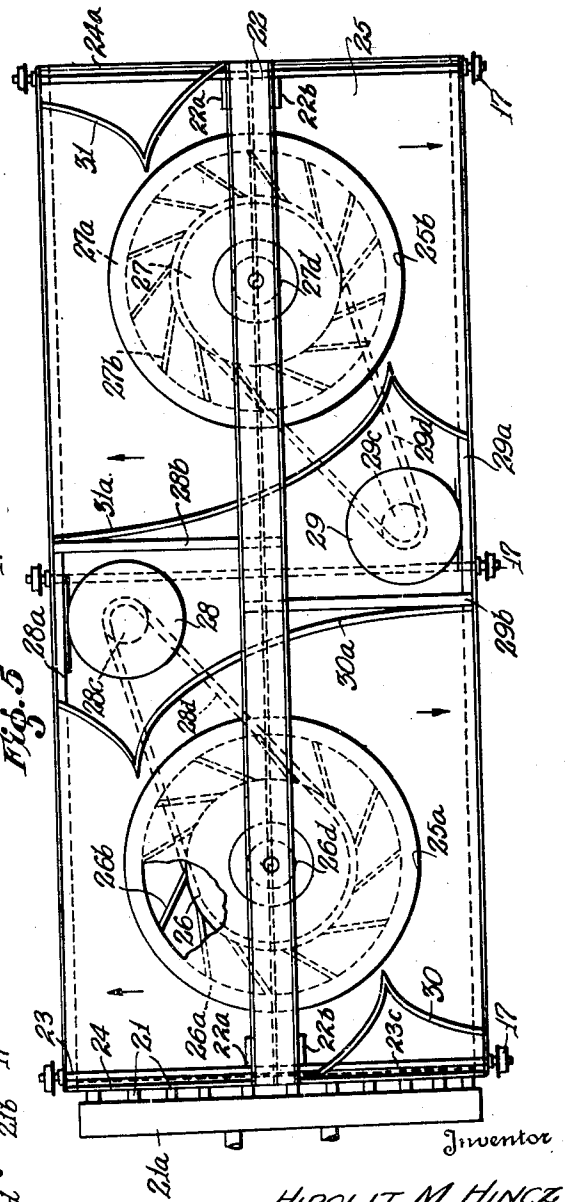


Fig. 5

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Filed April 23, 1945 5 Sheets-Sheet 4

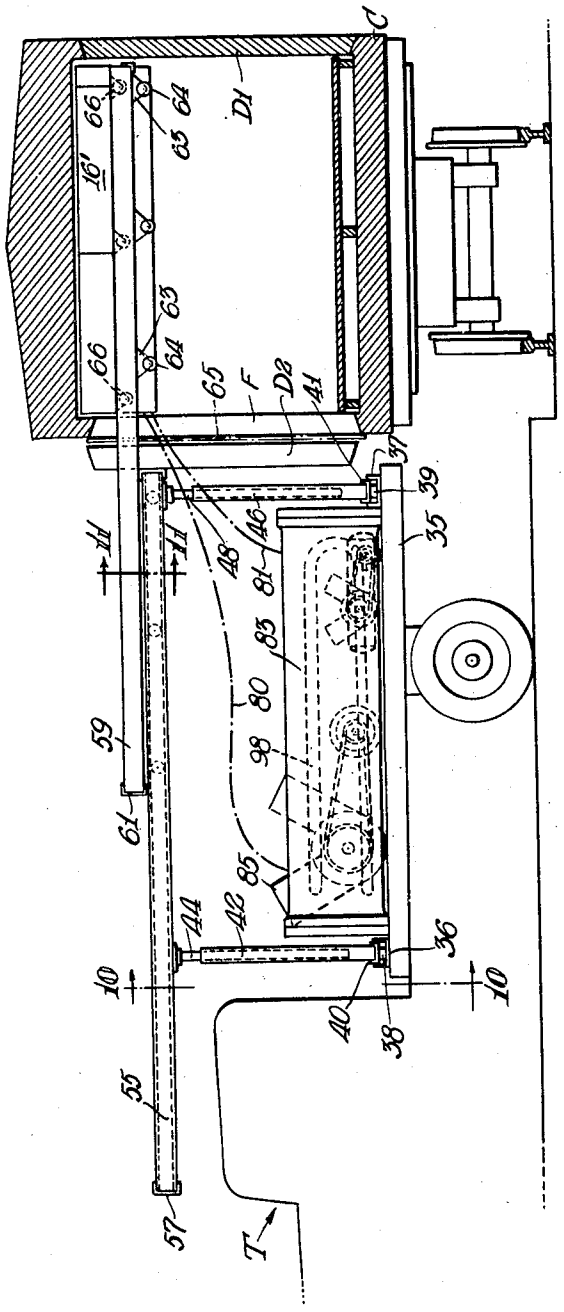


Fig. 8.

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APPARATUS FOR PRECOOLING REFRIGERATOR CARS, CONSISTING OF A HEAT-EXCHANGE UNIT TEMPORARILY INSERTED INTO THE CAR AND VERTICALLY MOVABLE THEREIN

Filed April 23, 1945 5 Sheets-Sheet 5

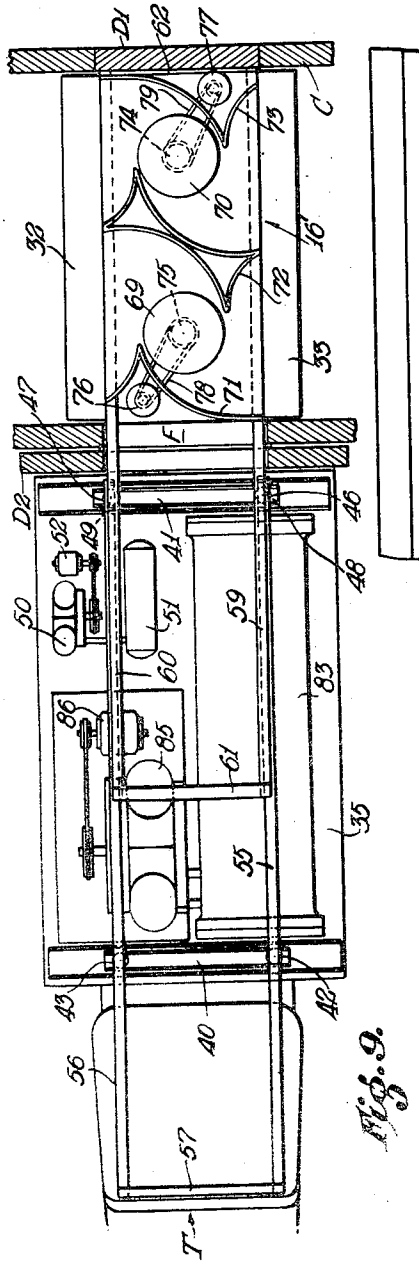


Fig. 9.

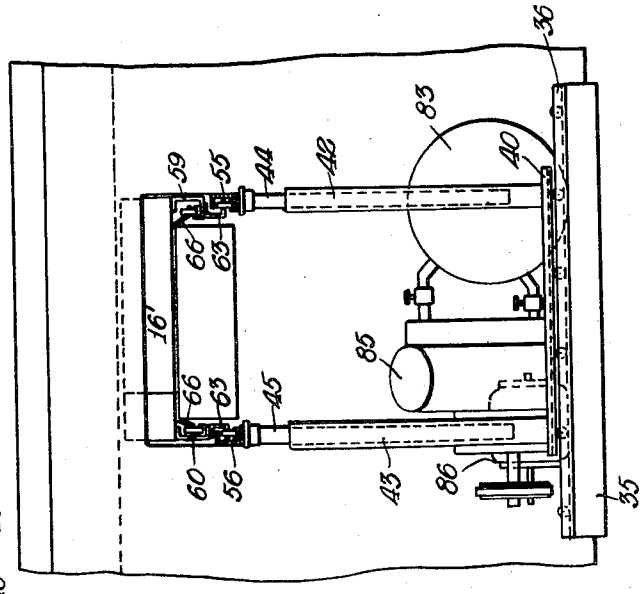


Fig. 10.

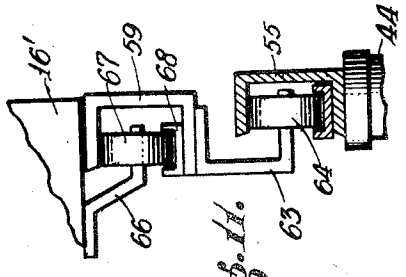


Fig. 11.

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UNITED STATES PATENT OFFICE

2,477,250

APPARATUS FOR PRECOOLING REFRIGERATOR CARS, CONSISTING OF A HEAT-EXCHANGE UNIT TEMPORARILY INSERTED INTO THE CAR AND VERTICALLY MOVABLE THEREIN

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Application April 23, 1945, Serial No. 589,917

17 Claims. (Cl. 62—102)

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This invention relates to heat exchange mechanisms particularly intended for use in pre-cooling fruits and vegetables as they are packed in refrigerator cars and trucks prior to shipment.

In view of the long distances that it is now customary to ship fruits, vegetables and other easily perishable food-stuffs, large savings in the food-stuffs themselves, as well as the ice and servicing labor required during transit, are effected by pre-cooling the fruits and vegetables during the time between the completion of loading a car or truck and the time shipment begins. This pre-cooling requires an appreciable time since the heat stored in each of the articles, must pass to the surface and there be absorbed by the circulation thereabout of cold air or other chilled gaseous medium. The temperature of the fruit or vegetables gradually lowers as the heat is removed therefrom. Other conditions being equal, the heat absorbed by the circulated air per unit time, varies as the temperature difference between the cooled or chilled air and the load being pre-cooled. Thus as the temperature of the load gradually lowers, the number of B. t. u. removed per pound of air becomes less. It is a well known fact that the efficiency of a refrigerating apparatus varies substantially directly as the load thereon. Furthermore, a certain minimum capacity of refrigeration apparatus is necessary to pre-cool a load of given size within a reasonable time—at most a matter of hours. Under such conditions it is obvious that the refrigerating apparatus, if cooling a single car only, begins operation at substantially maximum efficiency, which efficiency will gradually lower as the temperature difference and hence the load upon the apparatus, decreases.

It is therefore an object of my invention to provide a system for pre-cooling refrigerating cars or trucks wherein a number of cars may be serviced from and cooled by a single apparatus and by having the cars in various stages of cooling the total load upon the refrigerating apparatus remains substantially constant throughout its operation and its thermal efficiency remains at a near maximum.

A further object is to provide an apparatus wherein the entire equipment may be mounted upon a car or truck so as to be readily moved from one refrigerator car to another, and if desired, from one shipping point to another.

A still further object is to provide a refrigerating apparatus wherein the cooling coils for the air, together with fans or blowers for forcing circulation of the cooled air over and about the coils, then about the load, are so mounted as to be easily movable as a unit into the car being cooled whereby the pre-coling process may be carried out quickly and easily.

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It is a further object of the invention to provide a portable blower and coil device, as in the preceding paragraph and wherein the blower or fan and coils are moved into and out of the car as separate individual units but, when in operating position within the car coact to cool and circulate the air within the car over and about the load therein.

A further object is to provide a portable mounting, as described in the foregoing paragraph, wherein the coils and circulating blowers are mounted for quick and easy insertion through the loading doors of the car being serviced, and without the necessity for a precise alignment of the supporting truck or car with the doors of the refrigerator car.

A further object is to provide a cooling unit positionable within the car or other compartment to be cooled and in a position in which the natural circulation of the cooled air through the load is in the same general path as that induced by the fans or impellers.

Another object is to provide a cooling unit having power-driven impeller means for the cooling air that may be quickly and easily positioned within the car, whereby the pressure differential within and without the car itself remains substantially at zero at all times with the result that leakage of cooled air to the exterior of the car or of relatively warm outside air to the interior of the car, through cracks, etc., is kept at a minimum. In this manner I eliminate a troublesome loss of power, inevitably present in those systems wherein cooled air is circulated through the load by the application of a pressure difference between ducts for chilled air leading into and from the car itself.

Another object of my invention is to provide a pre-cooling unit, as aforesaid, wherein the air within the car is repeatedly circulated in heat-exchanging relation with the load and is repeatedly cooled by contact with coils within the car itself, which coils may be cooled, either by the circulation therethrough of chilled liquid, or by direct expansion therein of a liquid refrigerant. Since the piping conducting the cooled liquid or refrigerant to and from the car, is small in cross section as compared to prior art systems of equivalent capacity using air ducts to convey chilled air to and from cooling coils outside the car, complete sealing of the car from the

outside air is easily effected and heat losses may be kept at a minimum. Furthermore, the relatively small pipe distribution system used for conducting chilled liquid or refrigerant to and from the car occupies little space and can be suspended along the wall of a building or upon poles or other supports so as to be immediately available for connection to the car at all times while at the same time, leaving the loading openings unobstructed for free and easy loading.

A still further object is to provide a precooling system for cars wherein the refrigerating means may be located at a considerable distance from the compartment to be cooled and the refrigerant piped to the said compartment with minimum expense for piping and a minimum power loss.

Another object is to provide an apparatus for cooling wherein cooled air is projected horizontally from a central position at the top of the compartment, in opposite directions towards the ends thereof, whereby the natural circulation of the cooling air through the load is in the same direction as the direction of flow induced by the fans or blowers.

A still further object is to provide a cooling unit having a minimum vertical dimension while at the same time effecting an efficient circulation of the cooling air that is aided by the wall of the compartment being cooled.

Other objects and advantages of my invention will become apparent as the description proceeds.

In the drawings:

Fig. 1 is a view partly in cross section, showing one form of the means for supporting the cooling unit for movement into and out of a refrigerator car or compartment, together with the means for raising said unit into a preferred operating position within the car.

Fig. 1A is a detail view of one of the jack elements used for varying the elevation of the tracks upon which the cooling unit is mounted.

Fig. 2 is a plan view of the framework, including parallel tracks, upon which the cooling unit is supported within the car.

Fig. 3 is a section taken on line 3—3, Fig. 2, and showing the tracks, bracing, and attached sockets for two of the elevating jacks.

Fig. 4 is a side elevation of a preferred form of cooling unit showing the cooling coils, the framework for supporting the coils, the discharge openings for the fans, the driving means for said fans and the couplings for the coils. In this view the lower portion of the side cover plate is omitted to show the arrangement of the parts with greater clarity.

Fig. 5 is a top plan view of the unit of Fig. 4, showing the fan rotors, the motors for driving them and the supply header for the cooling coils.

Fig. 6 is an end elevation of the cooling unit with the corresponding end plate omitted and looking from the left, Figs. 4 and 5, and showing the arrangement of the supply and exhaust headers for the cooling coils, one of the fan casings, and the bracing for the casing of the unit.

Fig. 7 is a diagrammatic view showing the arrangement of inlet and outlet headers together with valves and connections for simultaneously servicing a plurality of cooling units similar to the one shown in detail in Figs. 4, 5 and 6.

Fig. 8 is a side elevation of a portable unit constructed in accordance with my invention and showing the unit comprising the cooling coils and blowers, projected through the side doors of a refrigerator car in the position occupied while actually in operation pre-cooling a load. This figure also shows the track means permitting the cooling unit to be projected into the car, the track means permitting the cooling unit to be adjusted longitudinally of the car, and the jacks enabling adjustment of the height of the tracks upon which the cooling unit rolls.

Fig. 9 is a plan view of the portable outfit of Fig. 8 showing the cooling coils projected into a refrigerator car and also showing the blowers and driving motors therefor. This figure also shows a preferred arrangement of the necessary auxiliaries upon the platform of the truck body or other conveyance on which the device may be mounted.

Fig. 10 is a section taken upon the line 10—10, Fig. 8 and showing in particular the transverse mounting for the jacks and cooling unit as well as the track arrangement for permitting projection of the cooling unit into a car.

Fig. 11 is a section taken upon the line 11—11, Fig. 8, showing in enlarged detail the arrangement of the tracks and rollers for slidably mounting the cooling unit.

Definition of terms

In the specification and claims, I desire to have it understood that the term "car" refers to a railroad car, automotive truck or aerial vehicle built and adapted to the transportation of perishable food-stuffs, as well as any other type of self-contained, detachable container adapted to be used for the transportation of appreciable quantities of food-stuffs or other perishable substances.

The term "load" as used herein, means the quantity of food-stuffs or other perishable substances carried by or within the particular car being cooled, irrespective of its kind or nature.

The term "cooling unit" refers to and identifies parts that are movable into the car either as a unit or in sections, including the cooling coils, blowers, wiring, hose connections and supporting framework.

Referring in detail to the drawing, and particularly to Fig. 1, C identifies a refrigerator compartment such as that of a railroad car or motor vehicle having a roof R, a floor F' and loading doors D1 and D2 centrally located in opposite side walls, door D1 being shown closed, and D2 open. As is usual in such compartments, a grille work formed by supporting strips S rest upon, and are spaced from floor F', by a series of sleepers S', so that a space is formed between the floor and strips whereby cooling air may be circulated beneath and about a load of food-stuffs or other perishable substances resting upon the grille-work.

According to one form of my invention, a pair of tracks 1 and 2 are joined in parallel relation by braces 3 that may conveniently be welded to said tracks to form a unitary rigid framework. Each end of each of the tracks has a socket 4 or 4a or 4b or 4c fixed thereto and adapted to rotatably receive the upper end of a respective jack screw 5 and 5a. As these jacks are all identical in construction, a description of one, in connection with Fig. 1A, will suffice.

A standard 6 comprising a cylinder within which screw 5 slidably fits, is enlarged at its lower end to rest upon the floor of the car. At its upper end, standard 6 has a bevel gear 7 journaled therein by a thrust bearing. A bracket 8 is carried by standard 6 and has a bearing journaling a shaft 9 on one end of which is fixed

a bevel gear 10 in mesh with gear 7. Gear 7 has a central aperture threaded to engage screw 5, and as crank 11 is turned, the screw is projected axially from the standard 6, whereby the framework, including tracks 1 and 2 may be raised within the compartment or car C.

At P is indicated a fixed platform adjacent which the car C is positioned. This platform may conveniently have a flat upper surface at or a little above the level of the floor of the car and is adapted to support a truck 12 mounted upon standard swivel casters 13. This truck is generally rectangular in plan and has standards or jacks 14 fixed to its four corners. These standards, except for the lengths of the screws, may be in all respects identical with the jacks used in the compartment as previously described. These jacks are adapted to support a rigid framework, including a pair of parallel tracks 15 and 15*a*, Fig. 6. These tracks 15, 15*a*, of course, have the same spacing as tracks 1 and 2.

A cooling unit 16, subsequently to be described, has flanged wheels 17 movable on tracks 15, 15*a* or 1, 2, and by which said unit may be easily moved into and out of car C.

In use, after car C has been positioned adjacent platform P and loaded, the framework, including tracks 1 and 2 is positioned within the car by means of the four jacks previously described, the truck 12, supporting the cooling unit 16, is rolled into position opposite the open door of the loaded compartment or car, and the several jacks 14 are adjusted until the tracks 15, 15*a*, upon the truck 12 are in alignment with the tracks 1 and 2, respectively, within the car, and at an elevation such as will afford ample clearance between the unit 16 and the top of the door opening in compartment C. The unit 16 is then rolled into the car from the position shown in dotted lines at the left of Fig. 1, to that shown in dotted lines within the car. The jacks within the car are then operated to raise unit 16 to its maximum height permitted by the roof of the car. A baffle sheet 18 is then secured over the door opening. Flexible tube and power connections are then made with unit 16 through an opening 18*a* in said flexible baffle sheet 18 after which the car is ready for cooling.

The cooling unit is indicated generally by the numeral 16 and includes a central beam element 19 that consists of a number of bar reinforcements 20, as indicated in dotted lines, Fig. 4, welded between two metal plates to form a rigid unitary beam. Brackets of any suitable and well-known construction not shown, are secured to and extend laterally from this beam. A plurality of U-shaped coils 21 is secured to and supported by said brackets. A pair of headers 21*a* and 21*b* is arranged in superposed relation across one end of the unit, 21*a* being a supply header and 21*b* an exhaust header. One end of each coil 21 is in communication with header 21*a*, while the other end is in communication with header 21*b*. Couplings 21*c* and 21*d* are provided whereby cooling fluid may be supplied to, and exhausted from the coils through flexible tubing. A channel 22 is mounted at the top of the unit. Struts 22*a* and 22*b* are secured at spaced intervals along and with their lower ends connected to the side plates of beam 19. At their upper ends, these struts are connected to the sides of channel 22 to thereby support said channel. Bracing that includes crossed struts 23, 23*a*, 23*b* and 23*c*, is secured to the ends of beam 19 and channel 22 to define the ends of the cooling unit and to serve as a support for the end plates 24 and 24*a* of the unit.

A crown plate or partition 25 is supported by the end plates 24, 24*a*, or in any other suitable manner, in a normally horizontal position parallel to and somewhat spaced above the top edge of beam 19. As shown at Fig. 5, this plate has circular openings 25*a* and 25*b* therein adapted to snugly receive the shroud ring sections 26*a* and 27*a*, respectively, of a pair of centrifugal fans having rotors 26 and 27. These rotors are of conventional constructions, having blades 26*b*, 27*b* which, when operating, act to draw air upwardly over coils 21, and to discharge the same horizontally outwardly in opposite directions. These rotors are mounted upon shafts 26*c*, 27*c*, each journaled at the top in bearings 26*d*, 27*d*, carried by channel 22, and at the bottom in bearings 26*e*, 27*e*, mounted upon the top edge of beam 19. A pair of driving motors 28 and 29 are mounted upon plates 28*a* and 29*a* that, in turn, are carried by brackets 28*b* and 29*b* secured to channel 22 and beam 19. Pulleys 28*c* and 29*c* are connected to the corresponding motor shafts and belts 28*d* and 29*d* connect each pulley with a respective pulley 26*f* and 27*f* upon a blower shaft. If desired, of course, a single motor can be arranged to drive both fan rotors.

As is indicated by the arrows in Fig. 5, each fan rotor is arranged to discharge air laterally toward each end of the car. To assist in this function, directing or baffle plates 30, 30*a*, 31, 31*a*, shaped as clearly shown in Fig. 5, are supported and secured to crown plate 25 so that air after passing through the load, is drawn upwardly, cooled by passing over coils 21, and subsequently deflected in uniform streams, toward opposite ends of the car. The inner pair of these plates 30*a* and 31*a*, may conveniently have their vertical edges secured to the corresponding edges of motor bases 28*a* and 29*a*.

From Fig. 1, it will be noted that, when in operating position, the unit 16 is closely adjacent the top of the car. This fact renders it unnecessary to provide a top cover plate for the unit although, of course, such a plate may be used if desired. The use of the roof of the car as a substitute for a cover plate not only lightens the unit but also facilitates adjustments and repairs when the unit is out of use.

Baffle plates 32 and 33, Fig. 6, are pivoted on axes parallel to beam 19, adjacent the respective sides of the unit. These plates are let down, after the unit is in operating position within the car, until their outer edges rest on the crates or other containers, constituting the load, and assist in directing the chilled air outwardly toward the ends of the car.

By the foregoing construction, a cooling unit is provided that is relatively light in weight, quickly and easily inserted into, and withdrawn from the car, and one that delivers a maximum volume of air for its weight and over-all vertical dimension. While I have shown this unit as built around and supported by a unitary framework, it will be appreciated that, if desired, the fans or blowers may be built as one element while the coils may be formed as a separate element. The two elements will then be adapted to fit together when in operating position and the blower element can be moved into the car and supported adjacent the top thereof while the coil element is subsequently moved into position.

The cooling unit just described in connection with Figs. 1 to 7, inclusive, will ordinarily be

located on or adjacent the shipping platform of a packing house or warehouse. The refrigeration apparatus and its auxiliaries will ordinarily be located in any convenient location in or near the packing house and only a supply pipe and a return pipe are required between the refrigeration apparatus and coils 21. These pipes may either convey chilled liquid, such as brine, to and from said coils, or refrigerant may be conveyed under pressure to said coils and evaporated therein after passing through a conventional reduction valve.

In cases where a plurality of cars are to be pre-cooled at the same time, the arrangement shown at Fig. 7 may be used. This consists of a supply pipe 90 from the outlet of a tank containing chilled liquid or the receiving tank for liquid refrigerant. A supply header 91 communicates with pipe 90. This header extends along the siding on which a number of cars to be loaded are positioned and supply pipes 92, 92a, 92b, and 92c lead from header 91 at properly spaced intervals. A shut off valve 93, 93a, 93b, and 93c is located in each supply pipe. Similarly, a series of return pipes 94, 94a, 94b, and 94c is adapted to be connected by couplings 21d, to the return header 21b of each cooling unit used. These pipes communicate with a return header 96 and valves 95, 95a, 95b, and 95c provide for putting any unit into or out of service. Header 96 is serviced by a return pipe 97 leading to the compressor or chilled liquid tank, as the case may be.

In other situations, as where the capacity of a packing house is not great enough to require the full time service of a cooling unit, it may be desirable to mount such unit upon the platform of a motor or railway vehicle whereby it may be moved from one location to another as desired.

At Figs. 8 to 11, inclusive, I have shown a mobile pre-cooling mechanism wherein the cooling unit may be the same as that indicated at 16, Fig. 1. In these figures, 35 identifies the platform of an automotive truck T. At its forward end, platform 35 has a transverse channel 36 fixed thereto. A second channel 37 is fixed to the rear edge of platform 35 parallel to channel 36. Channel sections 36 and 37 each have a plurality of spaced rollers 38 and 39 pivoted on axles or pins extending between the side walls thereof. A second channel section 40 has an over-all width a little less than the inside dimension between flanges on channel 36 and a length approximately two-thirds of the length of channel 36. Channel 37 carries a second and smaller section 41 similar to section 40. Thus each of the sections 40 and 41 are mounted on the rollers 38 and 39, respectively for guided movement in and along main channels 36 and 37. It will be understood that stop means will be provided preventing sliding channels 40 and 41 from leaving channels 36 and 37 in an endwise direction. Also, means will be provided for locking the sliding channels in central position on the truck platform during transportation from place to place. If desired the edges of fixed channels 36 and 37 may be turned over the corresponding upper edges of sliding channels 40 and 41 whereby to prevent the possibility that the latter may become unseated from rollers 38 and 39.

Sliding channel 40 has a pair of spaced upright cylinders 42 and 43 rigidly mounted thereon. Cylinder 42 has a plunger element 44 slidably fitted therein while cylinder 43 has a plunger element 45 slidable therein. In the same manner, sliding channel 41 has a pair of spaced cylinders 46 and 47 (Fig. 9) in each of which a respective plunger element 48 or 49 slidably fits. These four cylinders are located at the four corners of a rectangle that may have a width substantially equal to the width of the door or opening of the compartment to be cooled which, in the particular species selected for illustration, is the door opening F of a refrigerator railway car C. The plungers 44, 45, 48 and 49 form the movable elements of a hydraulic structure operable to raise and lower the cooling unit to a desired elevation for insertion through door opening F and subsequent elevation, if desired, to vary the vertical position of the cooling unit within the car. As a source of fluid pressure to actuate the plungers, I provide a compressor 50 of any suitable design and capacity and a receiver tank 51 connected to the compressor to store the actuating fluid under pressure. This fluid will usually be oil and it will be understood that compressor motor 52, will be controlled by a switch responsive to the pressure in tank 51, whereby said pressure is maintained substantially constant therein. Suitable piping and valves (not shown) are provided for conducting and controlling the flow of hydraulic fluid to the several cylinders.

Plungers 44 and 48 have attached to their tops a side rail 55. Likewise plungers 45 and 49 at the other side of platform 35 support at their tops a rail 56. Rails 55 and 56 are shown in the form of channels turned on their sides with channels facing each other. As shown at Figs. 8 and 9, rails 55 and 56 extend from a point substantially flush with the rear end of the truck, forwardly to a point over the truck cab. Brace 57 rigidly connects the forward ends of side rails 55 and 56 whereby to form a rigid elevator platform. Other braces (not shown) may extend between and interconnect the lower edges of these rails at any desired points.

The cooling unit support consists of a pair of sliding rails 59 and 60, connected at their ends by cross pieces 61 and 62, to form a rigid frame. As clearly indicated at Figs. 10 and 11, these rails each have a series of spaced brackets 63 secured along their lower edges, as by welding, and each bracket has a roller 64 pivoted to its outside lower portion. These rollers are of a size to fit the channels of side rails 55 and 56, and it will be noted that movable rails 59 and 60 are so spaced, that the channels of rails 55 and 56 form tracks within which rollers 64 are guided. An antifriction mounting for the frame comprising movable rails 59 and 60 is thus provided, whereby said frame may be easily projected from the rear end of the truck body. It will be noted that rails 55, 56, 59 and 60 are of substantially the same length so that when fully retracted, they are coextensive. On the other hand the mounting just described enables the movable frame to be projected rearwardly of the platform 35 and into a compartment that it is desired to pre-cool. Suitable locking means (not shown), such as pins projecting through aligned holes in rails 55 and 59, 56 and 60, or set screws, may be provided to secure the movable frame in any position along rails 55 and 56 and to prevent unauthorized use.

The cooling unit 16' may be of the same construction as has already been described in connection with Figs. 4, 5 and 6. As shown at Figs. 8 and 10, the casing of the cooling unit 16' has brackets 66, secured along its bottom wall. Each

bracket pivotally mounts a roller 67. These rollers are so spaced as to ride in and along track members 68 of U-shaped cross section, secured on and along the top sides of the lower side walls of sliding rail 59 and 60. Each roller 67 has a smooth fit between the inside faces of the side walls of channels 59 and 60. Thus the cooling unit as a whole is slidable longitudinally along sliding rails 59 and 60 and may be given an adjustment independently of said rails or, of course, adjusted therewith. It is within the purview of the invention to omit brackets 66 and rollers 67 in which case, cooling unit 16' is attached directly to channels 59 and 60.

As previously stated the cooling unit 16' per se, used in the species of Figs. 8 to 11, inclusive, may be identical with unit 16. However, I have shown a slightly different arrangement of baffles and arrangement of driving motors. These baffles 71, 72 and 73 are shaped as shown at Fig. 9 whereby all "dead" spaces along the delivery area of the blowers are eliminated and a more nearly uniform discharge of cooled air is effected. Each fan rotor has a belt pulley 74 or 75 fixed to its shaft and each is driven by a motor 76 or 77 secured to the end walls of the unit casing. Belts 78 and 79 connect each rotor with its fan motor. By this construction, as the rotors are driven counterclockwise as seen in Fig. 9, air is drawn upwardly from the central portion of the car, cooled by contact with the chilled surfaces of the coils, and directed horizontally outward in opposite directions toward the ends of the car. Cooled air is therefore positively circulated in heat-exchanging relation with the load, whereby the same is rapidly cooled for shipment. In this species, baffles 32 and 33 will be used as disclosed in connection with Fig. 6. Connection is made by means of flexible pipes 80 and 81, to circulate refrigerating fluid through the coils of unit 16'. The system may be self-contained except for connections to a separate source of cooling water for the condenser of the refrigerator, and, if desired, electrical connections from a separate source of power for driving compressor, fans, etc. A tank 83 for brine is mounted upon platform 35 and by the term "brine" it will be understood that I mean any suitable coolant liquid such as a solution of the chlorides of sodium, calcium, and magnesium. Expansion coils 98 for the refrigerant compressed by compressor 85, and liquefied in a conventional condenser (not shown) are located within tank 83. Compressor 85 is shown as a standard two-cylinder V-type machine, belt connected to be driven by a motor 86. Any standard refrigerant such as ammonia, Freon 21, butane, or dieline, may be used as the heat exchange medium. In all cases, suitable baffles are provided to cover the door opening after the cooling unit has been adjusted into proper position. Preferably these baffles will be in sections and one of them will have an opening through which electrical connections may be led to supply current for driving fan motors 76 and 77. If desired a single elevating plunger, fitting an hydraulic cylinder on platform 35, may be substituted for the four plungers shown upon Figs. 8, 9 and 10. In operation, the truck is backed up to the door of a loaded car into approximately correct position. Channels 40 and 41 are slid along and over rollers until the cooling unit 16' is exactly aligned with the door opening, after which they are secured in this position by any suitable means. Fluid under pressure is then admitted from tank 51 to elevator cylinders 42, 43, 46 and 47 until rails 55 and 56 are in such position as to enable unit 34 to be slid into the car. Rails 59 and 60 are next projected along rails 55 and 56 to project unit 16' into the car and as soon as said unit is in proper position within the car, the elevating mechanism is again actuated to move the unit 16' into its uppermost position within the car, as indicated at Fig. 8. Baffles 32 and 33 are now let down to rest upon the load and baffles 65 are placed in position above and below rails 59 and 60 to fully cover the door opening F. Electrical connections to fan motors 76 and 77 are established through one section of the door baffles, as previously explained, and condenser cooling water and electrical connections are made from outside sources to the truck. The machine is now ready for operation. Compressor 85 is started and, assuming that the brine in tank 83 is chilled to the proper temperature, motors 76 and 77 are started. Air in the car is now cooled by unit 16' and circulated in well-defined paths over and through the load and back to the cooler, thus rapidly absorbing the heat from the fruit, vegetables or other articles comprising the load. Cooling may continue for the desired period which may be a few hours, whereupon the unit is removed from the car by the reversal of the steps above outlined and the car doors closed. The car may be iced after the pre-cooling so that it is ready for shipment as soon as unit 16' has been withdrawn. The truck may then be moved to another loaded car and the process repeated. Thus it may be seen that, by applicant's construction, the unit may be moved longitudinally, toward and from, and vertically, of the car.

In the case where several cars are to be simultaneously serviced, as by the connections shown at Fig. 7, the load upon the compressor may be kept substantially constant by having the cars in various stages of pre-cooling so that, as soon as the pre-cooling of one car is complete, another freshly-loaded car may be connected. In this manner, the compressor may be operated at substantially maximum efficiency at all times by keeping the load curve substantially flat.

From the above description it will be seen that I have provided a system of pre-cooling loads of perishable products to be shipped, that is rapid, efficient and systematic. The mobile units may be quickly moved from place to place and kept in almost continuous operation to rapidly precool loaded compartments and prepare them for shipment.

While I have shown preferred forms of my invention, it will be clear to those skilled in the art that numerous changes, modifications and substitutions are possible without changing the broad principles and purposes thereof. I desire it to be understood therefore that I wish to reserve all such modifications, alterations and substitutions as fall within the scope of the subjoined claims.

Having now fully disclosed my invention, what I claim and desire to secure by Letters Patent is:

1. In a cooling unit for shipping compartments, a platform, parallel track means, elevator means mounting said track means on said platform for controlled vertical movement, a frame slidably mounted on said track means to be projectable therealong into an adjacent compartment, cooling coils on said frame, and power blower means on said frame positioned to circulate air over and about said coils, said elevator means being operable to translate said track means, frame, coils and blower means vertically.

2. In a device for pre-cooling a railway refrigerator car having a door opening, a cooling unit comprising a casing adapted to be passed through said opening, cooling coils in said casing, blower means in said casing adapted to force air over said coils to cool the air, means in said casing for directing said cooled air horizontally in opposite directions, power means in said casing connected to drive said blower means, a platform, means carried solely by said platform to mount said casing for movement laterally, vertically and horizontally into said compartment, and flexible connections from a source of cooling fluid to said coils.

3. The combination with a railway refrigerator car having a refrigerating space extending longitudinally thereof and a door arranged centrally of one side wall of the car, of structure for pre-cooling the contents of said car, said structure comprising first track means, jack means adapted to support said first track means in said car to extend transversely thereof from said door and elevated approximately midway between the floor and roof thereof, second track means, means adapted to support said second track means exteriorly of said car in alignment with said first track means, a cooling unit comprising a frame, cooperating cooling coils and blower means carried by said frame in superposed relation, and roller means mounting said cooling unit for movement into and out of said car on and along said first and said second aligned track means.

4. In a pre-cooling system for a railway refrigerator car having a door in the side wall thereof, a unitary frame including a pair of parallel tracks, jack means adapted to support said track means in said car in a position substantially midway between the floor and top thereof, a cooling unit comprising heat exchange coils, a pair of blowers superposed over said coils, shroud plates adapted to direct air drawn over said coils horizontally outwardly and power means connected to drive said blowers, and roller means mounting said cooling unit for translation on and along said tracks, said jack means being operable to vertically translate said tracks and unit from said first position to a second position whereby said unit may be positioned adjacent the roof of the car.

5. In a pre-cooler for a railway refrigerator car, a mobile base independent of said car, tank means carried by said base and adapted to contain a supply of chilled liquid, track means wholly supported by said base and adapted to be extended laterally from said base into and transversely across the car, a cooling unit supported for translation on and along said track means, said unit including heat exchange coils and power-driven blower means adapted to draw air over said coils and to expel the same laterally outwardly in opposite directions, means operable to elevate said track means and said unit while laterally extended from said base, and liquid-conveying connections between said tank means and said coils.

6. In a pre-cooling unit for temporary installation in a railway refrigerator car, a frame adapted to extend through the loading aisle of the car, heat exchange coils mounted within the lower portion of said frame, a pair of blowers having rotors journaled in said frame immediately above and adjacent said coils, on normally vertical axes spaced longitudinally of said frame, shroud means carried by said frame and extending about said rotors to direct air, drawn upwardly over said coils by said blowers, horizontally in opposite directions, said means defining a space centrally of said frame, and a pair of motors mounted on said frame within said space, each motor being coupled to drive a respective blower rotor.

7. The combination with a railway refrigerator car having a loading opening in its side wall, said opening extending from the floor thereof and terminating short of the ceiling thereof, of a cooling unit for pre-cooling the contents of the car, said unit comprising a casing, having a length substantially equal to the internal width of said car and a width less than the width of said opening, cooling coils in said casing, blower means in said casing over said coils, shrouds in said casing adapted to direct air from said blower means horizontally outwardly toward opposite ends of said car, and means supporting said unit for translation into said car through said opening, said means being operable to elevate said unit to occupy a space between the ceiling of said car and the top of said opening, whereby the space in said car below said unit may be loaded prior to insertion of the unit into the car.

8. The combination with a refrigerator car having a loading opening in its side wall extending from the floor and terminating below the level of the ceiling, a cooling unit comprising a casing, cooling coils and blower means in said casing in superposed relation, baffles in said casing adapted to direct air from said blower horizontally in opposite directions, a pair of parallel tracks, rollers carried by said casing to support the same for translation on and along said tracks into said car and jack means for supporting said tracks in spaced relation from the floor of the car, said jack means being operable to elevate said cooling unit into the space between the roof of the car and the top of said opening.

9. In a pre-cooler for a refrigerator car, truck means having mounted thereon a track adapted to extend from the exterior of the car into and across the same, jack means supporting said track means independently of the car for vertical adjustment relatively thereto, and a cooling unit supported on and by said track means for translation therealong, said unit including cooling coils and a blower operable to draw air upwardly over said coils and to discharge the same laterally in opposite directions.

10. In a pre-cooler for a refrigerator car, track means adapted to extend into and across the car, a cooling unit comprising cooling coils and a blower operable to draw air over said coils and to direct the same horizontally outwardly, means mounting said unit for translation on and along said track means, and means supporting said track means at all times independently of said car, said supporting means being operable to move said track means and unit vertically.

11. In a pre-cooler for a refrigerator car, a first pair of normally horizontal tracks, first jack means adapted to support said tracks within and transversely across said car and operable to vertically translate said tracks as a unit, a frame supported independently of said car, a second pair of normally horizontal tracks, second jack means mounting said second pair of tracks on said frame and operable to vertically translate said second pair of tracks into alignment with said first pair of tracks, a cooling unit comprising cooling coils and a blower adapted to pass air over said coils and direct the same horizontally outwardly, and means mounting said cooling unit for rolling

movement on and along said aligned pairs of tracks.

12. In a pre-cooling mechanism for a refrigerator car, a base, a refrigerator device, a tank adapted to contain a supply of liquid cooled by said device, a heat exchange unit, track means on said base supporting said unit independently of said car for guided horizontal translation into and out of the car, flexible couplings between said unit and said tank, and means operable to vertically translate said unit and supporting means relatively to said base and car.

13. In a device for pre-cooling the interior and contents of a railway refrigerator car, a platform supported independently of said car, refrigerating mechanism including expansion coils on said platform, a heat exchange unit comprising cooling coils and a blower for circulating air over and about said coils and directing the air horizontally outwardly, a pair of horizontal parallel tracks, means supporting said tracks on said platform for lateral extension therefrom, and operable to translate said tracks vertically relatively to said platform, means mounting said heat exchange unit for translation on and along said tracks, and flexible supply and withdrawal conduits from said refrigerator mechanism to said cooling coils.

14. In a cooling unit for a railway refrigerator car, means forming a casing having an open bottom, cooling coils mounted in said casing adjacent the bottom, a blower journaled in said casing above said coils and operable to draw air upwardly over said coils, baffles carried by said casing to direct the air from said blower horizontally in oppositely-directed streams, a motor carried by said casing in horizontally offset relation with said blower, means drivingly connecting said motor and blower, a truck independent of said car, and means supporting said casing on said truck, said last-named means mounting said casing for vertical and horizontal translation relatively to the truck.

15. In a mobile pre-cooling machine, a mobile platform, first and second normally horizontal parallel guide means on said platform extending in a horizontal direction, a first pair of spaced telescoping jack elements translatable on said first guide means, a second pair of spaced telescoping jack elements translatable on said second guide means, a pair of normally horizontally spaced parallel supporting rails each mounted on respective ones of said first and second jack elements and extending in a second direction normal to said first direction, power means on said platform connected to operate said jack elements to raise and lower said rails in unison, a pair of connected movable rails each mounted for movement on and along a respective one of said supporting rails and having their ends projectable therefrom, a cooling unit comprising cooling coils and air circulating means, means mounting said cooling unit for movement on and along said movable rails, a tank mounted on said platform and adapted to contain cooling fluid, and flexible closed-circuit connections from said tank to said cooling coils.

16. The combination with a refrigerator car, of means for cooling the contents thereof, said means including a casing extending laterally across the car between the side walls thereof, a partition in said casing dividing said casing into upper and lower compartments, cooling coils mounted in said lower compartment, there being apertures in said partition, a pair of centrifugal fan rotors in said upper compartment, each having a vertical axis of rotation and positioned centrally over a respective aperture, said rotors being spaced longitudinally of said casing, power means carried by said casing between and coupled to drive said fan rotors, means forming discharge passageways in said upper compartment to direct the air discharged from said rotors toward opposite ends of the car, a platform, and means carried by said platform supporting said casing for movement vertically, longitudinally and transversely of said car, whereby said casing may be moved vertically with respect to the roof of the car or withdrawn from the car through the side door thereof.

17. The combination with a transportation compartment having a door opening, of means for pre-cooling the contents of said compartment, said means comprising a cooling unit comprising a casing, cooling coils in said casing, power-driven blower means in said casing, means including said blower means arranged to impel air over said coils, then horizontally in opposite directions, a platform exteriorly of said compartment, and means mounting said casing solely upon said platform, for movement laterally and vertically of said opening and horizontally through said opening into said compartment.

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